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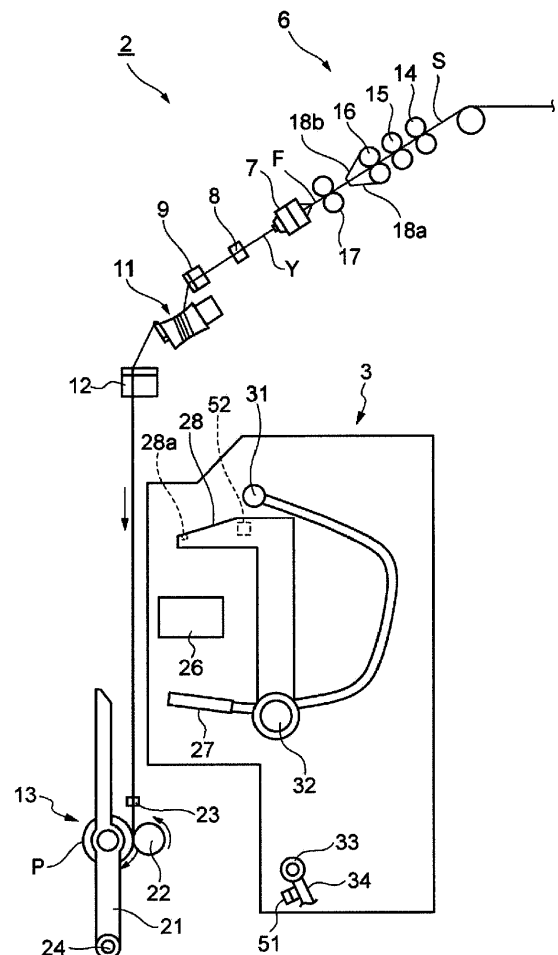
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(54) **YARN WINDING MACHINE**

(57) A yarn winding machine includes a cradle arm (21) that rotatably supports a package (P) into which a yarn is wound, a suction mouth (28) that catches the yarn from the package (P), and a first jetting device (51) that is provided separately from the suction mouth (28) and that is movable so that a distance thereof from the package (P) can be changed and that jets air on the package (P).

FIG.2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] As a conventional yarn winding machine, a spinning machine that includes a yarn catching device that catches a yarn from a package rotatably supported by a package supporting member, and in which the yarn catching device includes a jetting device that jets air on the package is known in the art. For example, see Japanese Patent Application Laid-Open No. H8-245081.

[0003] As another conventional yarn winding machine, an automatic winder that includes a yarn catching device that catches a yarn from a package rotatably supported by a package supporting member, and in which a jetting device that jets air on the package is arranged in a fixed manner and separately from the yarn catching device is known in the art. For example, see Japanese Utility Model Application Laid-Open No. H5-5769.

[0004] Air is jetted on the package in the above yarn winding machine to make catching of the yarn from the package easy.

[0005] There is a requirement in the yarn winding machines to be able to surely catch a yarn from a package.

SUMMARY OF THE INVENTION

[0006] In view of the above discussion, it is an object of the present invention to provide a yarn winding machine that can surely catch a yarn from a package.

[0007] A yarn winding machine according to one aspect of the present invention includes a package supporting member that rotatably supports a package into which a yarn is wound; a first yarn-catching device that catches the yarn from the package; and a first jetting device that is provided separately from the first yarn-catching device and that is movable so that a distance thereof from the package can be changed and that jets air on the package.

[0008] A yarn winding machine according to another aspect of the present invention includes a plurality of yarn winding units; and a yarn jointing cart capable of travelling with respect to each of the plural yarn winding units. Each of the plural yarn winding units includes a yarn supplying section that supplies a yarn; a package supporting member that rotatably supports a package into which the yarn is wound; and a winding drum that rotates the package in a direction from which the yarn is wound into the package. The yarn jointing cart includes a first yarn-catching device that catches the yarn from the package; a second yarn-catching device that catches the yarn from the yarn

supplying section; a yarn jointing device that joints the yarn caught and guided thereto by the first yarn-catching device and the yarn caught and guided thereto by the second yarn-catching device; a reverse-rotation roller that, in a state in which the package and the winding drum are separated from each other, rotates the package in a reverse direction of the direction from which the yarn is wound into the package; a moving member capable of moving the reverse-rotation roller in at least one of toward and away from the package; a first jetting device that is provided separately from the first yarn-catching device and that is movable so that a distance thereof from the package can be changed and that jets air on the package; and a second jetting device that jets air on the package.

[0009] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a front view of a spinning machine that is a yarn winding machine according to an embodiment of the present invention.

FIG. 2 is a side view of a spinning unit that is a yarn winding unit according to an embodiment of the present invention.

FIG. 3 is a front view of a configuration near a package in the spinning unit shown in FIG. 2.

FIG. 4 is a side view of the spinning unit shown in FIG. 2 when cutting a yarn.

FIG. 5 is a side view of the spinning unit shown in FIG. 2 when jetting air.

FIG. 6 is a side view of the spinning unit shown in FIG. 2 when catching the yarn.

FIG. 7 is a side view of the spinning unit shown in FIG. 2 when jointing the yarn.

DETAILED DESCRIPTION

[0011] Exemplary embodiments of the present invention are explained in detail below with reference to the accompanying drawings. Same reference numbers have been attached to the same or substantially similar structural elements and overlapping explanation thereof is omitted.

[0012] As shown in FIG. 1, a spinning machine (a yarn winding machine) 1 includes a plurality of spinning units (yarn winding units) 2, a yarn jointing cart 3, a not-shown doffing cart, a first-end frame 4, and a second end-frame 5. The spinning units 2 are arranged side-by-side in a line. Each of the spinning units 2 generates a yarn Y and winds the yarn Y into a package P. The yarn jointing cart

3 performs a yarn jointing operation in a certain spinning unit 2 in which the yarn Y is cut or a breakage occurs in the yarn Y for some reason. When the package P becomes fully wound in a certain spinning unit 2, the doffing cart doffs the fully wound package P and supplies a new empty bobbin B to that spinning unit 2.

[0013] A collecting device and the like for collecting fiber waste, yarn waste, and the like generated in the spinning unit 2 is arranged in the first-end frame 4. An air supplying section that supplies air to the various elements of the spinning machine 1 after appropriately adjusting an air pressure of compressed air (air) supplied to the spinning machine 1, and a driving motor and the like that supplies driving power to various elements of the spinning unit 2 are arranged in the second-end frames 5. The second-end frame 5 is provided with a machine-frame controlling device 41, a display screen 42, and one or more input keys 43. The machine-frame controlling device 41 centrally manages and controls various elements of the spinning machine 1. The display screen 42 displays information and the like about setting contents and / or a state of the spinning unit 2. An operator can perform various settings of the spinning unit 2 by appropriately operating the input keys 43.

[0014] As shown in FIGS. 1 and 2, each of the spinning units 2 includes a drafting device 6, an air spinning device (a yarn supplying section) 7, a yarn monitoring device 8, a tension sensor 9, a yarn accumulating device 11, a waxing device 12, and a winding device 13 in this order from upstream in a travelling direction of the yarn Y. One unit controller 10 is arranged for a predetermined number of the spinning units 2, and the unit controller 10 controls operations of those spinning units 2.

[0015] The drafting device 6 drafts a sliver (a fiber bundle) S. The drafting device 6 includes a back roller pair 14, a third roller pair 15, a middle roller pair 16, and a front roller pair 17 in this order from upstream in a travelling direction of the sliver S. Each of the roller pairs 14, 15, 16, and 17 includes a bottom roller and a top roller. The bottom roller is rotationally driven by the driving motor arranged in the second-end frame 5 or a driving motor arranged in each of the spinning units 2. An apron belt 18a is wound on the bottom roller of the middle roller pair 16. Another apron belt 18b is wound on the top roller of the middle roller pair 16.

[0016] The air spinning device 7 generates the yarn Y by applying twists by using a swirling air current to a fiber bundle F drafted by the drafting device 6. That is, the air spinning device 7 functions as a yarn supplying section that supplies the yarn Y. More particularly, (although not shown in the drawings) the air spinning device 7 includes a spinning chamber, a fiber guiding section, a swirling air current generating nozzle, and a hollow guiding member. The fiber guiding section guides the fiber bundle F, which is supplied from the drafting device 6 on the upstream side, to the inside of the spinning chamber. One or more swirling air current generating nozzles are arranged around a travelling path of the fiber bundle F. A swirling

air current is generated in the spinning chamber by jetting air from the swirling air current generating nozzles. The fiber ends of the fibers constituting the fiber bundle F are reversed and whirled by this swirling air current. The hollow guiding shaft guides the yarn Y from the inside of the spinning chamber to the outside of the air spinning device 7.

[0017] The yarn monitoring device 8 monitors, at a location between the air spinning device 7 and the yarn accumulating device 11, information about the travelling yarn Y, and detects presence / absence of a yarn defect in the yarn Y based on the monitored information. Upon detecting the yarn defect, the yarn monitoring device 8 transmits a yarn-defect detection signal to the unit controller 10. The yarn monitoring device 8 detects, for example, a thickness abnormality of the yarn Y and / or a foreign substance contained in the yarn Y as the yarn defect. The yarn monitoring device 8 also detects a yarn breakage and the like. The tension sensor 9 measures, at a location between the air spinning device 7 and the yarn accumulating device 11, a tension of the travelling yarn Y, and transmits a tension measurement signal representing the measured tension to the unit controller 10. When the unit controller 10 determines, based on a detection result obtained in the yarn monitoring device 8 and / or the tension sensor 9, that an abnormality is present in the yarn Y, the yarn Y is cut in the spinning unit 2. Specifically, the yarn Y is cut by suspending the generation of the yarn Y by stopping the supply of the air to the air spinning device 7. Alternatively, the yarn Y can be cut by using a dedicated cutter.

[0018] The waxing device 12 applies wax on the yarn Y at a location between the yarn accumulating device 11 and the winding device 13.

[0019] The yarn accumulating device 11 removes a slack of the yarn Y at a location between the air spinning device 7 and the winding device 13. The yarn accumulating device 11 has the following functions: to stably pull the yarn Y from the air spinning device 7, to prevent slacking of the yarn Y by temporarily accumulating the yarn Y fed out from the air spinning device 7 when the yarn jointing cart 3 performs the yarn jointing operation and the like, and to prevent variations in the tension of the yarn Y downstream of the yarn accumulating device 11 from being conveyed to the air spinning device 7.

[0020] The winding device 13 winds the yarn Y around the bobbin B thereby forming the package P. The winding device 13 includes a cradle arm (a package supporting member) 21, a winding drum 22, and a traversing guide 23. The cradle arm 21 rotatably supports the bobbin B. In other words, the cradle arm 21 rotatably supports the package P. The cradle arm 21 is pivotably supported by a support shaft 24. By pivoting the cradle arm 21, a surface of the bobbin B or a surface of the package P can be caused to come into contact with a surface of the winding drum 22 at an appropriate pressure. The not-shown driving motor provided in the second-end frame 5 drives the winding drums 22 of a predetermined number

of the spinning units 2 all at once. When the winding drums 22 of the corresponding spinning units 2 are rotated, the package P is rotated in a direction from which the yarn Y is wound into the package P. The traversing guides 23 of a predetermined number of the spinning units 2 is arranged on a shaft 25 that is shared by those spinning units 2. The traversing guide 23 traverses the yarn Y by a predetermined width on the rotating bobbin B or the package P when the driving motor arranged in the second-end frame 5 causes the shaft 25 to perform a reciprocating movement along a direction of a rotation axis of the winding drum 22.

[0021] The yarn jointing cart 3 can travel to a desired one of the spinning units 2. When the yarn Y is cut or when a breakage occurs in the yarn Y in a certain spinning unit 2 due to some reason, the yarn jointing cart 3 travels to that spinning unit 2 and performs a yarn jointing operation in that spinning unit 2. The yarn jointing cart 3 includes a yarn jointing device 26, a suction pipe (a second yarn-catching device) 27, a suction mouth (a first yarn-catching device) 28, a reverse-rotation roller 33, a moving member 34, a first jetting device 51, and a second jetting device 52.

[0022] The suction pipe 27 is pivotably supported by a support shaft 31. The suction pipe 27 catches the yarn Y from the air spinning device 7 and guides the caught yarn Y to the yarn jointing device 26. The suction mouth 28 is pivotably supported by a support shaft 32. The suction mouth 28 catches the yarn Y (an end of the yarn Y wound into the package P) from the package P and guides the caught yarn Y to the yarn jointing device 26. The yarn jointing device 26 joints the yarn Y caught and guided thereto by the suction pipe 27 and the yarn Y caught and guided thereto by the suction mouth 28. The yarn jointing device 26 can be a splicer that uses compressed air, a piecer that uses a seed yarn, a knotter that mechanically joints the yarn Y, and the like.

[0023] When catching the yarn Y from the package P with the suction mouth 28, the cradle arm 21 is moved by a not-shown air cylinder so that the package P and the winding drum 22 are separated from each other. In this state, the suction mouth 28 is pivoted so that a suction port 28a of the suction mouth 28 is positioned near a surface of the package P, and the reverse-rotation roller 33 is moved by the moving member 34 so that the reverse-rotation roller 33 contacts the package P. In this state in which the package P and the winding drum 22 are separated from each other, the reverse-rotation roller 33 that is in contact with the package P causes the package P to rotate in a reverse direction of the direction from which the yarn Y is wound into the package P (reverse rotation).

[0024] As shown in FIG. 3, the first jetting device 51 is attached to the moving member 34 through a bracket and the like. When the reverse-rotation roller 33 is being moved by the moving member 34 so that the reverse-rotation roller 33 contacts the package P, the first jetting device 51 jets air on the package P from a plurality of

first exhaust ports 51a. The first exhaust ports 51a are arranged in the first jetting device 51 in such a manner that air can be jetted therefrom in an entire width direction of the package P from a region on one end in the width direction of the package P. The first jetting device 51 is moved by the moving member 34 toward or away from the package together with the reverse-rotation roller 33. That is, the first jetting device 51 is movable separately from the suction mouth 28 (i.e., independently from the suction mouth 28) so that a distance between the first jetting device 51 and the package P can be changed. For example, the moving member 34 can be realized with a linkage, an air cylinder, and the like.

[0025] The second jetting device 52 is attached to the suction mouth 28 through a bracket and the like. While the suction mouth 28 is being pivoted so that the suction port 28a of the suction mouth 28 is positioned near the package P, the second jetting device 52 jets air on the package P from a plurality of second nozzles 52a. The second nozzles 52a are arranged in the second jetting device 52 in such a manner that air can be jetted therefrom in an entire width direction of the package P from a region on one end in the width direction of the package P.

[0026] Now, operations performed by the yarn jointing cart 3 and the spinning unit 2 when the yarn Y is cut or a breakage occurs in the yarn Y in a certain spinning unit 2 for some reason are explained below.

[0027] When the unit controller 10 determines that an abnormality has occurred based on a detection result obtained in the yarn monitoring device 8 and / or the tension sensor 9 while the yarn Y is being generated and wound into the package P, the unit controller 10 stops the operations of the drafting device 6 and the air spinning device 7 thereby cutting the yarn Y. The yarn Y can be cut with a separately provided cutter. Alternatively, when the unit controller 10 determines that a breakage has occurred in the yarn Y based on a detection result obtained in the yarn monitoring device 8 while the yarn Y is being generated and wound into the package P, the unit controller 10 stops the operations of the drafting device 6 and the air spinning device 7.

[0028] Subsequently, the unit controller 10 moves the cradle arm 21, as shown in FIG. 4, so that the package P and the winding drum 22 are separated from each other. Then, after the cut or broken yarn Y is wound into the package P, the unit controller 10 operates a not-shown braking mechanism to stop the rotation of the package P. Because the yarn Y is not traversed by the traversing guide 23 while the cut or broken yarn Y is being wound into the package P, the yarn Y is wound in substantially a central region of the package P in the width direction of the package P.

[0029] Subsequently, the unit controller 10 transmits to the yarn jointing cart 3 a signal that contains information specifying the spinning unit 2 in which the Y is cut or broken. Upon receiving this signal, the yarn jointing cart 3 travels to the spinning unit 2 specified in the signal and stops there. Then, in the yarn jointing cart 3, the suction

pipe 27 is pivoted, as shown in FIG. 5, from its current waiting position toward a position downstream of the air spinning device 7. Moreover, the suction mouth 28 is pivoted from its current waiting position toward a position near the surface of the package P, and the reverse-rotation roller 33 is moved by the moving member 34 from its current waiting position so that the reverse-rotation roller 33 contacts the package P. The pivoting of the suction pipe 27 toward the position downstream of the air spinning device 7 and the pivoting of the suction mouth 28 toward the position near the surface of the package P can be performed simultaneously or can be performed one after the other.

[0030] During a period from a start of the movement of the reverse-rotation roller 33 toward the package P until the reverse-rotation roller 33 contacts the package P, the first jetting device 51 is moved toward the package P by the moving member 34 (so that the distance to the package P is reduced) while continually jetting air on the package P. For example, the jetting of the air from the first jetting device 51 is started with the start of the movement of the reverse-rotation roller 33 toward the package P, and the jetting of the air from the first jetting device 51 is stopped with the contact of the reverse-rotation roller 33 with the package P (i.e., with a stop of the movement of the reverse-rotation roller 33 toward the package P). Moreover, during a period from a start of the pivoting of the suction mouth 28 toward the package P until the suction mouth 28 stops the pivoting, the second jetting device 52 is moved together with the suction mouth 28 toward the package P while jetting air on the package P. For example, the jetting of the air from the second jetting device 52 is started with the start of the pivoting of the suction mouth 28 toward the package P, and the jetting of the air from the second jetting device 52 is stopped with the stop of the pivoting of the suction mouth 28 toward the package P.

[0031] With respect to the width direction of the package P, a first injection direction D1 in which the air is jetted from the first jetting device 51 is oriented obliquely upward and it is parallel to the direction from which the yarn Y is wound into the package P (i.e., the direction from which the yarn Y is unwound). Moreover, with respect to the width direction of the package P, a second injection direction D2 in which the air is jetted from the second jetting device 52 is oriented downward and parallel to the direction from which the yarn Y is wound into the package P. Thus, the first injection direction D1 and the second injection direction D2 are oriented in different directions with respect to the width direction of the package P. Specifically, with respect to the width direction of the package P, the second injection direction D2 intersects the first injection direction D1 at an angle between 60 degrees or more and 90 degrees or less.

[0032] Subsequently, as shown in FIG. 6, the suction pipe 27 generates a suction air current at a position downstream of the air spinning device 7. At this time, because the unit controller 10 starts the operations of the drafting

device 6 and the air spinning device 7, the suction pipe 27 can suck and catch the yarn Y that is being generated. Moreover, the suction mouth 28 generates a suction air current at a position near the surface of the package P. At this time, because the reverse-rotation roller 33 that is in contact with the package P rotates the package P in the reverse direction, the suction mouth 28 can suck and catch the yarn Y that is unwound from the package P because of the reverse rotation of the package P. The catching of the yarn Y by the suction pipe 27 and the catching of the yarn Y by the suction mouth 28 can be performed simultaneously or can be performed one after the other.

[0033] Subsequently, as shown in FIG. 7, the suction pipe 27 is pivoted to a predetermined position just before the waiting position thereof. With this operation, the yarn Y from the air spinning device 7 is guided to the yarn jointing device 26. Also, the suction mouth 28 is pivoted to a predetermined position just before the waiting position thereof. With this operation, the yarn Y from the package P is guided to the yarn jointing device 26. In this state, the reverse-rotation roller 33 is moved and returned to the waiting position thereof by the moving member 34. The pivoting of the suction pipe 27 toward the predetermined position just before the waiting position thereof and the pivoting of the suction mouth 28 toward the predetermined position just before the waiting position thereof can be performed at the same time, or can be performed one after the other.

[0034] Subsequently, the yarn jointing device 26 moves from a waiting position thereof to a yarn jointing position and performs the yarn jointing upon reaching the yarn jointing position. When the yarn jointing is finished, the suction pipe 27, the suction mouth 28, and the yarn jointing device 26 are moved and returned to their respective waiting positions. Subsequently, as shown in FIG. 2, the unit controller 10 moves the cradle arm 21 so that the package P contacts the winding drum 22 whereby the winding of the yarn Y by the winding device 13 is restarted.

[0035] As explained above, in the spinning machine 1, the first jetting device 51 that jets air on the package P is arranged such that the distance between the first jetting device 51 and the package P can be changed independently of the suction mouth 28. Because the positioning of the first jetting device 51 can be performed independently of the suction mouth 28 and the like, the first jetting device 51 can jet air on the package P from the position at which the yarn end can come off easily from the surface of the package P, whereby the suction mouth 28 can easily catch the yarn Y from the package P. As a result, in the spinning machine 1, the yarn Y from the package P can be surely caught.

[0036] When the yarn Y is cut by stopping the operation of the air spinning device 7, because the yarn end is in a fibrous state with no twists, the yarn end may not easily come off from the surface of the package P. In this situation, jetting the air from the first jetting device 51 is par-

ticularly effective for surely catching the yarn Y from the package P.

[0037] In the spinning machine 1, the first exhaust ports 51a are arranged in the first jetting device 51 in such a manner that air can be jetted in an entire width direction of the package P from a region on one end in the width direction of the package P. As a result, to jet air in the entire width direction of the package P, for example, it is not necessary to provide the first jetting device 51 having a width that is substantially the same as that of the package P, or to provide the first jetting device 51 in each of a region on one side and a region on the other side in the width direction of the package P, thereby facilitating a simplified and compact configuration.

[0038] Because the yarn Y is not traversed by the traversing guide 23 while the cut or broken yarn Y is being wound into the package P, the yarn Y is generally wound in substantially the central region of the package P in the width direction of the package P. However, the winding position of the yarn Y in the width direction of the package P may sometime shift from the central region of the package P. To cope with such a situation, it is particularly effective to jet air on the entire package P in the entire width direction of the package P.

[0039] In the spinning machine 1, the first jetting device 51 jets air along the direction from which the yarn Y is wound into the package P (i.e., the direction from which the yarn Y is unwound). With this arrangement, the yarn end can be caused to easily come off from the surface of the package P.

[0040] In the spinning machine 1, the suction mouth 28 is provided with the second jetting device 52 that jets air on the package P, and the second injection direction D2 in which the air is jetted from the second jetting device 52 is different from the first injection direction D1 in which the air is jetted from the first jetting device 51. With this arrangement, the air can be jetted in a wider area of the package P and the yarn end can be caused to easily come off from the surface of the package P, whereby the yarn Y from the package P can be surely caught.

[0041] In the spinning machine 1, the first jetting device 51 and the reverse-rotation roller 33 can be moved at least one of toward and away from the package P with the moving member 34. With this arrangement, the movement of the first jetting device 51 and the movement of the reverse-rotation roller 33 can be realized with the single moving member 34, thereby facilitating a simple configuration.

[0042] In the spinning machine 1, during the period from the start of the movement of the reverse-rotation roller 33 toward the package P until the reverse-rotation roller 33 contacts the package P, the first jetting device 51 is moved toward the package P by the moving member 34 while continually jetting the air on the package P. Moreover, during the period from the start of the pivoting of the suction mouth 28 toward the package P until the suction mouth 28 stops the pivoting, the second jetting device 52 is moved together with the suction mouth 28

toward the package P while jetting the air on the package P. As a result, the yarn end can be caused to easily come off from the surface of the package P.

[0043] In the spinning machine 1, each spinning unit 2 includes the air spinning device 7 and the winding device 13 (the cradle arm 21, the winding drum 22, and the like), and, the yarn jointing cart 3 includes the yarn jointing device 26, the suction pipe 27, the suction mouth 28, the reverse-rotation roller 33, the moving member 34, the first jetting device 51, and the second jetting device 52. With this configuration, while sharing the configuration relating to the yarn jointing among a plurality of the spinning units 2, the yarn Y from the package P can be surely caught in each of the spinning units 2 and the yarn jointing can be surely performed.

[0044] The embodiments of the present invention are explained above. The present invention, however, is not limited to the above embodiments.

[0045] The first jetting device 51 can be configured to move separately from the suction mouth 28, in which case the first jetting device 51 can be configured to move separately from the reverse-rotation roller 33. Moreover, the first jetting device 51 can be arranged not in the yarn jointing cart 3 but in each of the spinning units 2. The first jetting device 51 can be caused to jet the air on the package P at least for a certain time during a period from a start of the movement of the first jetting device 51 toward the package P until a start of the rotation of the package P by the reverse-rotation roller 33. For example, jetting of the air from the first jetting device 51 can be started before the start of the movement of the reverse-rotation roller 33 toward the package P, and jetting of the air from the first jetting device 51 can be stopped before the reverse-rotation roller 33 contacts the package P (i.e., before the movement of the reverse-rotation roller 33 toward the package P stopped). The jetting of the air from the first jetting device 51 can be continuous or can be non-continuous (intermittent). Moreover, at least one of a timing and a strength of the air jet from the first jetting device 51 can be changed according to a diameter of the package P. The change of the strength of the air jet from the first jetting device 51 can be implemented by providing a valve that allows an amount of air passing in a part of air piping leading to the first jetting device 51 to be controlled. When this configuration is adopted, even if the peripheral position of the package changes with a change in the diameter of the package P, the air that is most suitable for the changed peripheral position can be jetted. Accordingly, the yarn Y from the package P can be surely caught and the yarn jointing can be surely performed irrespective of the diameter of the package P. The settings about the timing of jetting the air from the first jetting device 51 and / or the strength of the jetted air depending on the package diameter are stored beforehand in a storage device provided in the machine-frame controlling device 41. Moreover, the operator can suitably change one or more of those stored settings by appropriately operating the input keys 43.

[0046] The second jetting device 52 can be provided fixedly, and not movably, in the yarn jointing cart 3. The second jetting device 52 can be arranged in each of the spinning units 2 and not in the yarn jointing cart 3. When this configuration is adopted, the second jetting device 52 can be provided movably or fixedly with respect to each of the winding devices 13. The second jetting device 52 can be omitted. The jetting of the air from the second jetting device 52 can be performed, for example, in only certain situations and can be omitted in the other situations.

[0047] The configuration relating to the yarn jointing can be arranged in each of the spinning units 2 and not in the yarn jointing cart 3.

[0048] To prevent the twists of the fiber bundle F from being conveyed to the upstream of the air spinning device 7, the air spinning device 7 can be provided with a needle that projects in the spinning chamber by being held by the fiber guiding section. Moreover, instead of providing the needle, in the air spinning device 7, a downstream end of the fiber guiding section can be configured so that the twists of the fiber bundle F are prevented from being conveyed to the upstream of the air spinning device 7. Furthermore, in place of the above mentioned configuration, the air spinning device 7 can include a pair of air jetting nozzles that applies twists in opposite directions to the fiber bundle F.

[0049] In the spinning unit 2, the yarn accumulating device 11 is given the functionality of pulling the yarn Y from the air spinning device 7; however, the yarn Y can be pulled from the air spinning device 7 by using a combination of a delivery roller and a nip roller. When pulling the yarn Y from the air spinning device 7 by using the combination of the delivery roller and the nip roller, the yarn accumulating device 11 can be substituted with a slack tube that absorbs a slack of the yarn Y by using a suction air current, a mechanical compensator, and the like.

[0050] In the spinning machine 1, each device is arranged so that the yarn Y supplied from the upper part in a height direction of a machine frame is wound in the lower part. However, each device can be arranged so that the yarn Y supplied from the lower part is wound in the upper part.

[0051] In the spinning machine 1, the traversing guide 23 and at least one of the bottom rollers of the drafting device 6 are driven (i.e., commonly in a plurality of the spinning units 2) by the driving power from the second-end frame 5. However, all the parts (e.g., the drafting device 6, the air spinning device 7, the winding device 13, and the like) of each of the spinning units 2 can be driven independently in each of the spinning units 2.

[0052] The tension sensor 9 can be arranged upstream of the yarn monitoring device 8 in the travelling direction of the yarn Y. One unit controller 10 can be arranged for each of the spinning units 2. In the spinning unit 2, the waxing device 12, the tension sensor 9, and the yarn monitoring device 8 can be omitted.

[0053] In FIG. 1, the spinning machine 1 is shown to form a cheese-shaped package P; however, the spinning machine 1 can be configured to form a cone-shaped package P. A slack occurs in the yarn Y in traversing the yarn Y when forming the cone-shaped package P; however, this slack can be absorbed by the yarn accumulating device 11. Moreover, the material and / or the shape of each element are not limited to those mentioned above, and various materials and shapes can be adopted.

[0054] The application of the present invention is not limited to the spinning machine 1, and it can be applied to other yarn winding machines such as an open-end spinning frame and an automatic winder.

[0055] A yarn winding machine according to one aspect of the present invention includes a package supporting member that rotatably supports a package into which a yarn is wound; a first yarn-catching device that catches the yarn from the package; and a first jetting device that is provided separately from the first yarn-catching device and that is movable so that a distance thereof from the package can be changed and that jets air on the package.

[0056] With the above configuration, because the first jetting device can jet air on the package from a position at which a yarn end can come off easily from the surface of the package, the first yarn-catching device can easily catch the yarn from the package. As a result, in the yarn winding machine, the yarn from the package can be surely caught.

[0057] In the above yarn winding machine, the first jetting device can be provided with a first exhaust port in such a manner that the air can be jetted therefrom in an entire width direction of the package from a region on one end in the width direction of the package. As a result, to jet air in the entire width direction of the package, for example, it is not necessary to provide a first jetting device having a width that is substantially the same as that of the package, or to provide a first jetting device in each of a region on one side and a region on the other side in the width direction of the package, thereby facilitating a simplified and compact configuration.

[0058] In the above yarn winding machine, the first jetting device can jet the air along a direction from which the yarn is wound into the package. With this arrangement, the yarn end can be caused to easily come off from the surface of the package.

[0059] The above yarn winding machine can further include a second jetting device that jets air on the package. With this arrangement, the yarn from the package can be surely caught.

[0060] In the above yarn winding machine, the first yarn-catching device can be provided with the second jetting device. With this arrangement, the yarn from the package can be surely caught.

[0061] In the above yarn winding machine, a second injection direction in which the air is jetted from the second jetting device can be different from a first injection

direction in which the air is jetted from the first jetting device. With this arrangement, the yarn end can be caused to easily come off from the surface of the package.

[0062] The above yarn winding machine can further include a winding drum that rotates the package in a direction from which the yarn is wound into the package; a reverse-rotation roller that, in a state in which the package and the winding drum are separated from each other, rotates the package in a reverse direction of the direction from which the yarn is wound into the package; and a moving member capable of moving the first jetting device and the reverse-rotation roller in at least one of toward and away from the package. With this arrangement, the movement of the first jetting device and the movement of the reverse-rotation roller can be carried out with the single moving member thereby facilitating a simple configuration.

[0063] In the above yarn winding machine, the first jetting device can jet the air on the package at least for a certain time during a period from a start of a movement of the first jetting device toward the package by the moving member until a start of a rotation of the package by the reverse-rotation roller. As a result, the yarn end can be caused to easily come off from the surface of the package. Moreover, at least one of a timing and a strength of the air jet from the first jetting device can be changed according to a diameter of the package.

[0064] The above yarn winding machine can further include a yarn supplying section that supplies the yarn; a second yarn-catching device that catches the yarn from the yarn supplying section; and a yarn jointing device that joints the yarn caught and guided thereto by the first yarn-catching device and the yarn caught and guided thereto by the second yarn-catching device. With this configuration, the yarn from the package can be surely caught and the yarn jointing can be surely performed.

[0065] A yarn winding machine according to another aspect of the present invention includes a plurality of yarn winding units; and a yarn jointing cart capable of travelling with respect to each of the plural yarn winding units. Each of the plural yarn winding units includes a yarn supplying section that supplies a yarn; a package supporting member that rotatably supports a package into which the yarn is wound; and a winding drum that rotates the package in a direction from which the yarn is wound into the package. The yarn jointing cart includes a first yarn-catching device that catches the yarn from the package; a second yarn-catching device that catches the yarn from the yarn supplying section; a yarn jointing device that joints the yarn caught and guided thereto by the first yarn-catching device and the yarn caught and guided thereto by the second yarn-catching device; a reverse-rotation roller that, in a state in which the package and the winding drum are separated from each other, rotates the package in a reverse direction of the direction from which the yarn is wound into the package; a moving member capable of moving the reverse-rotation roller in at least one of

toward and away from the package; a first jetting device that is provided separately from the first yarn-catching device and that is movable so that a distance thereof from the package can be changed and that jets air on the package; and a second jetting device that jets air on the package.

[0066] With this configuration, while sharing the configuration relating to the yarn jointing among a plurality of the yarn winding units, the yarn from the package can be surely caught in each of the yarn winding units.

[0067] As explained above, the present invention provides a yarn winding machine that can surely catch a yarn from a package.

[0068] In the above explanation, the meaning of "a plurality of" also includes "a predetermined number of".

[0069] Although the invention has been explained with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching of the claims.

Claims

1. A yarn winding machine(1) comprising:

a package supporting member(21) that rotatably supports a package(P) into which a yarn is wound;
a first yarn-catching device(28) that catches the yarn from the package(P) ; and
a first jetting device(51) that is provided separately from the first yarn-catching device(28) and that is movable so that a distance thereof from the package(P) can be changed and that jets air on the package(P).

2. The yarn winding machine(1) as claimed in Claim 1, wherein the first jetting device(51) is provided with a first exhaust port (51a) in such a manner that the air can be jetted therefrom in an entire width direction of the package(P) from a region on one end in the width direction of the package(P).

3. The yarn winding machine(1) as claimed in Claim 1 or 2, wherein the first jetting device(51) jets the air along a direction from which the yarn is wound into the package(P).

4. The yarn winding machine(1) as claimed in any one of Claims 1 to 3, further comprising a second jetting device(52) that jets air on the package(P).

5. The yarn winding machine(1) as claimed in Claim 4, wherein the first yarn-catching device(28) is provided with the second jetting device(52).

6. The yarn winding machine(1) as claimed in Claim 4 or 5, wherein a second injection direction in which the air is jetted from the second jetting device(52) is different from a first injection direction in which the air is jetted from the first jetting device(51). 5
7. The yarn winding machine(1) as claimed in any one of Claims 1 to 6, further comprising:
- a winding drum(22) that rotates the package(P) in a direction from which the yarn is wound into the package(P); 10
 - a reverse-rotation roller(33) that, in a state in which the package(P) and the winding drum(22) are separated from each other, rotates the package(P) in a reverse direction of the direction from which the yarn is wound into the package(P); 15
 - and
 - a moving member(34) capable of moving the first jetting device(51) and the reverse-rotation roller(33) in at least one of toward and away from the package(P). 20
8. The yarn winding machine(1) as claimed in Claim 7, wherein the first jetting device (51) jets the air on the package(P) at least for a certain time during a period from a start of a movement of the first jetting device(51) toward the package by the moving member (34) until a start of a rotation of the package(P) by the reverse-rotation roller(33). 25 30
9. The yarn winding machine(1) as claimed in Claim 7, wherein at least one of a timing and a strength of the air jet from the first jetting device(51) can be changed according to a diameter of the package(P). 35
10. The yarn winding machine(1) as claimed in any one of Claims 1 to 9, further comprising:
- a yarn supplying section(7) that supplies the yarn; 40
 - a second yarn-catching device(27) that catches the yarn from the yarn supplying section(7); and
 - a yarn jointing device(26) that joints the yarn caught and guided thereto by the first yarn-catching device(28) and the yarn caught and guided thereto by the second yarn-catching device(27). 45
11. A yarn winding machine(1) comprising: 50
- a plurality of yarn winding units(2);
 - a yarn jointing cart(3) capable of travelling with respect to each of the plural yarn winding units(2), wherein 55
 - each of the plural yarn winding units(2) includes
 - a yarn supplying section(7) that supplies a

yarn;

a package supporting member(21) that rotatably supports a package(P) into which the yarn is wound; and

a winding drum(22) that rotates the package(P) in a direction from which the yarn is wound into the package(P), and wherein

the yarn jointing cart(3) includes

a first yarn-catching device(28) that catches the yarn from the package(P);

a second yarn-catching device(27) that catches the yarn from the yarn supplying section(7);

a yarn jointing device(27) that joints the yarn caught and guided thereto by the first yarn-catching device(28) and the yarn caught and guided thereto by the second yarn-catching device (27) ;

a reverse-rotation roller(33) that, in a state in which the package(P) and the winding drum(22) are separated from each other, rotates the package(P) in a reverse direction of the direction from which the yarn is wound into the package(P);

a moving member(34) capable of moving the reverse-rotation roller(33) in at least one of toward and away from the package(P);

a first jetting device(51) that is provided separately from the first yarn-catching device (28) and that is movable so that a distance thereof from the package(P) can be changed and that jets air on the package(P);

and

a second jetting device (52) that jets air on the package(P).

FIG.1

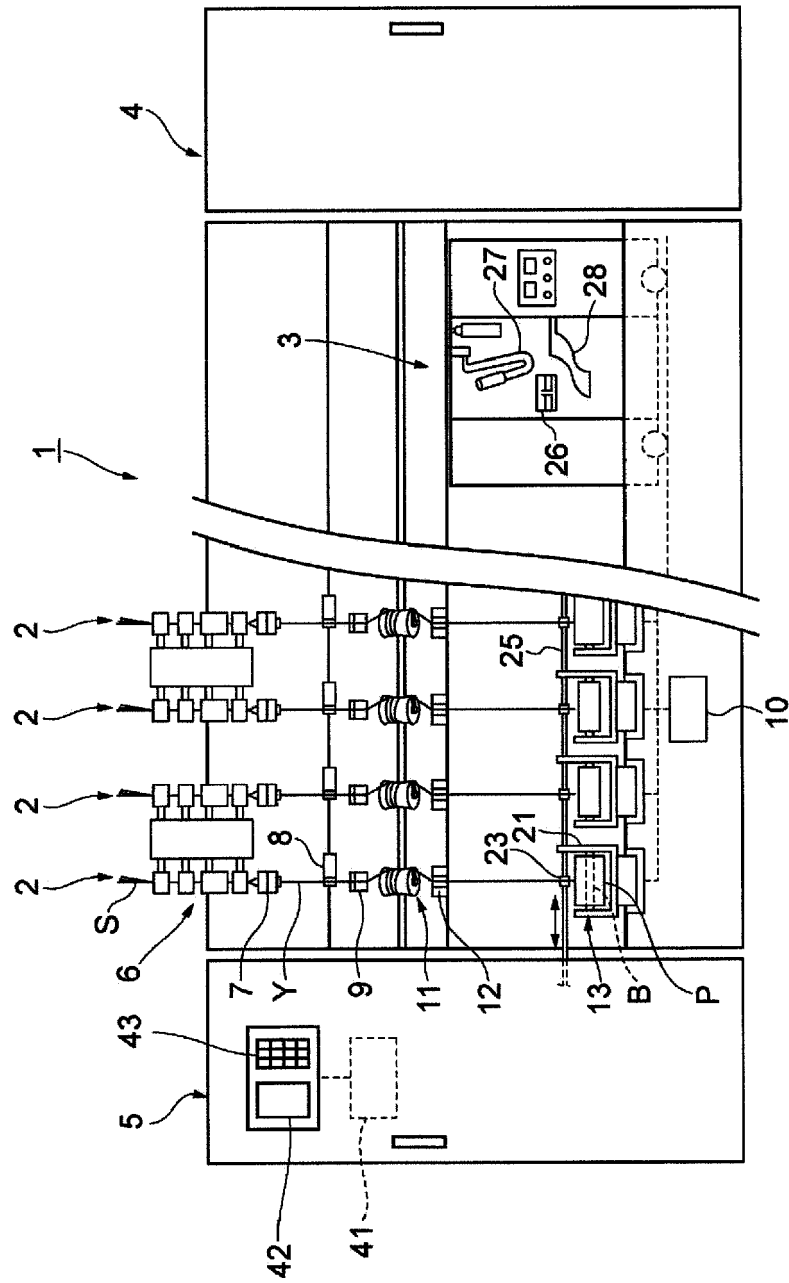


FIG.2

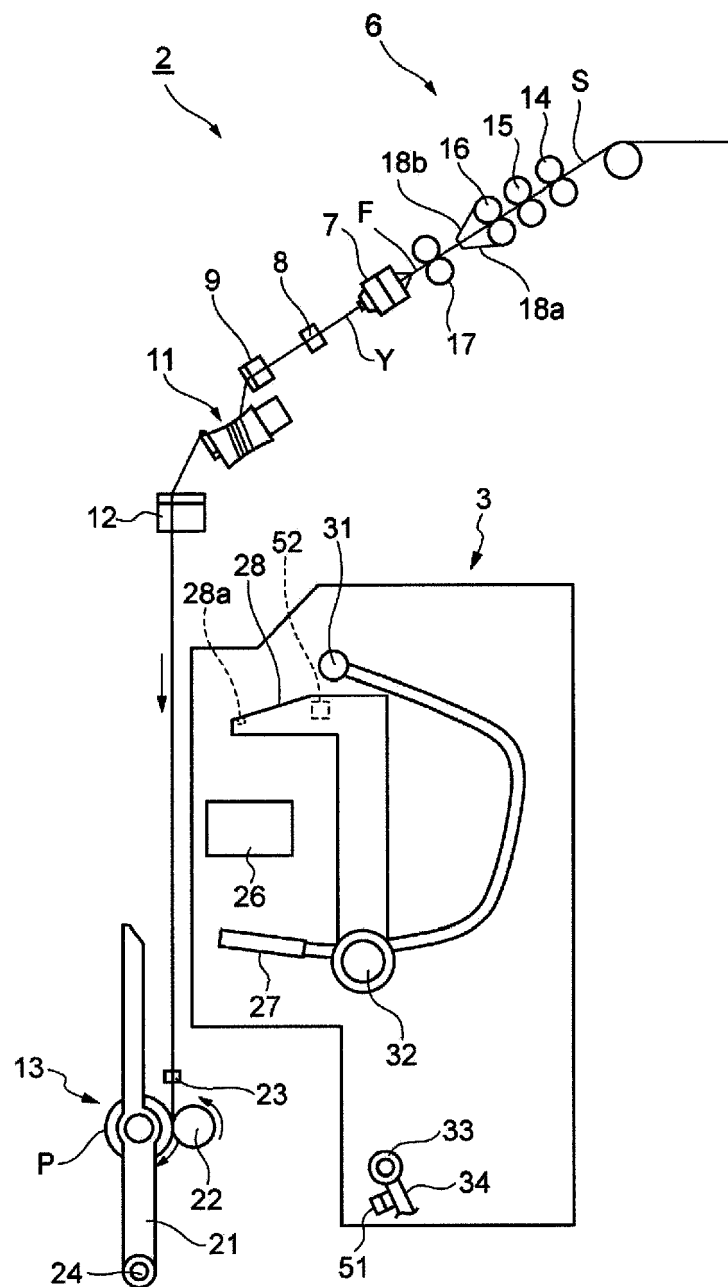


FIG.3

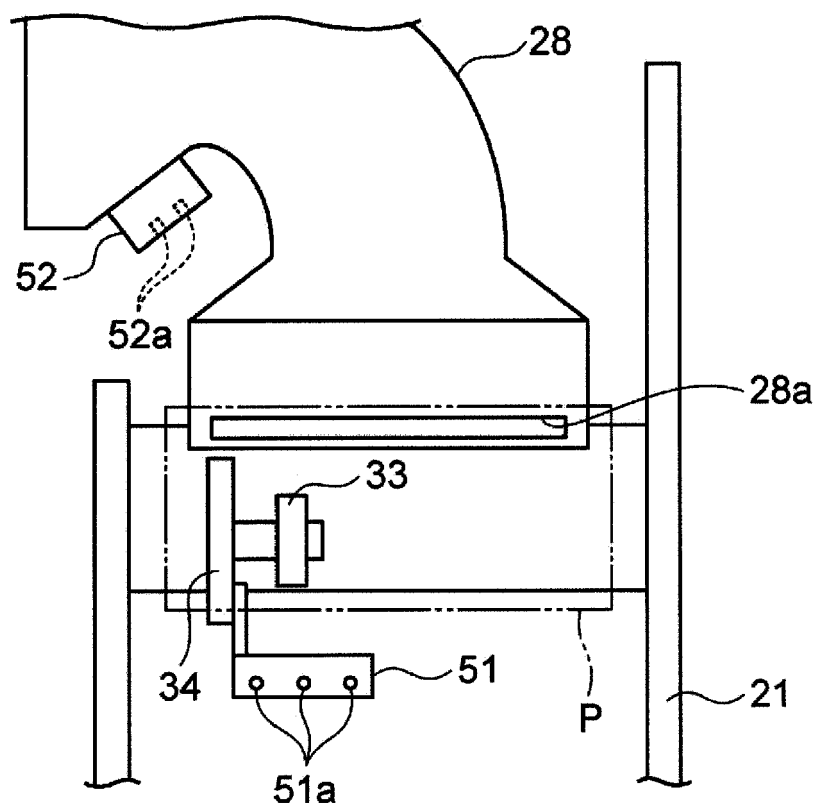


FIG.4

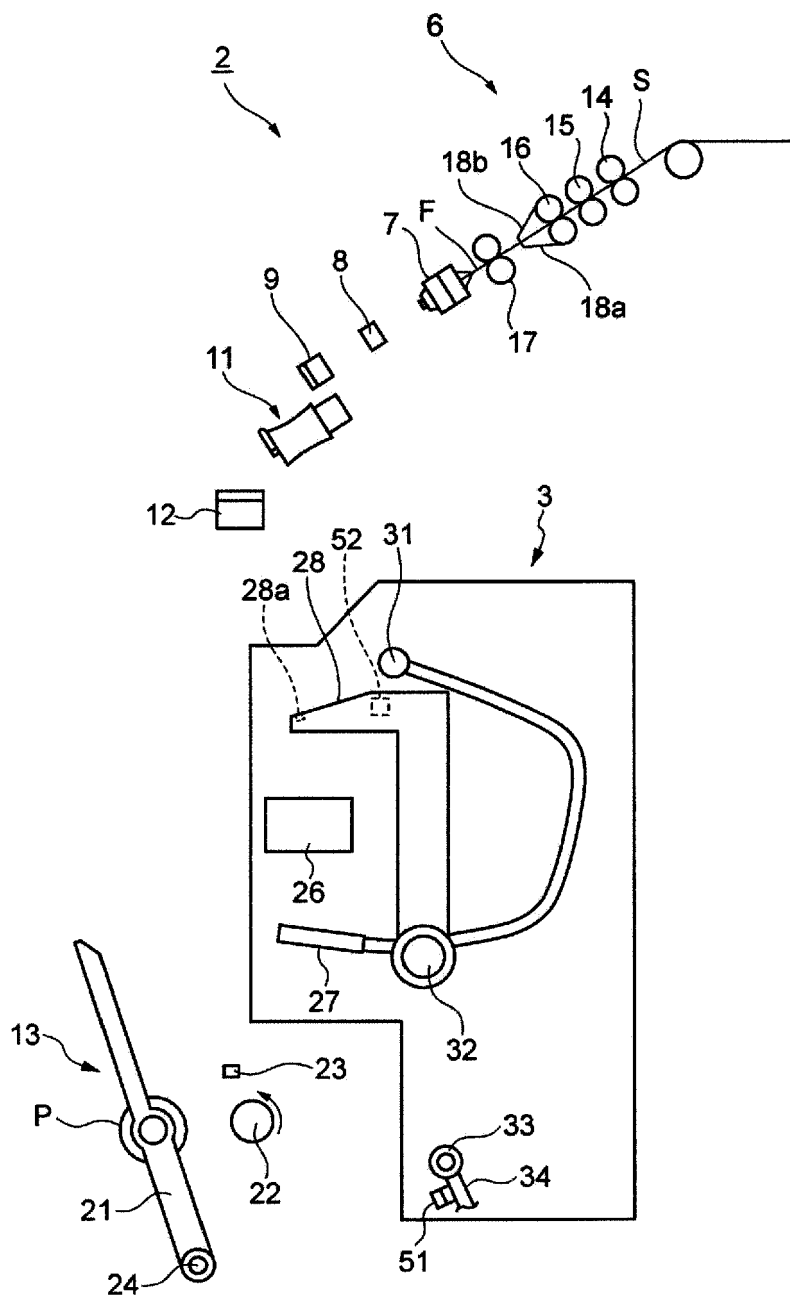


FIG.5

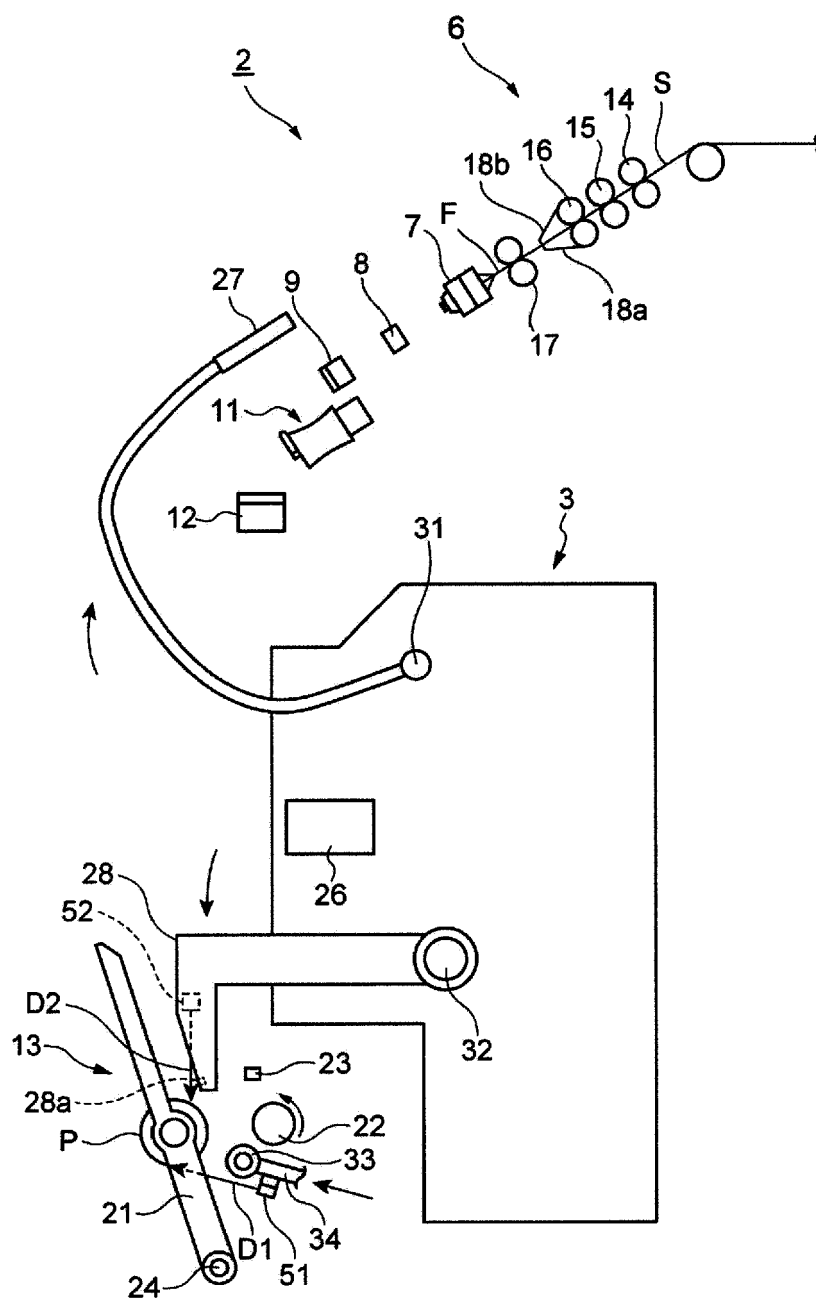


FIG.6

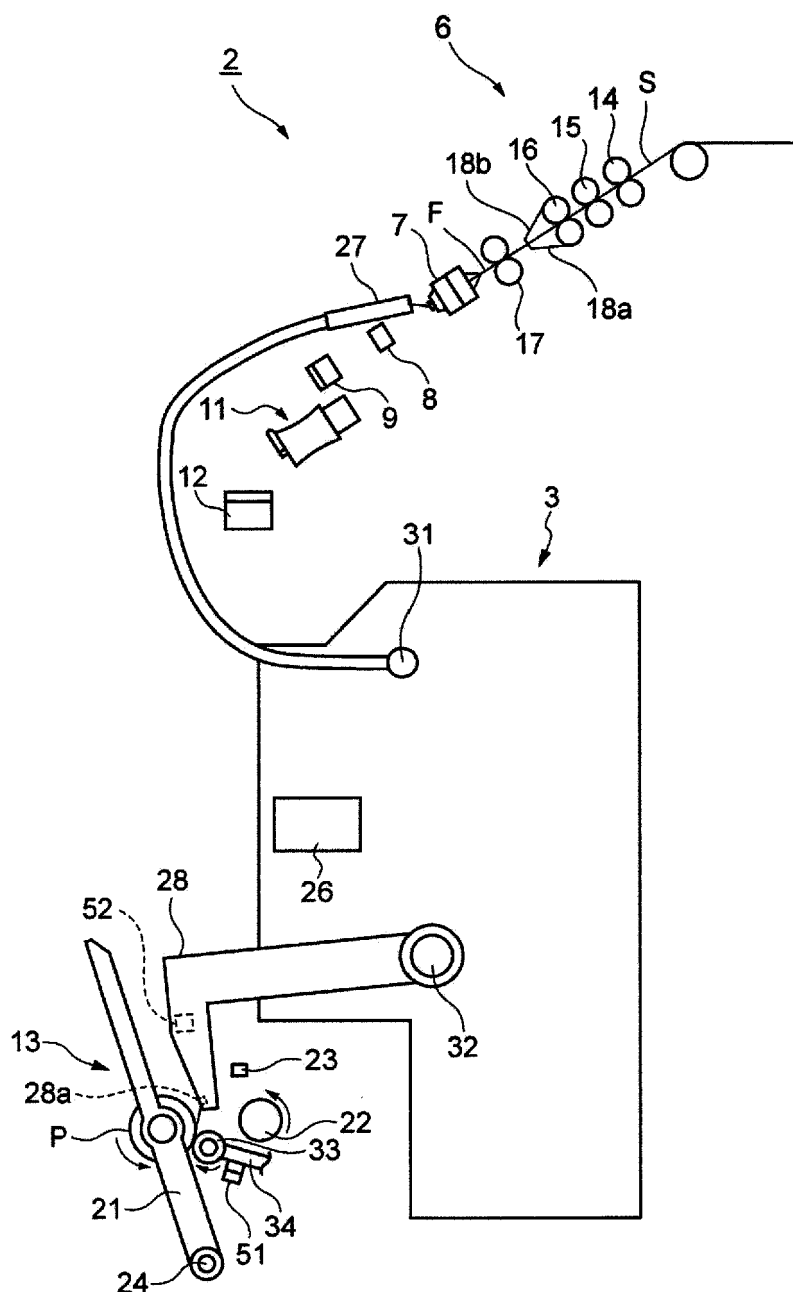
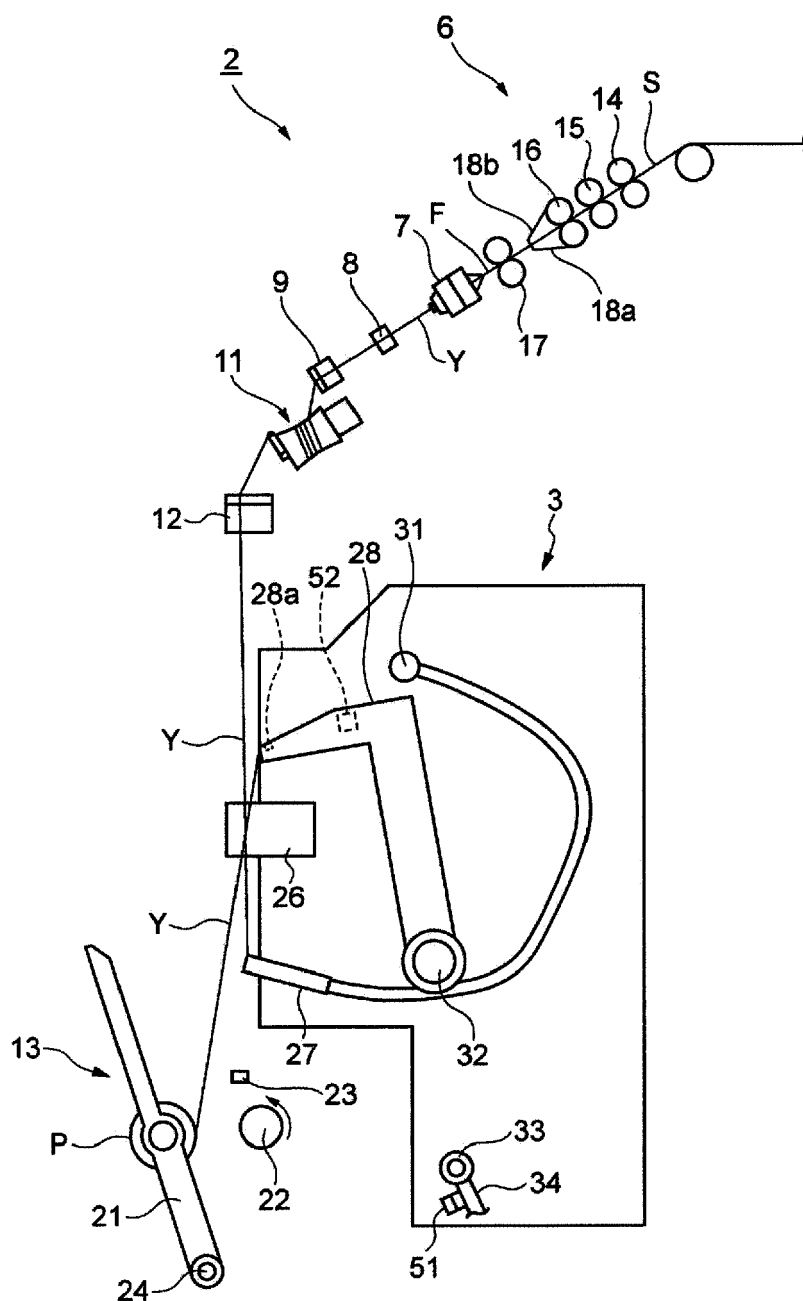


FIG.7





EUROPEAN SEARCH REPORT

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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 21 September 2016	Examiner Pussemier, Bart
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