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(54) YARN WINDING DEVICE AND YARN JOINING METHOD

GARNWICKLUNGSVORRICHTUNG UND GARNVERBINDUNGSVERFAHREN

DISPOSITIF DE BOBINAGE DE FIL ET PROCÉDÉ D'ASSEMBLAGE DE FIL

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn winding device including a winding unit having a yarn joining device and a yarn accumulating device arranged between a yarn supplying section and a winding section, and to a yarn joining method implemented in such a yarn winding device.

2. Description of the Related Art

[0002] For example, Japanese Patent Application Laid-Open No. 2016-47764 discloses a yarn winding device including a winding unit that winds in a winding section a yarn supplied from a yarn supplying section to form a package. In this yarn winding device, a yarn joining device that performs yarn joining is arranged between the yarn supplying section and the winding section, and a yarn accumulating device that temporarily accumulates the yarn is arranged between the yarn joining device and the winding section.

[0003] In such a yarn winding device, when performing the yarn winding from a state in which the yarn is discontinued between the package and the yarn accumulating device, such as when the yarn is broken between the package and the yarn accumulating device, the winding is started (restarted) after performing yarn joining of a yarn from the package and a yarn from the yarn supplying section in the yarn joining device.

SUMMARY OF THE INVENTION

[0004] However, to guide the yarn from the package to the yarn joining device, an operator must perform a troublesome operation of passing the yarn from the package through the yarn accumulating device. Accordingly, a time to start (restart) the winding is prolonged causing a reduction in the production efficiency of the package.

[0005] It is an object of the present invention to improve the production efficiency of a package in a yarn winding device including a winding unit having a yarn joining device and a yarn accumulating device arranged between a yarn supplying section and a winding section.

[0006] This object is achieved by the subject matter as defined in the independent claims.

[0007] According to one aspect of the present invention, a yarn winding device includes a winding unit that pulls a yarn from a yarn supplying section and winds the yarn on a winding tube in a winding section to form a package; and a doffing device that doffs from the winding unit a package in which the winding has been completed. The winding unit includes a yarn joining device arranged between the yarn supplying section and the winding section in a yarn travelling direction for subjecting a yarn from the yarn supplying section and a yarn from the winding section to yarn joining; a yarn accumulating device arranged between the yarn joining device and the winding section in the yarn travelling direction for accumulating the yarn; and a guiding mechanism that guides a yarn from the package to the yarn joining device after passing the yarn through the yarn accumulating device when the yarn has become discontinuous between the package and the yarn accumulating device. The doffing device includes a yarn transferring mechanism that guides to the guiding mechanism the yarn from the package that is rotating in a reverse direction that is opposite of a direction when winding the yarn when the yarn has become discontinuous between the package and the yarn accumulating device.

[0008] In the above yarn winding device, because the yarn transferring mechanism of the doffing device and the guiding mechanism of the winding unit collaborate with each other when the yarn has become discontinuous between the package and the yarn accumulating device, the process of guiding the yarn from the package to the yarn joining device after passing the yarn through the yarn accumulating device can be automated. Accordingly, the time required to perform the yarn joining, therefore, the time to start (restart) the winding, can be shortened and the production efficiency of the package can be improved.

[0009] In the above yarn winding device, the doffing device can include a seed yarn supplying section that supplies a new type of the yarn in a yarn-type changing process for changing a type of the yarn to be wound in the winding section. The winding unit can form in the yarn-type changing process a starter package that is the package in which the yarn supplied from the seed yarn supplying section has been wound on the winding tube. The yarn from the starter package can be guided to the yarn joining device by the yarn transferring mechanism and the guiding mechanism.

[0010] By doing this way, the yarn-type changing process can be automated, and the time required to perform the yarn-type changing process can be shortened.

[0011] In the above yarn winding device, the doffing device can include a suction holding member having a suction port capable of sucking and holding the yarn; a transferring mechanism that moves the yarn present between the starter package and the seed yarn supplying section near to the suction port after the starter package has been formed; and a yarn cutting member that cuts the yarn, which has been moved near to the suction port by the transferring mechanism, at a point nearer to the seed yarn supplying section than the suction port.

[0012] By cutting the yarn after moving the yarn near to the suction port of the suction holding member, the yarn from the starter package can be surely sucked and held with the suction holding member.

[0013] In the above yarn winding device, the suction holding member is capable of moving between a standby position and a proximal position in which the suction port

is located near the package. The transferring mechanism can move the yarn present between the starter package and the seed yarn supplying section near to the suction port of the suction holding member that is in the standby position.

[0014] With this configuration, because it is unnecessary to move the suction holding member to suck and hold the yarn from the starter package, the time required to perform the yarn-type changing process can be further shortened.

[0015] In the above yarn winding device, the transferring mechanism can include a yarn transferring member that moves the yarn near to the suction port of the suction holding member that is in the standby position after hooking the yarn present between the starter package and the seed yarn supplying section.

[0016] Because of the presence of such a yarn transferring member, the yarn can be moved near to the suction port of the suction holding member with a simple configuration.

[0017] In the above yarn winding device, the transferring mechanism can further include a fixed guide that retains the yarn present between the starter package and the seed yarn supplying section before moving the yarn present between the starter package and the seed yarn supplying section with the yarn transferring member.

[0018] Because of the presence of the fixed guide, as the yarn path between the starter package and the seed yarn supplying section is surely defined, the yarn can be surely hooked thereafter with the yarn transferring member.

[0019] In the above yarn winding device, the yarn transferring member, after releasing the retaining of the yarn by the fixed guide by moving in a predetermined direction, can move in an opposite direction of the predetermined direction to hook the yarn and can move the yarn near to the suction port of the suction holding member that is in the standby position.

[0020] In this manner, by performing both the releasing of the retaining of the yarn with the fixed guide and the movement of the yarn, the retaining of which has been released, near to the suction port with one yarn transferring member, an increase in the number of parts can be prevented.

[0021] In the above yarn winding device, the yarn transferring member can be also a component of the yarn transferring mechanism, and the yarn transferring member can hook the yarn from the starter package and sucked and held with the suction holding member that is in the standby position and can move the yarn.

[0022] In this manner, by causing the yarn transferring member to play a plurality of roles, increase in the number of parts of the doffing device can be prevented.

[0023] In the above yarn winding device, when the yarn is broken between the package and the yarn accumulating device, when performing an upper-yarn cutting process in which the yarns are subjected to yarn joining by the yarn joining device, the suction holding member can suck and hold the yarn from the package after moving from the standby position to the proximal position.

[0024] When the yarn is broken between the package and the yarn accumulating device, because the yarn from the package often gets stuck to the package, the yarn from the package can be sucked and held surely by moving the suction holding member to the proximal position.

[0025] In the above yarn winding device, in the upper-yarn cutting process, the suction holding member can move to the standby position with the sucked and held yarn after sucking and holding the yarn from the package at the proximal position.

[0026] By doing this way, the operation after the upper-yarn cutting process can be commonized with the yarn-type changing process in which the yarn from the package is sucked and held with the suction holding member that is in the standby position. Accordingly, increase of the number of parts can be prevented, and a control program can be simplified.

[0027] In the above yarn winding device, the doffing device can include a yarn holding and cutting section capable of holding and cutting the yarn present between the package and the yarn accumulating device when performing a doffing process of doffing the package in which the winding has been completed. The seed yarn supplying section can include a seed yarn transferring member that pulls the new type of the yarn to a position at which the yarn can be held with the yarn holding and cutting section.

[0028] By doing this way, the operation for holding the new type of the yarn with the yarn holding and cutting section during the yarn-type changing process can be commonized with the operation of the yarn holding and cutting section during the doffing process. Accordingly, the operation performed by the yarn holding and cutting section can be prevented from becoming complicated, and the configuration can be simplified.

[0029] According to another aspect of the present invention, a yarn joining method is a method for joining yarns in a yarn winding device when a yarn has become discontinuous between a package and a yarn accumulating device. The yarn winding device includes a winding unit that forms the package by winding the yarn on a winding tube in a winding section after temporarily accumulating the yarn pulled from a yarn supplying section in the yarn accumulating device, and that includes a yarn joining device arranged between the yarn supplying section and the yarn accumulating device in a yarn travelling direction and that subjects a yarn from the yarn supplying section and a yarn from the winding section to yarn joining; and a doffing device that doffs from the winding unit a packages in which the winding has been completed. The yarn joining method includes a yarn transferring step of guiding to the yarn accumulating device the yarn from the package with a yarn transferring mechanism arranged in the doffing device while rotating the package in a reverse direction that is opposite of a direction when winding the yarn; a guiding step of guiding, with a guiding

mechanism arranged in the winding unit, to the yarn joining device the yarn from the package that has been guided to the yarn accumulating device after passing the yarn through the yarn accumulating device; and a yarn joining step of subjecting the yarn from the package and guided to the yarn joining device and the yarn from the yarn supplying section to yarn joining by the yarn joining device.

[0030] In the above yarn joining method, because the yarn transferring mechanism of the doffing device and the guiding mechanism of the winding unit collaborate with each other when the yarn has become discontinuous between the package and the yarn accumulating device, the guiding step of guiding the yarn from the package to the yarn joining device after passing the yarn through the yarn accumulating device can be automated. Accordingly, the time required to perform the yarn joining, therefore, the time to start (restart) the winding, can be shortened and the production efficiency of the package can be improved.

[0031] The above yarn joining method can further include a starter package forming step in which, when performing a yarn-type changing process of changing a type of the yarn to be wound in the winding section, the winding unit receives supply of a new type of the yarn from a seed yarn supplying section arranged in the doffing device and forms a starter package that is the package in which the new type of the yarn has been wound on the winding tube; and an execution step of executing the yarn transferring step, the guiding step, and the yarn joining step with respect to the yarn present between the starter package and the seed yarn supplying section.

[0032] By doing this way, the yarn-type changing process can be automated, and the time required to perform the yarn-type changing process can be shortened.

[0033] The above yarn joining method can further include a sucking and holding step in which, when the yarn is broken between the package and the yarn accumulating device, the yarn from the package is sucked and held with a suction holding member arranged in the doffing device in an upper-yarn cutting process in which the yarns are subjected to the yarn joining by the yarn joining device; and an execution step of executing the yarn transferring step, the guiding step, and the yarn joining step with respect to the yarn present between the package and the suction holding member.

[0034] By doing this way, the upper-yarn cutting process can be automated, and the time required to perform the upper-yarn cutting process can be shortened.

[0035] 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

[0036]

FIG. 1 is a front view of an automatic winder according to one embodiment of the present invention.
FIG. 2 is a side view of a winding unit.
FIG. 3 is a front view of a winding section of the winding unit.
FIG. 4 is a view of a doffing device when seen from the winding unit side.
FIG. 5 is a block diagram of an electrical configuration of the automatic winder.
FIG. 6 is a flowchart of a doffing process.
FIGS. 7A to 7C are schematic top views for explaining an operation when fixing a yarn to a winding tube.
FIG. 8 is a flowchart of the first half of a yarn-type changing process.
FIG. 9 is a flowchart of the second half of the yarn-type changing process.
FIGS. 10A to 10F are schematic side views for explaining an operation performed during the yarn-type changing process.
FIGS. 11A to 11C are schematic back views and side views for explaining an operation performed during the yarn-type changing process.
FIGS. 12A to 12C are schematic back views and side views for explaining an operation performed during the yarn-type changing process.
FIGS. 13A to 13D are schematic side views for explaining an operation performed during the yarn-type changing process.
FIG. 14 is a flowchart of an upper-yarn cutting process.

DETAILED DESCRIPTION

[0037] Exemplary embodiments of the present invention are explained in detail with reference to the accompanying drawings.

Automatic Winder

[0038] FIG. 1 is a front view of an automatic winder according to one embodiment of the present invention. As shown in FIG. 1, an automatic winder 1 (yarn winding device of the present invention) includes a plurality of winding units 2 arranged along a predetermined arrangement direction (left-right direction in FIG. 1), a doffing device 3 capable of traveling along the arrangement direction, a bobbin supplying device 4 that supplies a yarn supplying bobbin B, and a machine-frame controlling device 5. Note that, in the automatic winder 1 according to the present embodiment, a left-right direction in FIG. 1 is termed as "left-right direction", an up-down direction in FIG. 1 is termed as "up-down direction", a front side in a direction orthogonal to the paper surface of FIG. 1 is termed as "front direction", and a back side in the di-

rection orthogonal to the paper surface of FIG. 1 is termed as "back direction".

[0039] The winding unit 2 unwinds a yarn Y from a yarn supplying bobbin B and winds the yarn Y on a winding tube Q (see FIG. 2) to form a package P. When the winding of the yarn Y is completed in a certain winding unit 2, the doffing device 3 travels along the arrangement direction to the position of that winding unit 2. Then, the doffing device 3 doffs the package P, in which the winding of the yarn Y has been completed, from this winding unit 2, and sets an empty winding tube Q in its place. The bobbin supplying device 4 mounts a yarn supplying bobbin B on a conveying tray T and supplies the yarn supplying bobbin B supported by the conveying tray T to a desired one of the winding units 2. The machine-frame controlling device 5 controls an operation of each of the winding units 2, the doffing device 3, and the bobbin supplying device 4. An operator can centrally manage the winding units 2 by appropriately operating the machine-frame controlling device 5.

Winding Unit

[0040] FIG. 2 is a side view of the winding unit 2. As shown in FIG. 2, the winding unit 2 includes a yarn supplying section 10 that supplies the yarn Y while unwinding the yarn Y wound on the yarn supplying bobbin B, a yarn processing section 20 that performs various processes on the yarn Y supplied from the yarn supplying section 10, a yarn accumulating device 30 that temporarily accumulates the yarn Y that has passed the yarn processing section 20, and a winding section 40 that winds the yarn Y on the winding tube Q while traversing the yarn Y from the yarn accumulating device 30 to form a package P. The yarn supplying section 10, the yarn processing section 20, the yarn accumulating device 30, and the winding section 40 are arranged in this order from bottom to top. In the following explanation, upstream and downstream in a yarn travelling direction, which is a direction in which the yarn travels from the yarn supplying section 10 to the winding section 40 after passing through the yarn processing section 20 and the yarn accumulating device 30, are simply called upstream and downstream, respectively.

Yarn Supplying Section

[0041] The yarn supplying section 10 includes a yarn unwinding assisting device 11 that assists the unwinding of the yarn Y when unwinding the yarn Y from the yarn supplying bobbin B held in an upright state by the conveying tray T. The yarn unwinding assisting device 11 controls a size of a balloon of the yarn Y unwound from the yarn supplying bobbin B to an appropriate size by using a regulating pipe 12 thereby preventing excessive increase of a tension of the yarn Y unwound from the yarn supplying bobbin B. When the entire yarn Y is unwound from the yarn supplying bobbin B, the yarn supplying section 10 discharges the empty yarn supplying bobbin B and receives a new yarn supplying bobbin B from the bobbin supplying device 4.

Yarn Processing Section

[0042] The yarn processing section 20 includes an upper yarn catching member 21, a yarn joining device 22, a lower yarn catching member 23, a tension applying device 24, a yarn monitoring device 25, and the like. The upper yarn catching member 21, the yarn joining device 22, the lower yarn catching member 23, the tension applying device 24, and the yarn monitoring device 25 are arranged in this order from upstream to downstream.

[0043] The upper yarn catching member 21 is arranged near but upstream of the yarn joining device 22. The upper yarn catching member 21 is connected to a not-shown negative pressure source. When performing the yarn joining, the upper yarn catching member 21 can generate a suction airflow and suck and catch the yarn Y from the winding section 40. The upper yarn catching member 21 guides the caught yarn Y to the yarn joining device 22.

[0044] The yarn joining device 22 performs the yarn joining of a discontinuous yarn Y. When the yarn Y between the yarn supplying section 10 and the winding section 40 becomes discontinuous, for example, when the yarn Y is cut with a cutter 25b when a monitoring section 25a of the yarn monitoring device 25 detects a yarn defect, when a yarn breakage occurs in which the yarn Y is discontinued between the yarn supplying bobbin B and the package P, when replacing the yarn supplying bobbin B, and the like, the yarn joining device 22 performs yarn joining of a yarn Y from the yarn supplying section 10 (lower yarn) and a yarn Y from the winding section 40 (upper yarn). The yarn joining device 22 is arranged at a position that is slightly retracted from a yarn path. The yarn joining device 22 joins yarn ends introduced thereinto by the upper yarn catching member 21 and the lower yarn catching member 23 so that the yarn Y becomes continuous. As the yarn joining device 22, a device that uses fluid such as compressed air, or a mechanical device can be used.

[0045] The lower yarn catching member 23 is arranged near but downstream of the yarn joining device 22. The lower yarn catching member 23 is connected to a not-shown negative pressure source. The lower yarn catching member 23 is a cylindrical member with an opening formed in a tip end part thereof. The lower yarn catching member 23 includes a driving section 23a. The driving section 23a drives the lower yarn catching member 23 so as to advance to and retreat from the yarn path.

[0046] The lower yarn catching member 23 generates a suction airflow at the tip thereof when the tip is near the yarn path. Accordingly, a yarn end of the yarn Y from the yarn supplying bobbin B that is blown by a later-explained lower yarn blow-feeding member 26 is sucked and caught by the lower yarn catching member 23. The

lower yarn catching member 23 can be configured to generate a suction airflow at the tip thereof to suck and remove fly-waste and the like that may be attached to the travelling yarn Y. The lower yarn catching member 23 introduces the yarn end into the yarn joining device 22 after moving away from the yarn path in a state in which it has caught the yarn end from the yarn supplying bobbin B.

[0047] The tension applying device 24 applies a predetermined tension to the traveling yarn Y. The tension applying device 24 is a gate-type member having fixed comb teeth and movable comb teeth, and applies a predetermined resistance on the yarn Y when the yarn Y travels between the comb teeth. The movable comb teeth can be moved by, for example, a solenoid, to change a distance between the movable comb teeth and the fixed comb teeth. As a result, the tension applying device 24 can adjust the tension applied to the yarn Y. Note that, the configuration of the tension applying device 24 is not limited to the gate-type, and it can be a disk-type tension applying device, for example.

[0048] The yarn monitoring device 25 includes the monitoring section 25a that detects a yarn defect such as slub or mixing of a foreign substance by monitoring a thickness and the like of the yarn Y with an appropriate sensor. Moreover, in the yarn monitoring device 25, the cutter 25b is arranged upstream of the monitoring section 25a. The cutter 25b cuts the yarn Y immediately when the monitoring section 25a detects a yarn defect.

[0049] To surely perform the yarn joining, the yarn processing section 20 includes the lower yarn blow-feeding member 26, an upper yarn blow-feeding member 27, and a yarn guiding member 28.

[0050] The lower yarn blow-feeding member 26 is a cylindrical member arranged near but downstream of the yarn unwinding assisting device 11. By jetting compressed air, the lower yarn blow-feeding member 26 generates an air current that can blow and feed the yarn Y to the lower yarn catching member 23. Accordingly, when a yarn breakage has occurred or after the yarn supplying bobbin B has been replaced, the lower yarn blow-feeding member 26 operates whereby the yarn end from the yarn supplying bobbin B can be caught with the lower yarn catching member 23 and this yarn end can be introduced into the yarn joining device 22.

[0051] Note that, if it is just after a new yarn supplying bobbin B has been supplied to the yarn supplying section 10, because enough yarn Y has not been pulled from the yarn supplying bobbin B, it may be difficult for the lower yarn blow-feeding member 26 to blow and feed the yarn end to the yarn joining device 22. To handle such a situation, an auxiliary blow-feeding member 13 is arranged in the yarn supplying section 10. The auxiliary blow-feeding member 13 is positioned right below the conveying tray T that is arranged in the yarn supplying section 10. The auxiliary blow-feeding member 13 jets compressed air inside the conveying tray T and the yarn supplying bobbin B both of which are hollow inside. As a result, an air current that blows and feeds the yarn Y from the yarn supplying bobbin B to the lower yarn blow-feeding member 26 is generated at a tip end part of the yarn supplying bobbin B. In this manner, the auxiliary blow-feeding member 13 and the lower yarn blow-feeding member 26 operate together when the new yarn supplying bobbin B is supplied. As a result, the yarn end from the yarn supplying bobbin B can be surely fed to the yarn joining device 22.

[0052] The upper yarn blow-feeding member 27 is a cylindrical member arranged near but upstream of the yarn accumulating device 30. By jetting compressed air, the upper yarn blow-feeding member 27 generates an air current that can blow and feed a yarn end from the yarn accumulating device 30 to the upper yarn catching member 21.

[0053] The yarn guiding member 28 is a cylindrical member that is curved and projects toward the front direction so as to detour around the yarn monitoring device 25, the tension applying device 24, the yarn joining device 22, and the like. An opening is formed at each of the longitudinal ends of the yarn guiding member 28. The opening on one end opposes an outlet of the upper yarn blow-feeding member 27, and the opening on the other end opposes the upper yarn catching member 21. A not-shown slit is formed in a back side of the yarn guiding member 28 over an entire length of the yarn guiding member 28 so that the yarn Y that passes inside the yarn guiding member 28 from the opening on one end to the opening on the other end can be taken out of the yarn guiding member 28.

[0054] The upper yarn blow-feeding member 27 catches the yarn end from the yarn accumulating device 30 and blows the same to the inside of the yarn guiding member 28, pulls the yarn Y along the yarn guiding member 28, and causes the yarn Y to be caught by the upper yarn catching member 21. In this manner, the yarn Y from the yarn accumulating device 30 is blown and fed by the upper yarn blow-feeding member 27 and guided to the yarn joining device 22.

Yarn Accumulating Device

[0055] The yarn accumulating device 30 is arranged between the yarn processing section 20 and the winding section 40 in the yarn travelling direction. The yarn accumulating device 30 pulls the yarn Y from the yarn supplying section 10, temporarily accumulates the pulled yarn Y and supplies the yarn Y to the winding section 40. Because of the yarn accumulating device 30, it is prevented that the variations in the tension of the yarn Y unwound from the yarn supplying bobbin B are transmitted to the winding section 40 side. As a result, the variations in the tension of the yarn Y supplied to the winding section 40 can be suppressed leading to formation of a good quality package P. Moreover, because of the yarn accumulating device 30, the winding of the yarn Y by the winding section 40 can be continued even while performing the yarn joining.

[0056] The yarn accumulating device 30 includes a yarn accumulating roller 31 on which the yarn Y can be wound, and a roller driving motor 32 that rotationally drives the yarn accumulating roller 31. The roller driving motor 32 can rotate the yarn accumulating roller 31 in a winding direction of the yarn Y from the yarn supplying section 10 (normal rotation) and can rotate the yarn accumulating roller 31 in an opposite direction of the winding direction (reverse rotation). The yarn Y wound on the yarn accumulating roller 31 is pulled to the downstream via a pulling guide 35 arranged on a line that extends from a central axis of the yarn accumulating roller 31.

[0057] The yarn accumulating roller 31 has a cylindrical shape and it is formed, for example, of metal. When the yarn accumulating roller 31 performs the normal rotation while the yarn Y has been wound thereon, the tension is applied to the yarn Y on the upstream side of the yarn accumulating device 30. As a result, the yarn Y is unwound from the yarn supplying bobbin B and the yarn Y is wound around an outer peripheral surface 31a of the yarn accumulating roller 31 thereby accumulating the yarn Y. In the below explanation, an end of the yarn accumulating roller 31 near the roller driving motor 32 will be called a base end and the opposite end will be called a tip end.

[0058] A ring member 33 is arranged on the outer peripheral surface 31a of the yarn accumulating roller 31 on a tip of the tip end thereof. The ring member 33 has a circular shape and it is formed, for example, of rubber. The ring member 33 is fit on the outer peripheral surface 31a by an elastic force that acts inward in a radial direction of the ring member 33. The yarn Y is passed inside the ring member 33. Accordingly, a resistance is applied on the yarn Y pulled from the yarn accumulating roller 31 because of the elastic force of the ring member 33. Accordingly, an appropriate tension is applied to the yarn Y that is being pulled from the yarn accumulating roller 31 allowing the unwinding of the yarn Y from the yarn accumulating roller 31 to be performed in a stable manner.

[0059] A groove 31b is formed in the outer peripheral surface 31a of the yarn accumulating roller 31 along an axial direction of the yarn accumulating roller 31 below the location of the ring member 33 as well. An urging member 36 that is biased outward in the radial direction by a not-shown spring is accommodated in a portion of the groove 31b that intersects with the ring member 33. This urging member 36 is forcefully pushed inward in the radial direction by a later-explained yarn passing nozzle 34. When the urging member 36 is pushed inward in the radial direction, a gap is produced between the ring member 33 and the urging member 36 and the yarn Y can be passed through this gap.

[0060] The yarn accumulating device 30 includes the cylindrical yarn passing nozzle 34. The yarn passing nozzle 34 is arranged near the yarn accumulating roller 31. One end of the yarn passing nozzle 34 is arranged so as to oppose the outer peripheral surface 31a of the yarn accumulating roller 31 on the tip of the tip end thereof. The yarn passing nozzle 34 is configured so that the compressed air can be passed inside thereof from the other end to the one end. That is, the other end (the end that is on an opposite side of a side on which the yarn accumulating roller 31 is present) of the yarn passing nozzle 34 functions as a suction port that sucks the yarn Y, and the one end (the end that opposes the yarn accumulating roller 31) of the yarn passing nozzle 34 functions as a blowing port for blowing off the sucked yarn Y. The yarn passing nozzle 34 can be moved toward or away from the outer peripheral surface 31a of the yarn accumulating roller 31 by, for example, a sliding mechanism that uses an actuator such as an air cylinder or a motor.

[0061] When the yarn passing nozzle 34 is moved toward the outer peripheral surface 31a of the yarn accumulating roller 31 while the urging member 36 is opposing the one end of the yarn passing nozzle 34, the yarn passing nozzle 34 forcefully pushes the urging member 36 inward in the radial direction against the urging force of the spring, and a gap is formed between the ring member 33 and the urging member 36. In this state, when the yarn Y is brought near the other end (suction port) of the yarn passing nozzle 34 and the compressed air is flown from the other end to the one end of the yarn passing nozzle 34, the yarn Y can be passed through this gap and the yarn Y can be blown off from the tip end (winding section 40 side) to the base end (yarn supplying section 10 side) inside the groove 31b. In this manner, the yarn Y can be passed to the yarn accumulating roller 31. A not-shown slit is formed in the yarn passing nozzle 34 along a length direction thereof so that the yarn Y that is passed to the yarn accumulating roller 31 can be taken out from the yarn passing nozzle 34.

[0062] The yarn end of the yarn Y that has passed from the tip end side to the base end side of the yarn accumulating roller 31 is further blown by the upper yarn blow-feeding member 27 to the yarn guiding member 28, caught by the upper yarn catching member 21, and guided to the yarn joining device 22. That is, a guiding mechanism 7, which guides the yarn Y to the yarn joining device 22 after passing the yarn Y from the package P through the yarn accumulating device 30 when the yarn Y has become discontinuous between the package P and the yarn accumulating device 30, includes the yarn passing nozzle 34, the upper yarn blow-feeding member 27, the yarn guiding member 28, and the upper yarn catching member 21. Moreover, although detailed explanation will be given later, the doffing device 3 includes a yarn transferring mechanism 8 for guiding the yarn Y from the package P to the guiding mechanism 7 (specifically, the suction port of the yarn passing nozzle 34) when the yarn Y has become discontinuous between the package P and the yarn accumulating device 30. Because the yarn transferring mechanism 8 and the guiding mechanism 7 collaborate, the yarn Y from the package P can be guided to the yarn joining device 22.

Winding Section

[0063] FIG. 3 is a front view of the winding section 40 of the winding unit 2. The winding section 40 includes a cradle 41 on which the winding tube Q can be mounted, a traversing drum 42 that rotates the winding tube Q or the package P while traversing the yarn Y, and a traversing guide 43 that guides the yarn Y traversed by the traversing drum 42.

[0064] The cradle 41 includes a pair of left and right arms 41a and a pair of left and right holders 41b attached respectively in the inside of each of the arms 41a. Accordingly, the cradle 41 can rotatably support the winding tube Q or the package P with the holders 41b. The cradle 41 can cause an outer peripheral surface of the supported package P to contact an outer peripheral surface of the traversing drum 42.

[0065] The traversing drum 42 is rotationally driven by a not-shown driving source (such as an electric motor). The winding tube Q or the package P is rotatably driven when the traversing drum 42 that is in contact with the outer peripheral surface of the winding tube Q or the package P is rotated. The traversing drum 42 can pull the yarn Y from the yarn accumulating device 30 and rotate in a winding direction (normal rotation) for winding the yarn Y on the winding tube Q, or can rotate to pull the yarn Y from the package P (reverse rotation). A traversing groove 42a is formed in the outer peripheral surface of the traversing drum 42. The traversing drum 42 can traverse the yarn Y in a traversing area by using this traversing groove 42a. In this manner, the package P of a predetermined shape can be formed while winding the yarn Y on the winding tube Q while traversing the yarn Y with the traversing drum 42. Note that, left and right end positions of the yarn Y (both end positions of the traversing area) during the traversing are only schematically shown in FIG. 3.

[0066] The traversing guide 43 is arranged near but upstream of the traversing drum 42 and relatively in the front direction of the traversing drum 42. The traversing guide 43 is a plate member formed of metal and the like. The traversing guide 43 includes a first guide wall 43a, left and right second guide walls 43b, and left and right yarn introducing members 43c.

[0067] A shape of the first guide wall 43a when seen from the front direction is substantially trapezoidal, and a surface thereof on a front side (a side that is opposite of the side on which the traversing drum 42 is present) functions as a guiding surface. The yarn Y that is traversed by the traversing drum 42 is guided while being in contact with the guiding surface of the first guide wall 43a, and the yarn Y performs reciprocating movement along an axial direction (traversing direction) of the traversing drum 42.

[0068] Each of the second guide walls 43b is connected to each of edges of the first guide wall 43a in the traversing direction. The second guide walls 43b are folded back toward the front side with respect to the first guide wall 43a and each of the second guide walls 43b encloses a respective edge of the first guide wall 43a in the traversing direction. Floating up of the yarn Y on the front side guided by the first guide wall 43a is prevented by the second guide walls 43b.

[0069] Each of the yarn introducing members 43c is connected to each of top edges of the second guide walls 43b. The yarn introducing members 43c are bent gently toward the front side with respect to the second guide walls 43b. The yarn introducing members 43c overlap with each other in a front-back direction such that an inner edge in the traversing direction of one yarn introducing member 43c extends in the front side than an inner edge in the traversing direction of the other yarn introducing member 43c, and a gap 43d for passing the yarn Y is formed in a region where the yarn introducing members 43c overlap in the front-back direction. The yarn Y positioned on the front side of the second guide walls 43b and the yarn introducing members 43c moves to a position where it contacts the first guide wall 43a after passing through the gap 43d by the yarn Y being traversed by the rotation of the traversing drum 42.

[0070] A yarn detecting sensor 44 is arranged on a left edge of the first guide wall 43a. The yarn detecting sensor 44 is an optical sensor of a so-called reflection type in which a light emitting element and a light receiving element are arranged adjacent to each other. A through-hole 43e is formed in the left second guide wall 43b at a position opposing the yarn detecting sensor 44. As a result, when the yarn Y is at a position opposing the yarn detecting sensor 44, light emitted from the light emitting element of the yarn detecting sensor 44 is reflected by the yarn Y, and the reflected light is received in the light receiving element. In contrast, when the yarn Y is at a position where it does not oppose the yarn detecting sensor 44, the light emitted from the light emitting element of the yarn detecting sensor 44 is not reflected by the yarn Y, and no reflected light is received in the light receiving element as the emitted light passes through the through-hole 43e. Whether the traversing is being performed normally can be determined based on whether the reflected light is received in the light receiving element of the yarn detecting sensor 44 in a predetermined traversing cycle.

Unit Controlling Section

[0071] Each of the winding units 2 includes a unit controlling section 2a (see FIG. 5) constituted by a CPU, a ROM, a RAM, an input-output interface, and the like. The unit controlling section 2a controls operations of various structural components such as the yarn supplying section 10, the yarn processing section 20, the yarn accumulating device 30, and the winding section 40. Moreover, each of the unit controlling sections 2a is capable of communicating with the machine-frame controlling device 5 so that operations of a plurality of the winding units 2 are centrally managed by the machine-frame controlling de-

vice 5.

Doffing Device

[0072] The doffing device 3 is explained below. FIG. 4 is a view of the doffing device 3 when seen from the winding unit 2 side (back side). Accordingly, it should be noted that, the left-right direction in FIG. 4 is opposite of the left-right direction of the automatic winder 1. FIG. 5 is a block diagram of an electrical configuration of the automatic winder 1.

[0073] When the winding of the yarn Y in a certain winding unit 2 is completed, the doffing device 3 moves to a position opposing that winding unit 2 and performs a doffing process for doffing the package P in which the winding has been completed. Apart from the doffing process, the doffing device 3 can perform by collaborating with the winding unit 2 other processes such as a yarn-type changing process of changing a type of the yarn Y to be wound in the winding section 40, and an upper-yarn cutting process of performing the yarn joining when the yarn Y is discontinued between the package P and the yarn accumulating device 30.

[0074] The doffing device 3 includes a housing 50, a clamp cutter 51, an extendible arm 52, a chucker 53, a cradle opener 54, a suction mouth 55, a seed yarn supplying section 70, and the like. The housing 50 has an opening in a back surface. The housing 50 accommodates various structural components of the doffing device 3.

Clamp Cutter

[0075] The clamp cutter 51 includes a not-shown cutter for cutting the yarn Y and a not-shown clamp for holding the yarn Y. The cutter and the clamp of the clamp cutter 51 are driven by an appropriate driving sources such as air cylinders. The clamp cutter 51 is attached at a tip end part of the extendible arm 52. The extendible arm 52 includes a plurality of rod (tube) members of different diameters and arranged in a coaxially nested manner so as to be extendible and contractible. Moreover, the extendible arm 52 is also configured as an air cylinder, and can be extended or contracted by compressed air supplied from a not-shown compressed air source. Moreover, the extendible arm 52 is pivotable in the front-back direction by a pivot motor 56 (see FIG. 5). In this manner, because the extendible arm 52 is extendible, contractible, and pivotable, the clamp cutter 51 attached to the tip end part of the extendible arm 52 can move to hold the yarn Y located just below the traversing guide 43, can move the held yarn Y to the side of the winding tube Q, and the like.

Chucker

[0076] The chucker 53 is attached so as to be rotatable around an axis 57 that extends in the left-right direction in the housing 50. The chucker 53 is driven by a chucker driving section 58 (see FIG. 5) constituted by a motor and the like so as to rotate up and down around the axis 57. The chucker 53 has a chucker part 53a at the tip end part for holding the winding tube Q. The chucker 53 takes out one empty winding tube Q from a not-shown stocker located above the automatic winder 1, and after holding the winding tube Q with the chucker part 53a, rotates down and sets the winding tube Q on the cradle 41.

Cradle Opener

[0077] The cradle opener 54 is attached to a right wall of the housing 50. The cradle opener 54 is driven by an opener driving section 59 (see FIG. 5) that includes an appropriate driving source such as a cylinder or a motor to perform various operations such as rotation and pivoting to operate a not-shown cradle lever of the cradle 41. When the cradle lever is operated, as shown in FIGS. 7A to 7C, the arm 41a and the holder 41b on the right side of the cradle 41 are opened and closed enabling removing of the package P in which the winding has been completed, and mounting of an empty winding tube Q on the cradle 41.

Suction Mouth

[0078] The suction mouth 55 is arranged at substantially the same height as the package P. The suction mouth 55 has a suction port 55a that extends in the left-right direction on a front side thereof. Moreover, the suction mouth 55 can be moved by a mouth driving section 60 (see FIG. 5) to a standby position inside the housing 50 and a proximal position. In the proximal position, the suction mouth 55 goes out of the housing 50 toward the winding unit 2 so that the suction port 55a is positioned near the package P. The yarn Y can be sucked and held with the suction port 55a by generating a negative pressure at the suction port 55a by using a not-shown negative pressure source. A mouth cutter 61 for cutting the yarn Y is arranged just below the right end of the suction mouth 55.

Seed Yarn Supplying Section

[0079] The seed yarn supplying section 70 supplies a new type of the yarn Y in the yarn-type changing process. In the following description, the new type of the yarn Y supplied by the seed yarn supplying section 70 may be appropriately called a seed yarn Y.

[0080] A part of a lower part of the housing 50 is formed as a box-shaped openable-closable member 50a with an open back surface. Various structural components constituting the seed yarn supplying section 70 are arranged inside this openable-closable member 50a. The openable-closable member 50a is pivotable in the front-back direction. The operator can access the seed yarn supplying section 70 from the front side of the automatic

winder 1 by pivoting the openable-closable member 50a forward to open the same. Accordingly, the maintenance and the like of the seed yarn supplying section 70 becomes easy.

[0081] The seed yarn supplying section 70 includes a seed yarn bobbin 71, a seed yarn transferring lever 72, a clamp cutter for seed yarn 73, a yarn trap 74, and the like. The seed yarn bobbin 71 is a bobbin on which the seed yarn Y has been wound. The seed yarn bobbin 71 is rotatably supported by a support shaft 75. The seed yarn transferring lever 72 can be rotated horizontally around a support shaft 72a by a seed yarn transferring motor 76 (see FIG. 5). A not-shown slit in which the yarn Y enters allowing pulling of the yarn Y by hooking the yarn Y is arranged at a tip end part of the seed yarn transferring lever 72. Moreover, a guide for seed yarn 77 is fixed to the tip end part of the seed yarn transferring lever 72. The guide for seed yarn 77 is arranged above the seed yarn transferring lever 72 at a certain distance. The guide for seed yarn 77 rotates integrally horizontally with the seed yarn transferring lever 72. The guide for seed yarn 77 has a not-shown notch for pulling the yarn Y by hooking the yarn Y. The seed yarn transferring lever 72 is movable in a standby position and a pulling position. In the standby position, the seed yarn transferring lever 72 is retracted inside the openable-closable member 50a. In the pulling position, the seed yarn transferring lever 72 extends from the openable-closable member 50a toward the winding unit 2 to pull the seed yarn Y to a position at which the seed yarn Y can be held with the clamp cutter 51.

[0082] The clamp cutter for seed yarn 73 is arranged little above the guide for seed yarn 77 when the guide for seed yarn 77 is in the standby position. The clamp cutter for seed yarn 73 includes a not-shown cutter for cutting the seed yarn Y and a not-shown clamp for holding the seed yarn Y. The cutter and the clamp of the clamp cutter for seed yarn 73 are driven by appropriate driving sources such as air cylinders. The seed yarn Y pulled by the seed yarn bobbin 71 is guided to the clamp cutter for seed yarn 73 after passing through the slit of the seed yarn transferring lever 72 and the notch of the guide for seed yarn 77. The yarn trap 74 is arranged near the clamp cutter for seed yarn 73. The yarn trap 74 has a suction function to suck the yarn Y.

[0083] The doffing device 3 includes various levers and guides that are used to guide the yarn Y from the package P to the suction port of the yarn passing nozzle 34 of the yarn accumulating device 30 when the yarn Y has become discontinuous between the package P and the yarn accumulating device 30. Configurations of these various levers and guides are explained below briefly, whereas their operations will be explained when explaining a series of operations of various processes.

Yarn Shifting Lever

[0084] A yarn shifting lever 62 is arranged little above the suction mouth 55. The yarn shifting lever 62 can be rotated horizontally around a support shaft 62a by a yarn shifting motor 63 (see FIG. 5). The yarn shifting lever 62 can hook the yarn Y with a tip end part thereof and rotate to move the yarn Y. The yarn shifting lever 62 is used mainly when fixing the yarn Y to the winding tube Q, and when forming bunch winding.

Fixed Guide

[0085] A fixed guide 64 is arranged below the suction mouth 55. The fixed guide 64 is fixed to the housing 50 and has an inverted V-shape when seen from the back direction. A concave retaining member 64a is formed in a lower left tip part of the fixed guide 64. The yarn Y can be retained with the retaining member 64a. Moreover, the fixed guide 64 has a protruding member 64b (see FIG. 10A etc.) that extends in the front direction. The yarn path of the yarn Y is defined by retaining the yarn Y with the retaining member 64a or the protruding member 64b.

Yarn transferring Lever

[0086] A yarn transferring lever 65 is arranged in the front direction of the fixed guide 64. The yarn transferring lever 65 can be rotated vertically around a support shaft 65a by a yarn transferring motor 66 (see FIG. 5). When the suction mouth 55 is in the standby position, a tip end part of the yarn transferring lever 65 rotates just in the front direction so as to go across the suction port 55a of the suction mouth 55. The yarn transferring lever 65 includes a hooking member 65b for hooking the yarn Y with a tip end part thereof to move the yarn Y. The yarn Y can be hooked by the hooking member 65b by rotating the yarn transferring lever 65 in a counterclockwise when seen from the back direction. Moreover, between the tip end part and a base end part of the yarn transferring lever 65, on the right side when seen from the back direction is arranged a curved concave part 65c, and on the left side when seen from the back direction is arranged a curved convex part 65d.

Yarn Flying Lever

[0087] A yarn flying lever 67 can be rotated vertically around a support shaft 67a by a yarn flying motor 68 (see FIG. 5). The yarn flying lever 67 is arranged at an extreme lower end of the doffing device 3. A yarn picking member 67b is arranged at a tip end part of the yarn flying lever 67 for picking the yarn Y. The yarn flying lever 67 picks with the yarn picking member 67b the yarn Y that has been moved downward by the yarn transferring lever 65, and guides the yarn Y to the suction port of the yarn passing nozzle 34 of the yarn accumulating device 30.

Doffing Controlling Section

[0088] As shown in FIG. 5, the doffing device 3 includes

a doffing controlling section 3a constituted by a CPU, a ROM, a RAM, an input-output interface, and the like. The doffing controlling section 3a is capable of communicating with the machine-frame controlling device 5. The doffing controlling section 3a controls the various driving sections of the doffing device 3 according to a command from the machine-frame controlling device 5.

Various Processes Performed by Automatic Winder

[0089] Various processes such as a doffing process for doffing a package P in which the winding has been completed, a yarn-type changing process for changing the type of the yarn Y to be wound in the winding section 40, and the upper-yarn cutting process in which yarn joining is performed when the yarn Y is discontinued between the package P and the yarn accumulating device 30 are performed by the automatic winder 1 by the winding unit 2 and the doffing device 3 collaborating with each other. These processes will be explained below in one after the other.

Doffing Process

[0090] At first, the doffing process is explained. FIG. 6 is a flowchart of the doffing process. FIGS. 7A to 7C are schematic top views for explaining an operation when fixing the yarn Y to the winding tube Q. When the yarn Y of a predetermined amount is wound in a certain winding unit 2 whereby it is detected that the winding of the yarn Y has completed, the unit controlling section 2a of this winding unit 2 stops the rotation of the traversing drum 42 and the yarn accumulating roller 31 and outputs a signal to the machine-frame controlling device 5 requesting the machine-frame controlling device 5 to instruct to perform the doffing process. In response to this instruction from the machine-frame controlling device 5, the doffing device 3 moves to the position of this winding unit 2 in which the winding of the yarn Y has been completed and then starts the doffing process. Note that, the package P stops rotating as the rotation of the traversing drum 42 has been stopped; however, in this case the yarn Y is still continuous between the package P and the yarn accumulating device 30.

[0091] At first, the doffing controlling section 3a drives the extendible arm 52 and the pivot motor 56 thereby moving the clamp cutter 51 to a position where it can hold and cut the yarn Y located just below the traversing guide 43, cuts the yarn Y and holds a yarn end of the yarn Y from the yarn accumulating device 30 (lower yarn) with the clamp cutter 51 (Step S101). Then, the doffing controlling section 3a moves the clamp cutter 51, which is holding the lower yarn, little above the cradle 41 (Step S102). Subsequently, the package P in which the winding has been completed is removed from the cradle 41, and an empty winding tube Q is set on the cradle 41 (Step S103). Note that, it is allowable to appropriately change the contents of Step S102 and Step S103. For example, it is allowable to perform a part of the processing of Step S102 and a part of the processing of Step S103 simultaneously.

[0092] Step S103 is explained in detail below. At first, the doffing controlling section 3a drives the opener driving section 59 to cause the cradle opener 54 to operate the not-shown cradle lever. As a result, as shown in FIG. 7A, the arm 41a and the holder 41b on the right side of the cradle 41 move to the right and open whereby the cradle 41 is released. Accordingly, the package P supported by the cradle 41 can be removed from the cradle 41. Then, the doffing controlling section 3a operates the chucker 53 by driving the chucker driving section 58. The chucker 53 takes out one empty winding tube Q with the chucker part 53a from the not-shown stocker, and sets the winding tube Q on the cradle 41.

[0093] When the winding tube Q is set by the chucker 53, the yarn Y held by the clamp cutter 51 is fixed to the winding tube Q, and then the bunch winding is formed (Step S104). The "bunch winding" is a yarn layer formed on the winding tube Q outside the traversing area and used in a post-process when unwinding the yarn Y from a plurality of packages P in succession. Specifically, yarn joining is previously performed of a yarn end of a yarn Y in the bunch winding on a package P to be unwound earlier and a winding ending yarn end of an outermost layer on a package P to be unwound later enabling the yarns Y of a plurality of the packages P to be unwound successively.

[0094] Step S104 is explained in more detail below while referring to FIGS. 7A to 7C. When the winding tube Q is set by the chucker 53 (not shown in FIGS. 7A to 7C), the doffing controlling section 3a drives the yarn shifting motor 63 whereby, as shown in FIG. 7A, the yarn shifting lever 62 is rotated clockwise in the figure from a standby position (position as shown with an alternate long and short dash line). As a result, the yarn Y held by the clamp cutter 51 moves to the right side of the winding tube Q and passes through a space between the winding tube Q and the holder 41b on the right side.

[0095] In this state, when the cradle lever is operated by the cradle opener 54 again, the arm 41a and the holder 41b on the right side move to the left and are closed. As a result, as shown in FIG. 7B, the yarn Y is sandwiched between the winding tube Q and the holder 41b whereby the yarn Y is fixed to the winding tube Q. After the yarn Y is fixed to the winding tube Q, the chucker 53 is separated from the winding tube Q and the clamp cutter 51 releases the held yarn Y. Then, as shown in FIG. 7C, the yarn shifting lever 62 is rotated a little counterclockwise in the figure and returned. In this state, when the traversing drum 42 is caused to perform the normal rotation, the bunch winding A is formed.

[0096] Finally, the doffing controlling section 3a returns the yarn shifting lever 62 to the standby position, the unit controlling section 2a causes the traversing drum 42 and the yarn accumulating roller 31 to perform the normal rotation and the winding of the yarn Y is restarted (Step

S105).

Yarn-type Changing Process

[0097] The yarn-type changing process will be explained now. FIG. 8 is a flowchart of the first half of the yarn-type changing process and FIG. 9 is a flowchart of the second half of the yarn-type changing process. FIGS. 10A to 10F are schematic side views for explaining an operation performed during the yarn-type changing process. FIGS. 11A to 11C and FIGS. 12A to 12C are schematic back views (left views) and side views (right views) for explaining an operation performed during the yarn-type changing process. FIGS. 13A to 13D are schematic side views for explaining an operation performed during the yarn-type changing process. Note that, in FIGS. 10A to 13D, some structural components have been appropriately omitted.

[0098] When changing the type of the yarn Y to be wound in the winding section 40 of a certain winding unit 2, the operator inputs information indicative of this fact into the machine-frame controlling device 5. Accordingly, an instruction is output from the machine-frame controlling device 5 whereby a yarn supplying bobbin B on which the new type of the yarn Y has been wound is supplied from the bobbin supplying device 4 to the yarn supplying section 10 of this winding unit 2, and the doffing device 3 moves to the position of this winding unit 2 and starts the yarn-type changing process. Note that, in the following explanation it is assumed that the previous package P has been already removed from the cradle 41. However, such a package P may be present on the cradle 41. When such a package P is present on the cradle 41, like at Step S103 of the doffing process, this package P is removed before setting an empty winding tube Q.

[0099] FIG. 10A shows a state in which the various structural components of the doffing device 3 are in the standby position (initial position). In this state, the seed yarn Y pulled from the seed yarn bobbin 71 is held by the clamp cutter for seed yarn 73 after passing through the slit of the seed yarn transferring lever 72 and the notch of the guide for seed yarn 77. At first, the doffing controlling section 3a drives the seed yarn transferring motor 76 to rotate the seed yarn transferring lever 72 horizontally. Accordingly, as shown in FIG. 10B, the seed yarn transferring lever 72 moves from the standby position to the pulling position allowing pulling of the seed yarn Y toward the winding unit 2 (Step S201).

[0100] Subsequently, the doffing controlling section 3a drives the extendible arm 52 and the pivot motor 56 to move, as shown in FIG. 10C, the clamp cutter 51 to a position at which the seed yarn Y can be held with the clamp cutter 51. Then, the doffing controlling section 3a causes the clamp cutter 51 to cut the seed yarn Y, hold a yarn end from the seed yarn bobbin 71 (Step S202), and while the clamp cutter 51 is holding the yarn end moves the clamp cutter 51 to just above the cradle 41 (Step S203) . After the seed yarn Y is cut, the seed yarn Y held by the clamp cutter for seed yarn 73 is released, and the yarn trap 74 is operated to suck yarn waste held by the clamp cutter for seed yarn 73 with the yarn trap 74. Then, the doffing controlling section 3a drives the chucker driving section 58 to set an empty winding tube Q on the cradle 41 (Step S204). Note that, it is allowable to appropriately change the contents of Steps S203 and S204. For example, it is allowable to perform a part of the processing of Step S203 and a part of the processing of Step S204 simultaneously.

[0101] Furthermore, the doffing controlling section 3a drives the yarn shifting motor 63 to rotate the yarn shifting lever 62 horizontally to, as shown in FIG. 10D, hook the seed yarn Y present between the clamp cutter 51 and the tip end part of the seed yarn transferring lever 72 with the tip end part of the yarn shifting lever 62 and move the hooked seed yarn Y to the right side of the winding tube Q. As a result, the state shown in FIG. 7A is achieved. Before or after this, the seed yarn transferring lever 72 is returned to the standby position inside the openable-closable member 50a. Then, the bunch winding is formed after fixing the seed yarn Y to the winding tube Q (Step S205). Because the operation performed at Step S205 is the same as that performed at Step S104 in the doffing process, a detained explanation of the operation performed at Step S205 will be omitted.

[0102] After the bunch winding is formed, the doffing controlling section 3a causes the traversing drum 42 to perform the normal rotation while slowly returning the yarn shifting lever 62 toward the standby position. Accordingly, as shown in FIG. 10E, a starter package SP in which the seed yarn Y has been wound on the winding tube Q is formed (Step S206). Then, the seed yarn Y present between the starter package SP and the seed yarn transferring lever 72 is moved by a transferring mechanism 9 arranged in the doffing device 3 near to the suction port 55a of the suction mouth 55 that is in the standby position. The transferring mechanism 9 is constituted by the yarn shifting lever 62, the fixed guide 64, and the yarn transferring lever 65. The normal rotation of the traversing drum 42 is stopped before the seed yarn Y is cut at Step S210.

[0103] When the yarn shifting lever 62 is rotated further toward the standby position, as shown in FIGS. 10F and 11A, the seed yarn Y is hooked with the retaining member 64a of the fixed guide 64 and retained (Step S207). In this state, the rotation of the yarn shifting lever 62 is once stopped, and then an operation to move the seed yarn Y near to the suction port 55a of the suction mouth 55 that is in the standby position is performed by using the yarn transferring lever 65. Such an operation is explained by referring to FIGS. 11A to 12C. At a time point at which the seed yarn Y is retained by the retaining member 64a, the seed yarn Y present between the yarn shifting lever 62 and the fixed guide 64 spans over the yarn transferring lever 65 in the front-back direction, and a yarn path that passes on the left side of the yarn transferring lever 65 is formed.

[0104] As shown in FIG. 11A, when the seed yarn Y has been retained by the retaining member 64a of the fixed guide 64, the doffing controlling section 3a drives the yarn transferring motor 66 to rotate the yarn transferring lever 65 clockwise when seen from the back direction. As a result, as shown in FIG. 11B, the seed yarn Y is pushed to the left lower side while the seed yarn Y has entered into the concave part 65c of the yarn transferring lever 65, and the seed yarn Y retained by the retaining member 64a is released (Step S208).

[0105] The doffing controlling section 3a rotates the yarn transferring lever 65 counterclockwise when seen from the back direction to move the seed yarn Y near to the suction port 55a of the suction mouth 55 (Step S209) . The term "near to the suction port 55a" means a position relative to the suction port 55a, e.g., a position just in front of the suction port 55a, at which the yarn Y can be sucked with the suction port 55a. Step S209 is explained in detail below.

[0106] When the yarn transferring lever 65 is rotated counterclockwise, at first, the seed yarn Y that slips from the retaining member 64a of the fixed guide 64 and the concave part 65c of the yarn transferring lever 65 goes over a left end of the fixed guide 64 from the back direction to the front direction, and, as shown in FIG. 11C, passes through the notch of the guide for seed yarn 77 and the clamp cutter for seed yarn 73 and is put on a left hand side of the protruding member 64b of the fixed guide 64. When the yarn transferring lever 65 is further rotated counterclockwise and makes approximately one rotation, as shown in FIG. 12A, the seed yarn Y contacts the convex part 65d of the yarn transferring lever 65, and as the yarn transferring lever 65 rotates further, the seed yarn Y moves above along an edge of the convex part 65d and finally goes into the hooking member 65b. When the yarn transferring lever 65 is further rotated counterclockwise in the state in which the seed yarn Y has been hooked by the hooking member 65b, as shown in FIG. 12B, the seed yarn Y passes just in front of a central part of the suction port 55a of the suction mouth 55. At this point, the rotation of the yarn transferring lever 65 is once stopped. Because the seed yarn Y hooked by the hooking member 65b is pulled by the yarn transferring lever 65, just before attending the state shown in FIG. 12B, the seed yarn Y slips from the yarn shifting lever 62, and, with this, the yarn shifting lever 62 is returned to the standby position.

[0107] When the seed yarn Y is just in front of the suction port 55a, if the seed yarn Y is cut by the clamp cutter for seed yarn 73, as shown in FIG. 12C, the yarn end of the seed yarn Y from the starter package SP is sucked by the suction port 55a of the suction mouth 55, and this yarn end can be sucked and held with the suction mouth 55 (Step S210). In the next step, to make it possible to easily hook the seed yarn Y with the hooking member 65b, the yarn transferring lever 65 is rotated clockwise when seen from the back direction only a little almost simultaneously with cutting the seed yarn Y with the clamp cutter for seed yarn 73.

[0108] The subsequent operations are explained by referring to FIGS. 13A to 13D. When sucking and holding of the yarn end from the starter package SP by the suction mouth 55 is completed, the unit controlling section 2a rotates the traversing drum 42 slowly in the reverse direction to rotate the starter package SP in a reverse direction to pull the seed yarn Y from the starter package SP (Step S211).

[0109] Then, the doffing controlling section 3a drives the yarn transferring motor 66 to rotate the yarn transferring lever 65 counterclockwise when seen from the back direction. As a result, as shown in FIG. 13A, the seed yarn Y present between the starter package SP and the suction mouth 55 can be hooked with the hooking member 65b of the yarn transferring lever 65. Furthermore, by further rotating the yarn transferring lever 65 downward to make approximately half a rotation, as shown in FIG. 13B, the seed yarn Y being pulled from the starter package SP can be moved to a position at which the seed yarn Y can be delivered to the yarn flying lever 67 (Step S212). Note that, as shown in FIG. 13B, when moving the seed yarn Y downward by the yarn transferring lever 65, the seed yarn Y is guided to a position at which the seed yarn Y can be cut with the mouth cutter 61.

[0110] Subsequently, the doffing controlling section 3a drives the yarn flying motor 68 to rotate the yarn flying lever 67 in the back direction. As a result, the yarn picking member 67b of the yarn flying lever 67 picks the seed yarn Y that was moved downward by the yarn transferring lever 65, and, as shown in FIG. 13C, moves the seed yarn Y near to the suction port of the yarn passing nozzle 34 of the yarn accumulating device 30 (Step S213). That is, the yarn transferring mechanism 8, which guides the yarn Y from the package P to the suction port of the yarn passing nozzle 34, is constituted by the yarn transferring lever 65 and the yarn flying lever 67. Steps S212 and S213 are equivalent to a "yarn transferring step" of the present invention.

[0111] Before or after this, after positioning the yarn accumulating roller 31 so that the urging member 36 of the yarn accumulating roller 31 is located facing the yarn passing nozzle 34, the unit controlling section 2a moves the yarn passing nozzle 34 toward the yarn accumulating roller 31 to press the urging member 36, and generates an air current that flows from the suction port to the blowing port inside the yarn passing nozzle 34. In this state, when the doffing controlling section 3a causes the mouth cutter 61 to cut the seed yarn Y (Step S214), as shown in FIG. 13D, the yarn end of the cut seed yarn Y from the starter package SP is sucked by the yarn passing nozzle 34 and this yarn end is blown toward inside the groove 31b of the yarn accumulating roller 31. The seed yarn Y that passes through the groove 31b of the yarn accumulating roller 31 is blown further toward the yarn guiding member 28 by the upper yarn blow-feeding member 27, and the seed yarn Y is caught by the upper yarn catching member 21 and guided to the yarn joining device 22. The

steps after the yarn flying lever 67 moves the seed yarn Y near to the suction port of the yarn passing nozzle 34 up to this point are equivalent to a "guiding step" of the present invention. Note that, after the seed yarn Y is cut by the mouth cutter 61, the yarn Y from the suction mouth 55 is sucked with the suction mouth 55 and discarded, and thereafter the sucking operation of the suction mouth 55 is stopped.

[0112] A yarn end from the yarn supplying bobbin B is blown toward the lower yarn catching member 23 by the auxiliary blow-feeding member 13 and the lower yarn blow-feeding member 26, and this yarn end is guided to the yarn joining device 22 while being caught by the lower yarn catching member 23. The seed yarn Y pulled from the starter package SP and caught by the upper yarn catching member 21 (upper yarn) and the yarn Y from the yarn supplying bobbin B caught by the lower yarn catching member 23 (lower yarn) are subjected to yarn joining by the yarn joining device 22 whereby the upper yarn and the lower yarn become continuous. This process is equivalent to a "yarn joining step" of the present invention.

[0113] Finally, the doffing controlling section 3a returns the yarn transferring lever 65 and the yarn flying lever 67 to the initial position, the unit controlling section 2a separates the yarn passing nozzle 34 from the yarn accumulating roller 31 and rotates the traversing drum 42 and the yarn accumulating roller 31 in the normal direction to start the winding of the new type of the yarn Y (Step S215).

[0114] The yarn Y from the yarn supplying bobbin B subjected to the yarn joining by the yarn joining device 22 is all monitored with the yarn monitoring device 25 arranged downstream of the yarn joining device 22 so that the yarn Y can be removed when a yarn defect is found. Therefore, if the seed yarn Y wound on the seed yarn bobbin 71 is an inspected and non-defective product, the package P formed after the yarn-type changing process will have superior quality with no yarn Y having a yarn defect.

Upper-yarn Cutting Process

[0115] Finally, the upper-yarn cutting process is explained below. FIG. 14 is a flowchart of the upper-yarn cutting process. When it is detected that a yarn breakage (upper yarn breakage) has occurred between the package P and the yarn accumulating device 30 in a certain winding unit 2, the unit controlling section 2a of this winding unit 2 stops the rotation of the traversing drum 42 and the yarn accumulating roller 31, and outputs a signal to the machine-frame controlling device 5 to request to perform the upper-yarn cutting process. In response to this, the machine-frame controlling device 5 sends an instruction to the doffing device 3, and the doffing device 3 moves to the position of the winding unit 2 in which the upper yarn breakage has occurred and starts the upper-yarn cutting process. The upper yarn breakage can be detected by the yarn detecting sensor 44 as the traversing of the yarn Y is not performed properly when the upper yarn breakage has occurred. Alternatively, when the upper yarn breakage occurs, as the yarn Y goes on accumulating on the yarn accumulating roller 31 without being pulled from the yarn accumulating roller 31, the upper yarn breakage can be detected by using a not-shown sensor that can detect whether an amount of the yarn Y accumulated on the yarn accumulating roller 31 has reached an upper limit.

[0116] At first, the unit controlling section 2a causes the cutter 25b of the yarn monitoring device 25 to cut the yarn Y and causes the yarn accumulating roller 31 to perform the reverse rotation to discard a residual yarn (Step S301). Specifically, after the yarn Y is cut by the cutter 25b, the unit controlling section 2a causes the upper yarn blow-feeding member 27 to blow the yarn end from the yarn accumulating roller 31 toward the yarn guiding member 28 so that the yarn end can be caught with the upper yarn catching member 21. In this state, by causing the yarn accumulating roller 31 to rotate in the reverse direction, the yarn pulled from the yarn accumulating roller 31 can be sucked with the upper yarn catching member 21 and discarded.

[0117] Subsequently, the doffing controlling section 3a drives the mouth driving section 60 to move the suction mouth 55 from the standby position to the proximal position (Step S302). When the package P is rotated in the reverse direction by the unit controlling section 2a by rotating the traversing drum 42 in the reverse direction, the yarn end sticking to the package P is sucked with the suction port 55a of the suction mouth 55 so that the yarn end can be held with the suction mouth 55 (Step S303). After the sucking and holding of the yarn Y from the package P is achieved with the suction mouth 55, the doffing controlling section 3a returns the suction mouth 55 from the proximal position to the standby position (Step S304). Steps S302 to S304 can be performed in parallel with Step S301.

[0118] When the suction mouth 55 is returned to the standby position, the state shown in FIG. 13A is achieved. Then the yarn Y present between the package P and the suction mouth 55 is moved downward with the yarn transferring lever 65 (Step S305), and the yarn Y is guided with the yarn flying lever 67 near to the suction port of the yarn passing nozzle 34 (Step S306) . Steps S305 and S306 are equivalent to the "yarn transferring step" of the present invention.

[0119] Then, after the yarn Y is cut with the mouth cutter 61 (Step S307), the yarn end from the package P reaches the upper yarn catching member 21 via the yarn passing nozzle 34, the yarn accumulating roller 31, the upper yarn blow-feeding member 27, and the yarn guiding member 28, and the yarn end is guided by the upper yarn catching member 21 to the yarn joining device 22 (equivalent to the "guiding step" of the present invention). The yarn Y that is pulled from the package P and caught by the upper yarn catching member 21 (upper yarn) and

the yarn Y from the yarn supplying bobbin B and caught by the lower yarn catching member 23 (lower yarn) are subjected to the yarn joining by the yarn joining device 22 (equivalent to the "yarn joining step" of the present invention), and thereafter the winding of the yarn Y is restarted (Step S308). Because the operation performed at Steps S305 to S308 is the same as that performed at Steps S212 to S215 in the yarn-type changing process, a detained explanation of the operation performed at Steps S305 to S308 will be omitted.

Advantages

[0120] In the automatic winder 1 (yarn winding device) according to the present embodiment, the winding unit 2 includes the guiding mechanism 7 that guides the yarn Y form the package P to the yarn joining device 22 after passing the yarn Y through the yarn accumulating device 30 when the yarn Y has become discontinuous between the package P and the yarn accumulating device 30, and the doffing device 3 includes the yarn transferring mechanism 8 that guides the yarn Y pulled from the package P that is being rotated in the reverse direction to the guiding mechanism 7 when the yarn Y has become discontinuous between the package P and the yarn accumulating device 30. With this configuration, the yarn transferring mechanism 8 and the guiding mechanism 7 collaborate with each other whereby the process of guiding the yarn Y from the package P to the yarn joining device 22 after passing the yarn Y through the yarn accumulating device 30 can be automated. Accordingly, the time required to perform the yarn joining, therefore, the time to start (restart) the winding, can be shortened and the production efficiency of the package P can be improved.

[0121] Moreover, in the present embodiment, the doffing device 3 includes the seed yarn supplying section 70 for supplying a new type of the yarn Y in the yarn-type changing process, the winding unit 2 forms the starter package SP by winding on the winding tube Q the seed yarn Y that is supplied from the seed yarn supplying section 70 in the yarn-type changing process, and in the doffing device 3 the yarn Y from the starter package SP is guided to the yarn joining device 22 by the yarn transferring mechanism 8 and the guiding mechanism 7. With this configuration, the yarn-type changing process can be automated, and the time required to perform the yarn-type changing process can be shortened.

[0122] Moreover, in the present embodiment, the doffing device 3 includes the suction mouth 55 (suction holding member) having the suction port 55a for holding the yarn Y by suction, the transferring mechanism 9 that after the formation of the starter package SP moves the seed yarn Y present between the starter package SP and the seed yarn supplying section 70 near to the suction port 55a, and the clamp cutter for seed yarn 73 (yarn cutting member) that cuts the seed yarn Y, which was moved by the transferring mechanism 9 near to the suction port 55a, at a point nearer to the seed yarn supplying section 70 than the suction port 55a. By cutting the seed yarn Y after moving the seed yarn Y near to the suction port 55a of the suction mouth 55, the yarn Y from the starter package SP can be surely sucked and held with the suction mouth 55.

[0123] Moreover, in the present embodiment, the suction mouth 55 is movable between the standby position and the proximal position in which the suction port 55a is located near the package P, and the transferring mechanism 9 is configured to move the seed yarn Y present between the starter package SP and the seed yarn supplying section 70 near to the suction port 55a of the suction mouth 55 that is in the standby position. With this configuration, because it is unnecessary to move the suction mouth 55 to suck and hold the yarn Y from the starter package SP, the time required to perform the yarn-type changing process can be further shortened.

[0124] Moreover, in the present embodiment, the transferring mechanism 9 includes the yarn transferring lever 65 (yarn transferring member) for hooking the seed yarn Y present between the starter package SP and the seed yarn supplying section 70 and moving the hooked seed yarn Y near to the suction port 55a of the suction mouth 55 that is in the standby position. Because of the presence of such a yarn transferring lever 65, the yarn Y can be moved near to the suction port 55a of the suction mouth 55 with a simple configuration.

[0125] Moreover, in the present embodiment, the transferring mechanism 9 further includes the fixed guide 64 that retains the seed yarn Y present between the starter package SP and the seed yarn supplying section 70 before the seed yarn Y present between the starter package SP and the seed yarn supplying section 70 is moved with the yarn transferring lever 65. Because of the presence of the fixed guide 64, as the yarn path between the starter package SP and the seed yarn supplying section 70 is surely defined, the yarn Y can be surely hooked thereafter with the yarn transferring lever 65.

[0126] Moreover, in the present embodiment, the yarn transferring lever 65 first releases the retaining of the yarn Y by the fixed guide 64 by moving in a predetermined direction and then hooks the seed yarn Y by moving in an opposite direction of the predetermined direction, and moves the seed yarn Y near to the suction port 55a of the suction mouth 55 that is in the standby position. In this manner, by performing both the releasing of the retaining of the seed yarn Y with the fixed guide 64 and the movement of the seed yarn Y, the retaining of which has been released, near to the suction port 55a with one yarn transferring lever 65, an increase in the number of parts can be prevented.

[0127] Moreover, in the present embodiment, the yarn transferring lever 65 is also a component of the yarn transferring mechanism 8, and the yarn transferring lever 65 can hook the seed yarn Y from the starter package SP and sucked and held with the suction mouth 55 that is in the standby position and can move the seed yarn Y. In this manner, by causing the yarn transferring lever

65 to play a plurality of roles, increase in the number of parts of the doffing device 3 can be prevented.

[0128] Moreover, in the present embodiment, during the upper-yarn cutting process, the suction mouth 55 sucks and holds the yarn Y from the package P after moving from the standby position to the proximal position. When the yarn Y is broken between the package P and the yarn accumulating device 30, because the yarn Y from the package P often gets stuck to the package P, the yarn Y from the package P can be sucked and held surely by moving the suction mouth 55 to the proximal position.

[0129] Moreover, in the present embodiment, during the upper-yarn cutting process, the suction mouth 55 sucks and holds the yarn Y from the package P at the proximal position and then moves to the standby position while holding the yarn Y. By doing this way, the operation after the upper-yarn cutting process can be commonized with the yarn-type changing process in which the yarn Y from the package P is sucked and held with the suction mouth 55 that is in the standby position. Accordingly, increase of the number of parts can be prevented, and a control program can be simplified.

[0130] Moreover, in the present embodiment, the doffing device 3 includes the clamp cutter 51 (yarn holding and cutting section) capable of holding and cutting the yarn Y present between the package P and the yarn accumulating device 30 during the doffing process, and the seed yarn supplying section 70 includes the seed yarn transferring lever 72 (seed yarn transferring member) for pulling the seed yarn Y to the position at which the seed yarn Y can be held with the clamp cutter 51. Therefore, the operation for holding the seed yarn Y with the clamp cutter 51 during the yarn-type changing process can be commonized with the operation of the clamp cutter 51 during the doffing process. Accordingly, the operation performed by the clamp cutter 51 can be prevented from becoming complicated, and the configuration can be simplified.

Other Embodiments

[0131] The embodiments of the present invention are explained above; however, the present invention is not necessarily limited to these embodiments.

[0132] For example, in the embodiment it is explained that the yarn transferring mechanism 8 of the doffing device 3 includes the yarn transferring lever 65 and the yarn flying lever 67, and the transferring mechanism 9 includes the yarn shifting lever 62, the fixed guide 64, and the yarn transferring lever 65. Moreover, it is explained that the guiding mechanism 7 of the winding unit 2 includes the yarn passing nozzle 34, the upper yarn blow-feeding member 27, the yarn guiding member 28, and the upper yarn catching member 21. However, the structural components constituting the above elements are not limited to those explained in this embodiment, i.e., other structural component can be appropriately added to or a part of the structural components can be omitted from the respective element.

[0133] Moreover, it is explained that, in the yarn-type changing process according to the embodiment, the starter package SP is formed by using the seed yarn Y supplied from the seed yarn supplying section 70. However, it is not necessary to provide the seed yarn supplying section 70 in the doffing device 3. That is, the starter package SP can be prepared beforehand and set on the cradle 41, and thereafter the yarn-type changing process can be started.

[0134] Moreover, it is explained that, in the upper-yarn cutting process according to the embodiment, the residual yarn on the yarn accumulating roller 31 is sucked with the upper yarn catching member 21 and discarded. However, the method of discarding the residual yarn is not limited to that explained above, i.e., the operator can cut the residual yarn with scissors and the like and discard the residual yarn.

[0135] In the above explanation, the meaning of "a plurality of" also includes "a predetermined number of".

Claims

1. A yarn winding device (1) comprising:

a winding unit (2) configured to pull a yarn from a yarn supplying section (10) and to wind the yarn on a winding tube (Q) in a winding section (40) to form a package (P); and
a doffing device (3) configured to doff from the winding unit (2) a package (P) in which the winding has been completed,
wherein the winding unit (2) includes

a yarn joining device (22) arranged between the yarn supplying section (10) and the winding section (40) in a yarn travelling direction and configured to subject a yarn from the yarn supplying section (10) and a yarn from the winding section (40) to yarn joining;
a yarn accumulating device (30) arranged between the yarn joining device (22) and the winding section (40) in the yarn travelling direction and configured to accumulate the yarn; and
a guiding mechanism (7) configured to guide a yarn from the package (P) to the yarn joining device (22) after passing the yarn through the yarn accumulating device (30) when the yarn has become discontinuous between the package (P) and the yarn accumulating device (30), and

characterized in that
the doffing device (3) includes a yarn transfer-

ring mechanism (8) configured to guide to the guiding mechanism (7) the yarn from the package (P) that is rotating in a reverse direction that is opposite of a direction when winding the yarn when the yarn has become discontinuous between the package (P) and the yarn accumulating device (30).

2. The yarn winding device (1) as claimed in Claim 1, **characterized in that**
the doffing device (3) includes a seed yarn supplying section (70) configured to supply a new type of the yarn in a yarn-type changing process for changing a type of the yarn to be wound in the winding section (40),
the winding unit (2) is configured to form in the yarn-type changing process a starter package (P) that is the package (P) in which the yarn supplied from the seed yarn supplying section (70) has been wound on the winding tube (Q), and
the yarn transferring mechanism (8) and the guiding mechanism (7) are configured to guide the yarn from the starter package (P) to the yarn joining device (22).

3. The yarn winding device (1) as claimed in Claim 2, **characterized in that** the doffing device (3) includes a suction holding member (55) having a suction port (55a) configured to suck and hold the yarn;
a transferring mechanism (9) configured to move the yarn present between the starter package (P) and the seed yarn supplying section (70) to a first position relative to the suction port (55a) after the starter package (P) has been formed so that the yarn (Y) can be sucked with the suction port (55a); and
a yarn cutting member (73) configured to cut the yarn, which has been moved to the first position relative to the suction port (55a) by the transferring mechanism (9), at a point closer to the seed yarn supplying section (70) than the suction port (55a).

4. The yarn winding device (1) as claimed in Claim 3, **characterized in that**
the suction holding member (55) is configured to move between a standby position and a proximal position in which the suction port (55a) is located at the package (P), and
the transferring mechanism (9) is configured to move the yarn present between the starter package (P) and the seed yarn supplying section (70) to the first position relative to the suction port (55a) of the suction holding member (55) that is in the standby position.

5. The yarn winding device (1) as claimed in Claim 4, **characterized in that** the transferring mechanism (9) includes a yarn transferring member (65) configured to move the yarn to the first position relative to the suction port (55a) of the suction holding member (55) that is in the standby position after hooking the yarn present between the starter package (P) and the seed yarn supplying section (70).

6. The yarn winding device (1) as claimed in Claim 5, **characterized in that** the transferring mechanism (9) further includes a fixed guide (64) configured to retain the yarn present between the starter package (P) and the seed yarn supplying section (70) before moving the yarn present between the starter package (P) and the seed yarn supplying section (70) with the yarn transferring member (65).

7. The yarn winding device (1) as claimed in Claim 6, **characterized in that**, the yarn transferring member (65), after releasing the retaining of the yarn by the fixed guide (64) by moving in a predetermined direction, is configured to move in an opposite direction of the predetermined direction to hook the yarn and to move the yarn to the first position relative to the suction port (55a) of the suction holding member (55) that is in the standby position.

8. The yarn winding device (1) as claimed in any one of Claims 5 to 7, **characterized in that** the yarn transferring member (65) is a component of the yarn transferring mechanism (8), and the yarn transferring member (65) is configured to hook the yarn from the starter package (P) which is sucked and held with the suction holding member (55) that is in the standby position and can move the yarn.

9. The yarn winding device (1) as claimed in any one of Claims 4 to 8, **characterized in that**, when the yarn is broken between the package (P) and the yarn accumulating device (30), when performing an upper-yarn cutting process in which the yarns are subjected to yarn joining by the yarn joining device (22), the suction holding member (55) is configured to suck and hold the yarn from the package (P) after moving from the standby position to the proximal position.

10. The yarn winding device (1) as claimed in Claim 9, **characterized in that** in the upper-yarn cutting process, the suction holding member (55) is configured to move to the standby position with the sucked and held yarn after sucking and holding the yarn from the package (P) at the proximal position.

11. The yarn winding device (1) as claimed in any one of Claims 2 to 10, **characterized in that**
the doffing device (3) includes a yarn holding and cutting section (51) configured to hold and cut the yarn present between the package (P) and the yarn accumulating device (30) when performing a doffing process of doffing the package (P) in which the wind-

ing has been completed, and
the seed yarn supplying section (70) includes a seed yarn transferring member (72) configured to pull the new type of the yarn to a position at which the yarn is to be held with the yarn holding and cutting section (51).

12. A yarn joining method for joining yarns in a yarn winding device (1) when a yarn has become discontinuous between a package (P) and a yarn accumulating device (30),
the yarn winding device (1) including

a winding unit (2) configured to form the package (P) by winding the yarn on a winding tube (Q) in a winding section (40) after temporarily accumulating the yarn pulled from a yarn supplying section (10) in the yarn accumulating device (30), and that includes a yarn joining device (22) arranged between the yarn supplying section (10) and the yarn accumulating device (30) in a yarn travelling direction and that is configured to subject a yarn from the yarn supplying section (10) and a yarn from the winding section (40) to yarn joining; and
a doffing device (3) configured to doff from the winding unit (2) a package (P) in which the winding has been completed,

the yarn joining method comprising:

a yarn transferring step of guiding to the yarn accumulating device (30) the yarn from the package (P) with a yarn transferring mechanism (8) arranged in the doffing device (3) while rotating the package (P) in a reverse direction that is opposite of a direction when winding the yarn;
a guiding step of guiding, with a guiding mechanism (7) arranged in the winding unit (2), to the yarn joining device (22) the yarn from the package (P) that has been guided to the yarn accumulating device (30) after passing the yarn through the yarn accumulating device (30); and
a yarn joining step of subjecting the yarn from the package (P) and guided to the yarn joining device (22) and the yarn from the yarn supplying section (10) to yarn joining by the yarn joining device (22).

13. The yarn joining method as claimed in Claim 12, further comprising:

a starter package forming step in which, when performing a yarn-type changing process of changing a type of the yarn to be wound in the winding section (40), the winding unit (2) receives supply of a new type of the yarn from a seed yarn supplying section (70) arranged in the doffing device (3) and forms a starter package (P) that is the package (P) in which the new type of the yarn has been wound on the winding tube (Q); and
an execution step of executing the yarn transferring step, the guiding step, and the yarn joining step with respect to the yarn present between the starter package (P) and the seed yarn supplying section (70).

14. The yarn joining method as claimed in Claim 12 or 13, further comprising:

a sucking and holding step in which, when the yarn is broken between the package (P) and the yarn accumulating device (30), the yarn from the package (P) is sucked and held with a suction holding member (55) arranged in the doffing device (3) in an upper-yarn cutting process in which the yarns are subjected to the yarn joining by the yarn joining device (22); and
an execution step of executing the yarn transferring step, the guiding step, and the yarn joining step with respect to the yarn present between the package (P) and the suction holding member (55).

Patentansprüche

1. Eine Garnwickelvorrichtung (1), die folgende Merkmale aufweist:

eine Wickeleinheit (2), die ausgebildet ist, um ein Garn von einem Garnzuführabschnitt (10) zu ziehen und das Garn in einem Wickelabschnitt (40) auf eine Wickelröhre (Q) zu wickeln, so dass ein Wickelkörper (P) gebildet wird; und
eine Abziehvorrichtung (3), die ausgebildet ist, um von der Wickeleinheit (2) einen Wickelkörper (P) abzuziehen, bei dem das Wickeln abgeschlossen wurde,
wobei die Wickeleinheit (2) folgende Merkmale aufweist:

eine Garnaneinanderfügungsvorrichtung (22), die in einer Garnbewegungsrichtung zwischen dem Garnzuführabschnitt (10) und dem Wickelabschnitt (40) angeordnet und ausgebildet ist, um ein Garn von dem Garnzuführabschnitt (10) und ein Garn von dem Wickelabschnitt (40) einem Garnaneinanderfügen zu unterziehen;
eine Garnsammelvorrichtung (30), die in der Garnbewegungsrichtung zwischen der Garnaneinanderfügungsvorrichtung (22) und dem Wickelabschnitt (40) angeordnet und ausgebildet ist, um das Garn zu sam-

meln; und
einen Führungsmechanismus (7), der ausgebildet ist, um ein Garn von dem Wickelkörper (P) zu der Garnaneinanderfügungsvorrichtung (22) zu führen, nachdem das Garn durch die Garnsammelvorrichtung (30) gelaufen ist, wenn das Garn zwischen dem Wickelkörper (P) und der Garnsammelvorrichtung (30) unterbrochen wurde, und

dadurch gekennzeichnet, dass:
die Abziehvorrichtung (3) einen Garnübertragungsmechanismus (8) aufweist, der ausgebildet ist, um das Garn von dem Wickelkörper (P), der sich in einer Rückwärtsrichtung dreht, die entgegengesetzt zu einer Richtung beim Wickeln des Garns ist, zu dem Führungsmechanismus (7) zu führen, wenn das Garn zwischen dem Wickelkörper (P) und der Garnsammelvorrichtung (30) unterbrochen wurde.

2. Die Garnwickelvorrichtung (1) gemäß Anspruch 1, die **dadurch gekennzeichnet ist, dass**:

die Abziehvorrichtung (3) einen Ursprungsgarnzuführabschnitt (70) aufweist, der ausgebildet ist, um einen neuen Typ des Garns in einem Garntyp-Änderungsvorgang zum Verändern eines Typs des Garns zuzuführen, das in dem Wickelabschnitt (40) gewickelt werden soll,
die Wickeleinheit (2) ausgebildet ist, um bei dem Garntyp-Änderungsvorgang einen Anfangswickelkörper (P) zu bilden, der der Wickelkörper (P) ist, bei dem das Garn, das von dem Ursprungsgarnzuführabschnitt (70) zugeführt wird, auf die Wickelröhre (Q) gewickelt wurde, und
der Garnübertragungsmechanismus (8) und der Führungsmechanismus (7) ausgebildet sind, um das Garn von dem Anfangswickelkörper (P) zu der Garnaneinanderfügungsvorrichtung (22) zu führen.

3. Die Garnwickelvorrichtung (1) gemäß Anspruch 2, die **dadurch gekennzeichnet ist, dass** die Abziehvorrichtung (3) folgende Merkmale aufweist:

ein Ansaughaltebauteil (55) mit einer Ansaugöffnung (55a), das ausgebildet ist, um das Garn anzusaugen und zu halten;
einen Übertragungsmechanismus (9), der ausgebildet ist, um das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt, zu einer ersten Position relativ zu der Ansaugöffnung (55a) zu bewegen, nachdem der Anfangswickelkörper (P) gebildet wurde, so dass das Garn (Y) mit der Ansaugöffnung (55a) angesaugt werden kann; und
ein Garnabschneidebauteil (73), das ausgebildet ist, um das Garn, das durch den Übertragungsmechanismus (9) zu der ersten Position relativ zu der Ansaugöffnung (55a) bewegt wurde, an einem Punkt abzuschneiden, der näher an dem Ursprungsgarnzuführabschnitt (70) liegt als die Ansaugöffnung (55a).

4. Die Garnwickelvorrichtung (1) gemäß Anspruch 3, die **dadurch gekennzeichnet ist, dass**
das Ansaughaltebauteil (55) ausgebildet ist, um sich zwischen einer Standby-Position und einer Nahposition zu bewegen, in der sich die Ansaugöffnung (55a) an dem Wickelkörper (P) befindet, und
der Übertragungsmechanismus (9) ausgebildet ist, um das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt, zu der ersten Position relativ zu der Ansaugöffnung (55a) des Ansaughaltebauteils (55) zu bewegen, das sich in der Standby-Position befindet.

5. Die Garnwickelvorrichtung (1) gemäß Anspruch 4, die **dadurch gekennzeichnet ist, dass** der Übertragungsmechanismus (9) ein Garnübertragungsbauteil (65) aufweist, das ausgebildet ist, um das Garn zu der ersten Position relativ zu der Ansaugöffnung (55a) des Ansaughaltebauteils (55) zu bewegen, das sich in der Standby-Position befindet, nachdem das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt, eingehakt wurde.

6. Die Garnwickelvorrichtung (1) gemäß Anspruch 5, die **dadurch gekennzeichnet ist, dass** der Übertragungsmechanismus (9) ferner eine fixierte Führung (64) aufweist, die ausgebildet ist, um das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt, zu halten, bevor das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt, mit dem Garnübertragungsbauteil (65) bewegt wird.

7. Die Garnwickelvorrichtung (1) gemäß Anspruch 6, die **dadurch gekennzeichnet ist, dass** das Garnübertragungsbauteil (65) nach einem Lösen des Haltens des Garns durch die fixierte Führung (64) durch Bewegen in eine vorbestimmte Richtung ausgebildet ist, um sich in einer entgegengesetzten Richtung zu der vorbestimmten Richtung zu bewegen, um das Garn einzuhaken und das Garn zu der ersten Position relativ zu der Ansaugöffnung (55a) des Ansaughaltebauteils (55) zu bewegen, das sich in der Standby-Position befindet.

8. Die Garnwickelvorrichtung (1) gemäß einem der An-

sprüche 5 bis 7, die **dadurch gekennzeichnet ist, dass** das Garnübertragungsbauteil (65) eine Komponente des Garnübertragungsmechanismus (8) ist und das Garnübertragungsbauteil (65) ausgebildet ist, um das Garn von dem Anfangswickelkörper (P) einzuhaken, das mit dem Ansaughaltebauteil (55) angesaugt und gehalten wird, das sich in der Standby-Position befindet, und das Garn bewegen kann.

9. Die Garnwickelvorrichtung (1) gemäß einem der Ansprüche 4 bis 8, die **dadurch gekennzeichnet ist, dass**, wenn das Garn zwischen dem Wickelkörper (P) und der Garnsammelvorrichtung (30) entzwei ist, wenn ein Oberes-Garn-Abschneidevorgang durchgeführt wird, bei dem die Garne einem Garnaneinanderfügen durch die Garnaneinanderfügungsvorrichtung (22) unterzogen werden, das Ansaughaltebauteil (55) ausgebildet ist, um das Garn von dem Wickelkörper (P) anzusaugen und zu halten, nachdem dasselbe aus der Standby-Position in die Nahposition bewegt wurde.

10. Die Garnwickelvorrichtung (1) gemäß Anspruch 9, die **dadurch gekennzeichnet ist, dass** bei dem Oberes-Garn-Abschneidevorgang das Ansaughaltebauteil (55) ausgebildet ist, um sich mit dem angesaugten und gehaltenen Garn in die Standby-Position zu bewegen, nachdem das Garn von dem Wickelkörper (P) an der Nahposition angesaugt und gehalten wurde.

11. Die Garnwickelvorrichtung (1) gemäß einem der Ansprüche 2 bis 10, die **dadurch gekennzeichnet ist, dass**:

die Abziehvorrichtung (3) einen Garnhalte- und Abschneideabschnitt (51) aufweist, der ausgebildet ist, um das Garn, das zwischen dem Wickelkörper (P) und der Garnsammelvorrichtung (30) vorliegt, zu halten und abzuschneiden, wenn ein Abziehvorgang eines Abziehens des Wickelkörpers (P) durchgeführt wird, bei dem das Wickeln abgeschlossen wurde, und
der Ursprungsgarnzuführabschnitt (70) ein Ursprungsgarnübertragungsbauteil (72) aufweist, das ausgebildet ist, um den neuen Typ von Garn in eine Position zu ziehen, an der das Garn mit dem Garnhalte- und Abschneideabschnitt (51) gehalten werden soll.

12. Ein Garnaneinanderfügungsverfahren zum Aneinanderfügen von Garnen in einer Garnwickelvorrichtung (1), wenn ein Garn zwischen einem Wickelkörper (P) und einer Garnsammelvorrichtung (30) unterbrochen wurde,
wobei die Garnwickelvorrichtung (1) folgende Merkmale aufweist:

eine Wickeleinheit (2), die ausgebildet ist, um den Wickelkörper (P) zu bilden durch Wickeln des Garns auf eine Wickelröhre (Q) in einem Wickelabschnitt (40) nach einem zeitweiligen Sammeln des Garns, das von einem Garnzuführabschnitt (10) gezogen wird, in der Garnsammelvorrichtung (30), und die eine Garnaneinanderfügungsvorrichtung (22) aufweist, die in einer Garnbewegungsrichtung zwischen dem Garnzuführabschnitt (10) und der Garnsammelvorrichtung (30) angeordnet ist und ausgebildet ist, um ein Garn von dem Garnzuführabschnitt (10) und ein Garn von dem Wickelabschnitt (40) einem Garnaneinanderfügen zu unterziehen; und
eine Abziehvorrichtung (3), die ausgebildet ist, um einen Wickelkörper (P), bei dem das Wickeln abgeschlossen wurde, von der Wickeleinheit (2) abzuziehen,

wobei das Garnaneinanderfügungsverfahren folgende Schritte aufweist:

einen Garnübertragungsschritt eines Führens des Garns von dem Wickelkörper (P) mit einem Garnübertragungsmechanismus (8), der in der Abziehvorrichtung (3) angeordnet ist, zu der Garnsammelvorrichtung (30), während sich der Wickelkörper (P) in einer Rückwärtsrichtung dreht, die entgegengesetzt zu einer Richtung beim Wickeln des Garns ist;
einen Führungsschritt eines Führens des Garns mit einem Führungsmechanismus (7), der in der Wickeleinheit (2) angeordnet ist, von dem Wickelkörper (P), der zu der Garnsammelvorrichtung (30) geführt wurde, zu der Garnaneinanderfügungsvorrichtung (22), nachdem das Garn durch die Garnsammelvorrichtung (30) gelaufen ist; und
einen Garnaneinanderfügungsschritt eines Unterziehens des Garns von dem Wickelkörper (P), und das zu der Garnaneinanderfügungsvorrichtung (22) geführt wird, und des Garns von dem Garnzuführabschnitt (10) gegenüber einem Garnaneinanderfügen durch die Garnaneinanderfügungsvorrichtung (22).

13. Das Garnaneinanderfügungsverfahren gemäß Anspruch 12, das ferner folgende Schritte aufweist:

einen Anfangswickelkörperbildungsschritt, bei dem beim Durchführen eines Garntypänderungsvorgangs eines Veränderns eines Typs des Garns, das in dem Wickelabschnitt (40) gewickelt werden soll, die Wickeleinheit (2) eine Zuführung eines neuen Typs des Garns von einem Ursprungsgarnzuführabschnitt (70), der in der Abziehvorrichtung (3) angeordnet ist, auf-

nimmt und einen Anfangswickelkörper (P) bildet, der der Wickelkörper (P) ist, bei dem der neue Typ des Garns auf die Wickelröhre (Q) gewickelt wurde; und
einen Ausführungsschritt eines Ausführens des Garnübertragungsschritts, des Führungsschritts und des Garnaneinanderfügungsschritts in Bezug auf das Garn, das zwischen dem Anfangswickelkörper (P) und dem Ursprungsgarnzuführabschnitt (70) vorliegt.

14. Das Garnaneinanderfügungsverfahren gemäß Anspruch 12 oder 13, das ferner folgende Schritte aufweist:

einen Ansaug- und Halteschritt, bei dem, wenn das Garn zwischen den Wickelkörper (P) und der Garnsammelvorrichtung (30) entzwei ist, das Garn von dem Wickelkörper (P) mit einem Ansaughaltebauteil (55), das in der Abziehvorrichtung (3) angeordnet ist, bei einem Oberes-Garn-Abschneidevorgang angesaugt und gehalten wird, bei dem die Garne dem Garnaneinanderfügen durch die Garnaneinanderfügungsvorrichtung (22) unterzogen werden; und einen Ausführungsschritt eines Ausführens des Garnübertragungsschritts, des Führungsschritts und des Garnaneinanderfügungsschritts in Bezug auf das Garn, das zwischen dem Wickelkörper (P) und dem Ansaughaltebauteil (55) vorliegt.

Revendications

1. Dispositif de bobinage de fil (1), comprenant:

une unité de bobinage (2) configurée pour tirer un fil d'un segment d'alimentation de fil (10) et pour enrouler le fil sur un tube de bobinage (Q) dans un segment de bobinage (40) pour former un paquet (P); et
un dispositif de retrait (3) configuré pour retirer de l'unité de bobinage (2) un paquet (P) dans lequel le bobinage est terminé,
dans lequel l'unité de bobinage (2) comprend

un dispositif de jonction de fil (22) disposé entre le segment d'alimentation de fil (10) et le segment de bobinage (40) dans une direction de déplacement de fil et configuré pour soumettre un fil du segment d'alimentation de fil (10) et un fil du segment de bobinage (40) à une jonction de fil;
un dispositif d'accumulation de fil (30) disposé entre le dispositif de jonction de fil (22) et le segment de bobinage (40) dans la direction de déplacement de fil et configuré pour accumuler le fil; et
un mécanisme de guidage (7) configuré pour guider un fil du paquet (P) vers le dispositif de jonction de fil (22) après avoir passé le fil par le dispositif d'accumulation de fil (30) lorsque le fil est devenu discontinu entre le paquet (P) et le dispositif d'accumulation de fil (30), et

caractérisé par le fait que
le dispositif de retrait (3) comporte un mécanisme de transfert de fil (8) configuré pour guider vers le mécanisme de guidage (7) le fil du paquet (P) qui tourne dans une direction inverse qui est opposée à une direction lors de le bobinage du fil lorsque le fil est devenu discontinu entre le paquet (P) et le dispositif d'accumulation de fil (30).

2. Dispositif de bobinage de fil (1) selon la revendication 1, **caractérisé par le fait que**
le dispositif de retrait (3) comporte un segment d'alimentation de fil de germe (70) configuré pour alimenter un nouveau type de fil dans un processus de changement de type de fil pour changer un type de fil à bobiner dans le segment de bobinage (40),
l'unité de bobinage (2) est configurée pour former dans le processus de changement de type de fil un paquet de départ (P) qui est le paquet (P) dans lequel le fil alimenté par le segment d'alimentation de fil de germe (70) a été bobiné sur le tube de bobinage (Q), et
le mécanisme de transfert de fil (8) et le mécanisme de guidage (7) sont configurés pour guider le fil du paquet de départ (P) vers le dispositif de jonction de fil (22).

3. Dispositif de bobinage de fil (1) selon la revendication 2, **caractérisé par le fait que** le dispositif de retrait (3) comporte
un élément de maintien par aspiration (55) présentant un orifice d'aspiration (55a) configuré pour aspirer et maintenir le fil;
un mécanisme de transfert (9) configuré pour déplacer le fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70) vers une première position par rapport à l'orifice d'aspiration (55a) après que le paquet de départ (P) ait été formé, de sorte que le fil (Y) puisse être aspiré par l'orifice d'aspiration (55a); et
un élément de coupe de fil (73) configuré pour couper le fil qui a été déplacé vers la première position par rapport à l'orifice d'aspiration (55a) par le mécanisme de transfert (9), en un point plus proche du segment d'alimentation de fil de germe (70) que de l'orifice d'aspiration (55a).

4. Dispositif de bobinage de fil (1) selon la revendica-

tion 3, **caractérisé par le fait que**
l'élément de maintien par aspiration (55) est configuré pour se déplacer entre une position d'attente et une position proximale dans laquelle l'orifice d'aspiration (55a) se situe au niveau du paquet (P), et
le mécanisme de transfert (9) est configuré pour déplacer le fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70) vers la première position par rapport à l'orifice d'aspiration (55a) de l'élément de maintien par aspiration (55) qui se trouve en position d'attente.

5. Dispositif de bobinage de fil (1) selon la revendication 4, **caractérisé par le fait que** le mécanisme de transfert (9) comporte un élément de transfert de fil (65) configuré pour déplacer le fil vers la première position par rapport à l'orifice d'aspiration (55a) de l'élément de maintien par aspiration (55) qui se trouve dans la position d'attente après l'accrochage du fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70).

6. Dispositif de bobinage de fil (1) selon la revendication 5, **caractérisé par le fait que** le mécanisme de transfert (9) comporte par ailleurs un guide fixe (64) configuré pour retenir le fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70) avant de déplacer le fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70) par l'élément de transfert de fil (65).

7. Dispositif de bobinage de fil (1) selon la revendication 6, **caractérisé par le fait que** l'élément de transfert de fil (65), après avoir dégagé la retenue du fil par le guide fixe (64) en se déplaçant dans une direction prédéterminée, est configuré se déplacer dans une direction opposée à la direction prédéterminée pour accrocher le fil et déplacer le fil vers la première position par rapport à l'orifice d'aspiration (55a) de l'élément de maintien par aspiration (55) qui se trouve dans la position d'attente.

8. Dispositif de bobinage de fil (1) selon l'une quelconque des revendications 5 à 7, **caractérisé par le fait que** l'élément de transfert de fil (65) est un composant du mécanisme de transfert de fil (8) et que l'élément de transfert de fil (65) est configuré pour accrocher le fil du paquet de départ (P) qui est aspiré et maintenu par l'élément de maintien par aspiration (55) qui se trouve dans la position d'attente et peut déplacer le fil.

9. Dispositif de bobinage de fil (1) selon l'une quelconque des revendications 4 à 8, **caractérisé par le fait que**, lorsque le fil est cassé entre le paquet (P) et le dispositif d'accumulation de fil (30), lors de la réalisation d'un processus de coupe de fil supérieur où les fils sont soumis à une jonction de fil par le dispositif de jonction de fil (22), l'élément de maintien par aspiration (55) est configuré pour aspirer et maintenir le fil du paquet (P) après avoir été déplacé de la position d'attente à la position proximale position.

10. Dispositif de bobinage de fil (1) selon la revendication 9, **caractérisé par le fait que**, dans le processus de coupe du fil supérieur, l'élément de maintien par aspiration (55) est configuré pour se déplacer vers la position d'attente avec le fil aspiré et maintenu après aspiration et maintien du fil du paquet (P) en position proximale.

11. Dispositif de bobinage de fil (1) selon l'une quelconque des revendications 2 à 10, **caractérisé par le fait que**
le dispositif de retrait (3) comporte un segment de maintien et de coupe de fil (51) configuré pour maintenir et couper le fil présent entre le paquet (P) et le dispositif d'accumulation de fil (30) lors de la réalisation d'un processus de retrait du paquet (P) dans lequel le bobinage est terminé, et
le segment d'alimentation de fil de germe (70) comporte un élément de transfert de fil de germe (72) configuré pour tirer le nouveau type de fil vers une position dans laquelle le fil doit être maintenu par le segment de maintien et de coupe de fil (51).

12. Procédé de jonction de fil pour joindre des fils dans un dispositif de bobinage de fil (1) lorsqu'un fil est devenu discontinu entre un paquet (P) et un dispositif d'accumulation de fil (30),
le dispositif de bobinage de fil (1) comportant

une unité de bobinage (2) configurée pour former le paquet (P) en bobinant le fil sur un tube de bobinage (Q) dans un segment de bobinage (40) après avoir temporairement accumulé le fil tiré d'un segment d'alimentation de fil (10) dans le dispositif d'accumulation de fil (30), et qui comporte un dispositif de jonction de fil (22) disposé entre le segment d'alimentation de fil (10) et le dispositif d'accumulation de fil (30) dans une direction de déplacement de fil, et qui est configuré pour soumettre un fil du segment d'alimentation de fil (10) et un fil du segment de bobinage (40) à une jonction de fil; et
un dispositif de retrait (3) configuré pour retirer de l'unité de bobinage (2) un paquet (P) dans lequel le bobinage est terminé, le procédé de jonction de fil comprenant:

une étape de transfert de fil consistant à guider vers le dispositif d'accumulation de fil (30) le fil du paquet (P) par un mécanisme de transfert de fil (8) disposé dans le dispositif de retrait (3) tout en faisant tourner le

paquet (P) dans une direction inverse qui est opposée à une direction lors du bobinage du fil;

une étape de guidage consistant à guider, par un mécanisme de guidage (7) disposé dans l'unité de bobinage (2), vers le dispositif de jonction de fil (22) le fil du paquet (P) qui a été guidé vers le dispositif d'accumulation de fil (30) après avoir passé le fil par le dispositif d'accumulation de fil (30); et

une étape de jonction de fil consistant à soumettre le fil du paquet (P) et à guider vers le dispositif de jonction de fil (22) le fil du segment d'alimentation de fil (10) pour une jonction de fil par le dispositif de jonction de fil (22).

13. Procédé de jonction de fil selon la revendication 12, comprenant par ailleurs:

une étape de formation de paquet de départ dans laquelle, lors de la réalisation d'un processus de changement de type de fil consistant à changer un type de fil à bobiner dans le segment de bobinage (40), l'unité de bobinage (2) reçoit l'alimentation d'un nouveau type de fil d'un segment d'alimentation de fil de germe (70) disposé dans le dispositif de retrait (3) et forme un paquet de départ (P) qui est le paquet (P) dans lequel le nouveau type de fil a été bobiné sur le tube de bobinage (Q); et

une étape d'exécution consistant à exécuter l'étape de transfert de fil, l'étape de guidage et l'étape de jonction de fil en ce qui concerne le fil présent entre le paquet de départ (P) et le segment d'alimentation de fil de germe (70).

14. Procédé de jonction de fil selon la revendication 12 ou 13, comprenant par ailleurs:

une étape d'aspiration et de maintien dans laquelle, lorsque le fil est cassé entre le paquet (P) et le dispositif d'accumulation de fil (30), le fil du paquet (P) est aspiré et maintenu par un élément de maintien par aspiration (55) disposé dans le dispositif de retrait (3) dans un processus de coupe de fil supérieur dans lequel les fils sont soumis à la jonction de fil par le dispositif de jonction de fil (22); et

une étape d'exécution consistant à exécuter l'étape de transfert de fil, l'étape de guidage et l'étape de jonction de fil en ce qui concerne le fil présent entre le paquet (P) et l'élément de maintien par aspiration (55).

FIG. 1

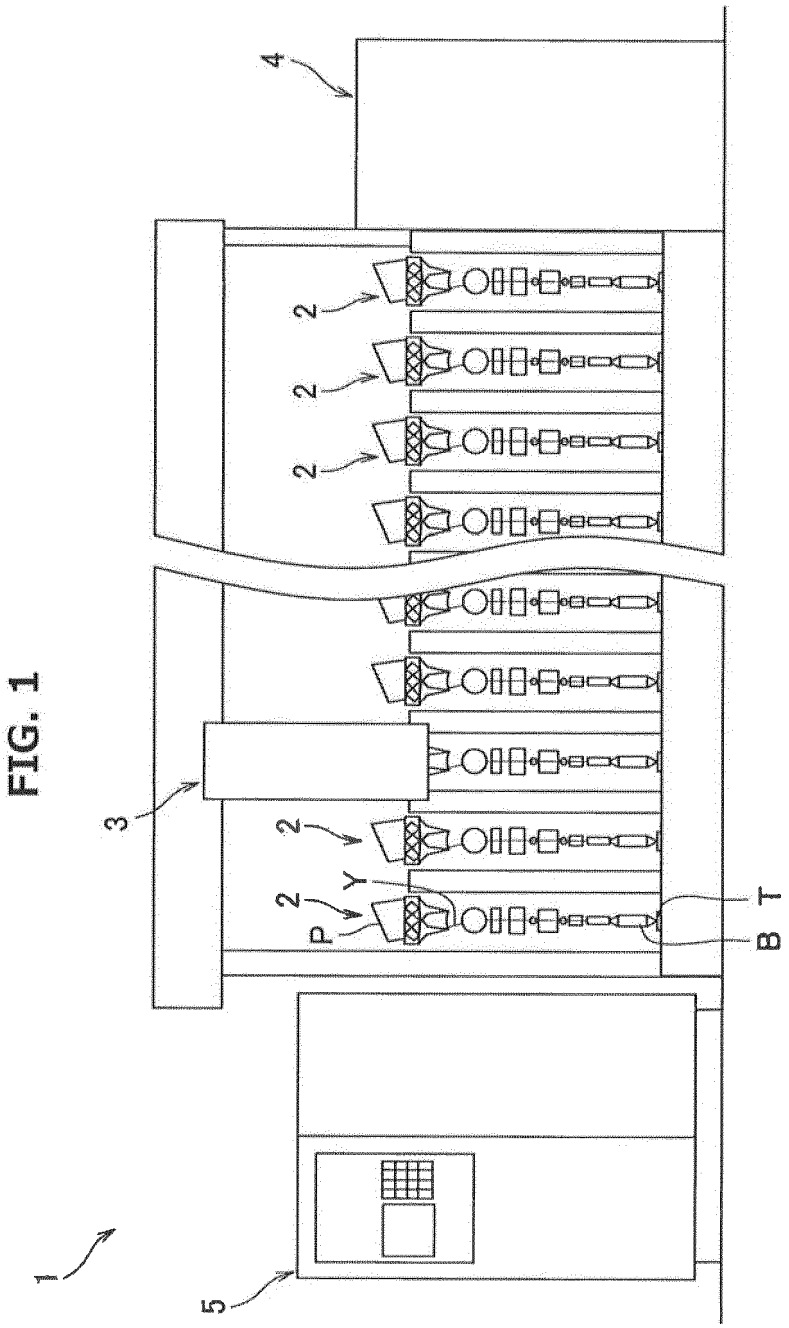


FIG. 2

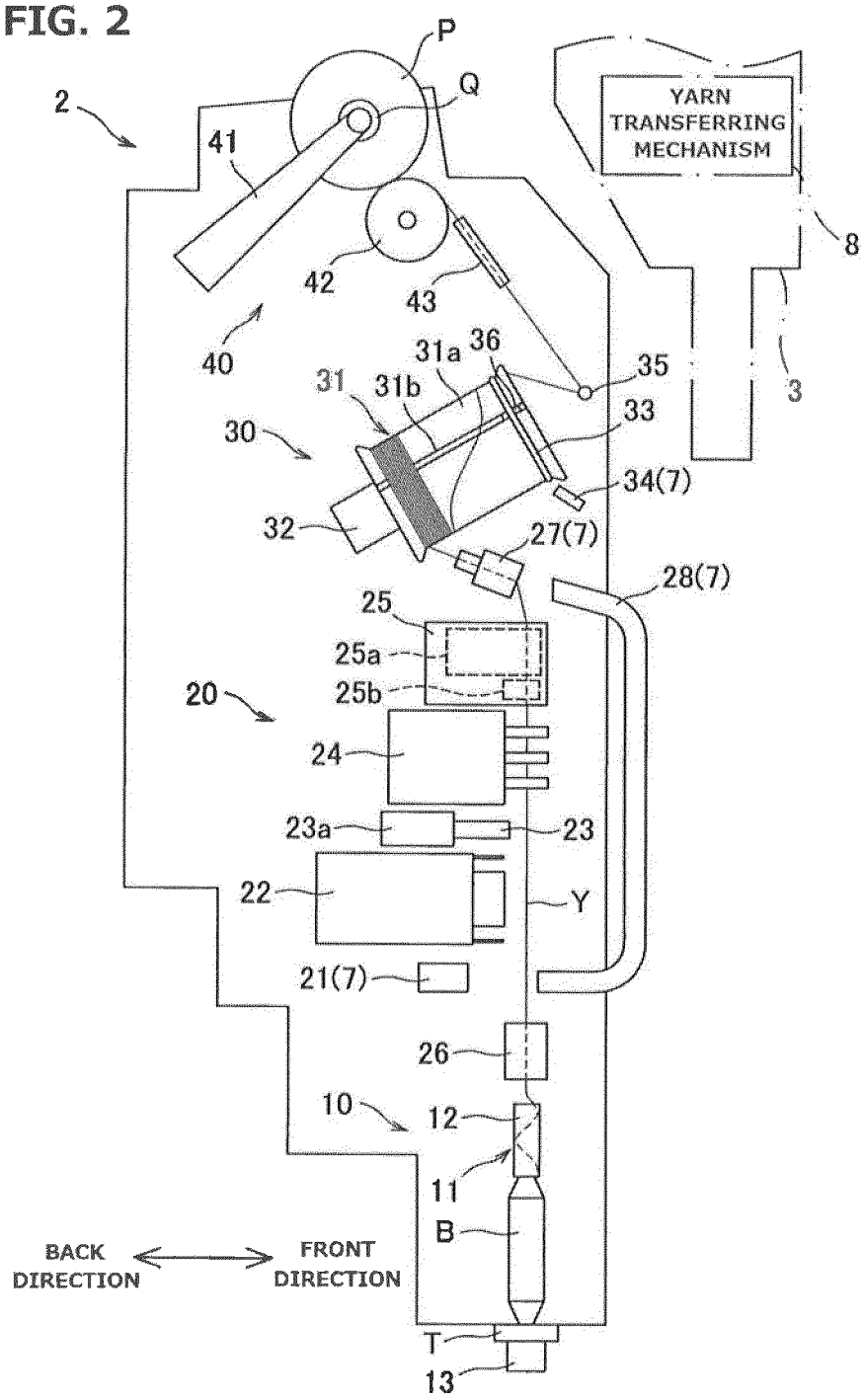

P
Q
2
41
YARN TRANSFERRING MECHANISM
8
42
43
40
31a
36
35
3
31
31b
33
30
34(7)
32
27(7)
28(7)
25
25a
25b
20
24
23a
23
22
Y
21(7)
26
10
12
11
B
BACK DIRECTION
FRONT DIRECTION
T
13

FIG. 3

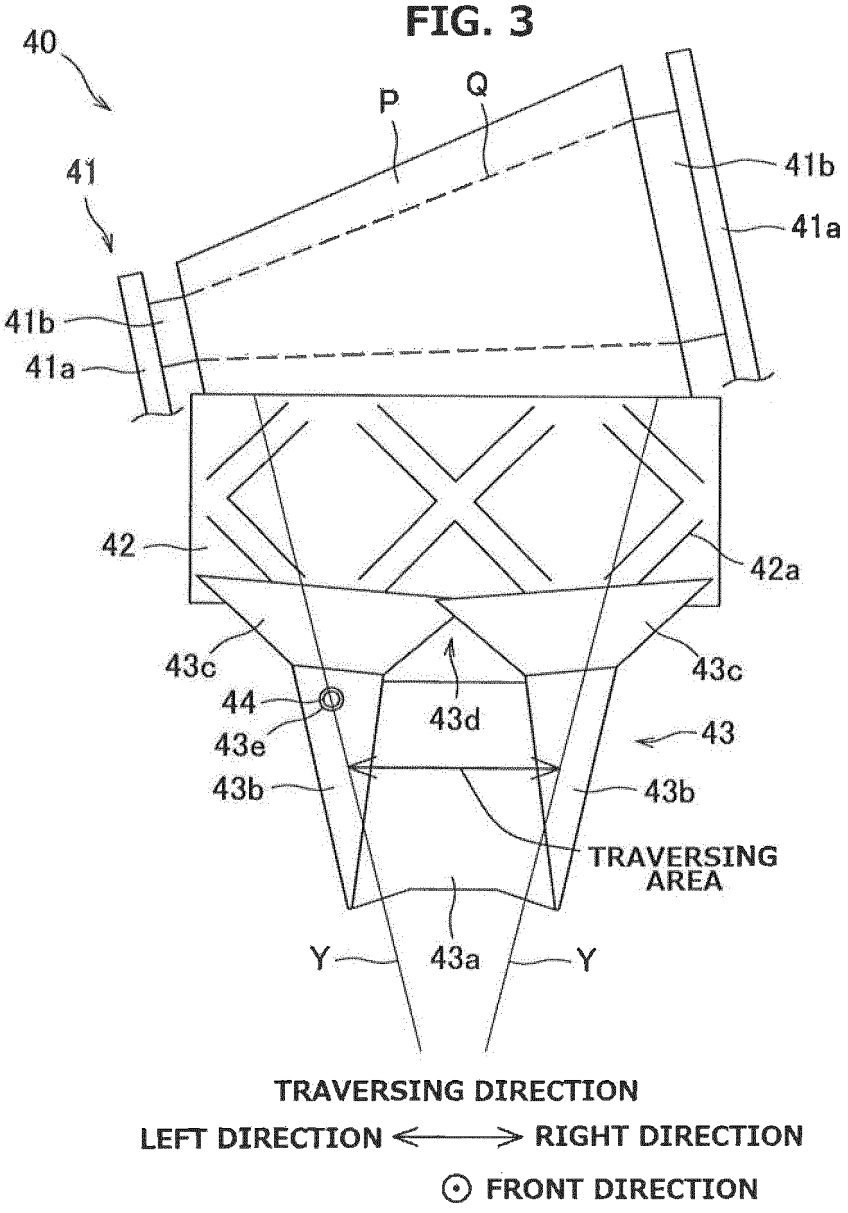

40
41
P
Q
41b
41a
41b
41a
42
42a
43c
43c
44
43d
43
43e
43b
43b
TRAVERSING AREA
Y
43a
Y
TRAVERSING DIRECTION
LEFT DIRECTION ⟷ RIGHT DIRECTION
⊙ FRONT DIRECTION

FIG. 4

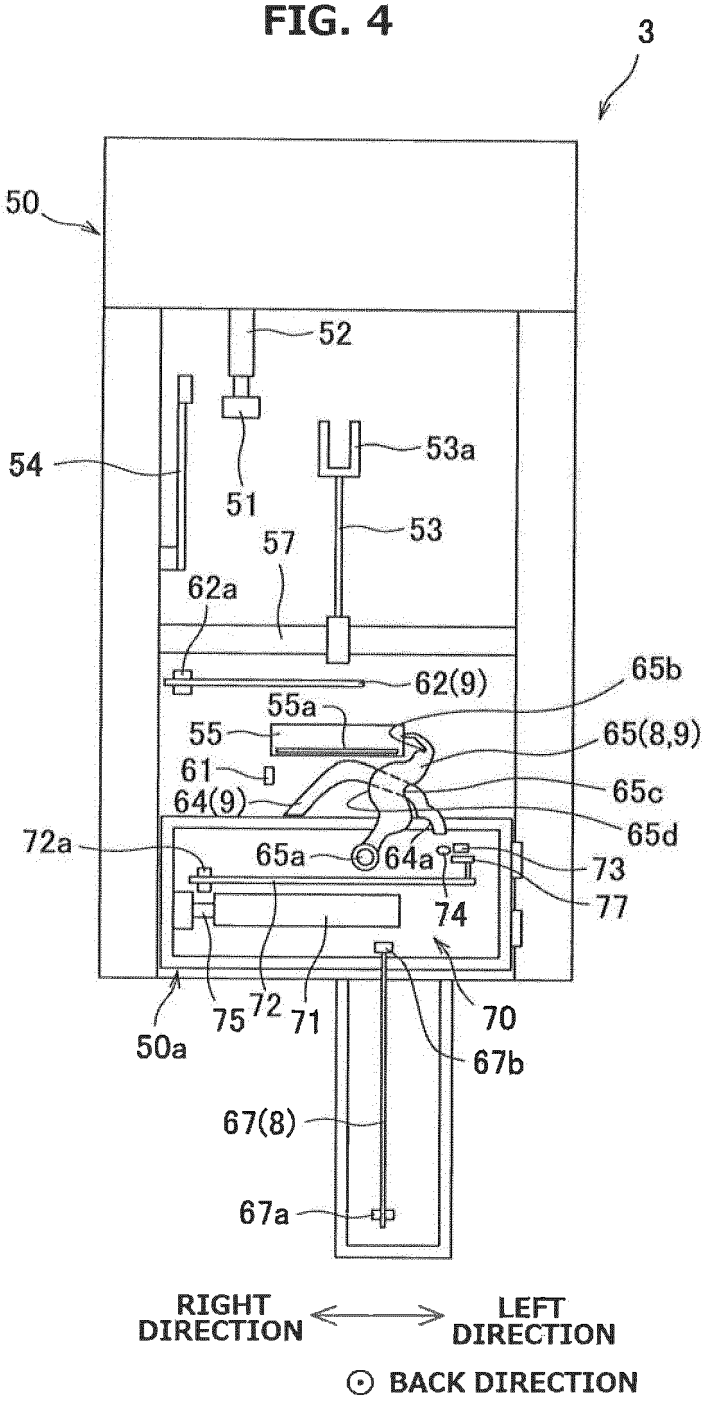

3
50
52
54
53a
51
53
57
62a
62(9)
65b
55a
55
65(8,9)
61
65c
64(9)
65d
72a
65a
64a
73
74
77
75
72
71
70
50a
67b
67(8)
67a
RIGHT DIRECTION
LEFT DIRECTION
BACK DIRECTION

FIG. 5

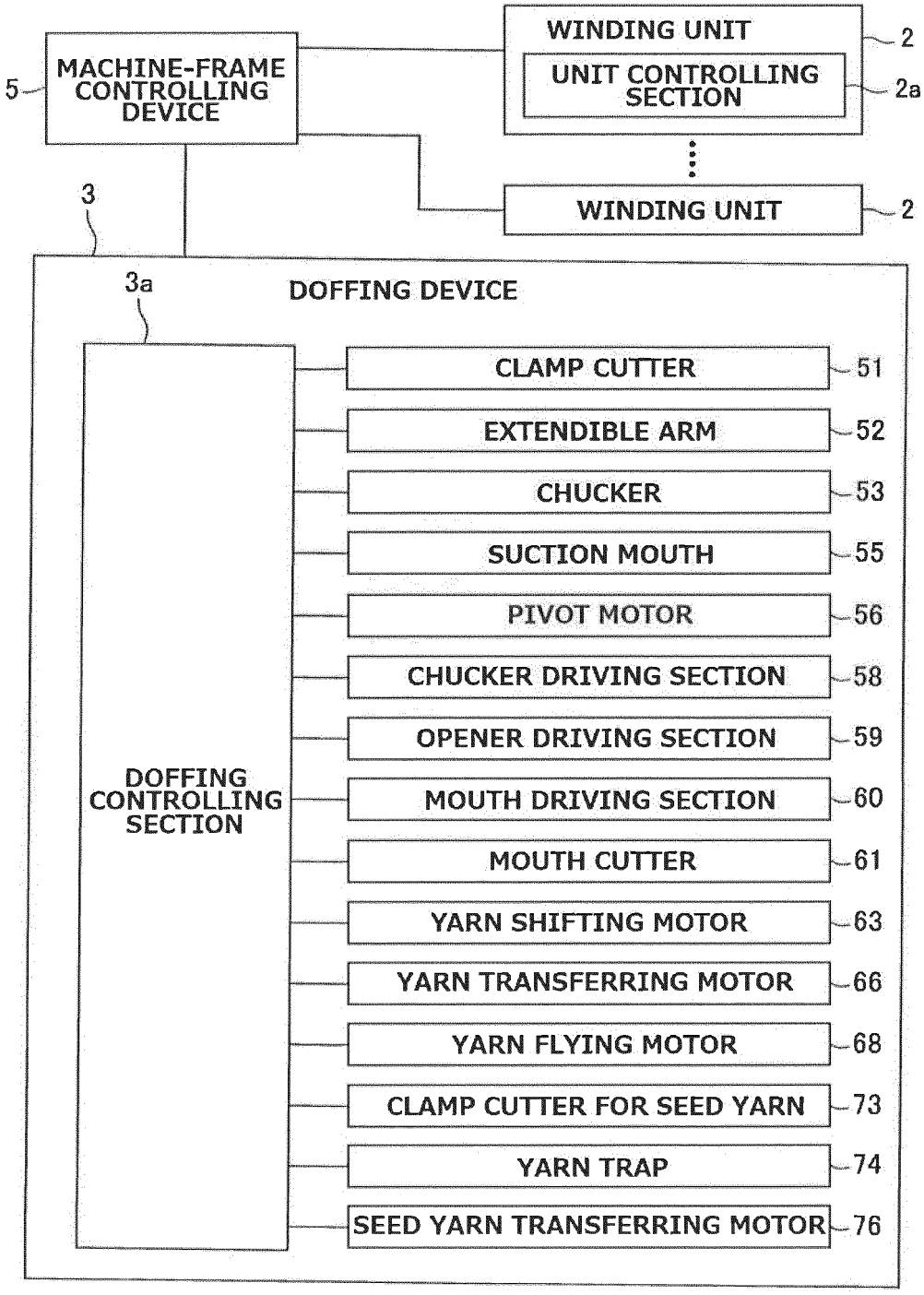

WINDING UNIT
2
UNIT CONTROLLING SECTION
2a
5
MACHINE-FRAME CONTROLLING DEVICE
WINDING UNIT
2
3
3a
DOFFING DEVICE
DOFFING CONTROLLING SECTION
CLAMP CUTTER
51
EXTENDIBLE ARM
52
CHUCKER
53
SUCTION MOUTH
55
PIVOT MOTOR
56
CHUCKER DRIVING SECTION
58
OPENER DRIVING SECTION
59
MOUTH DRIVING SECTION
60
MOUTH CUTTER
61
YARN SHIFTING MOTOR
63
YARN TRANSFERRING MOTOR
66
YARN FLYING MOTOR
68
CLAMP CUTTER FOR SEED YARN
73
YARN TRAP
74
SEED YARN TRANSFERRING MOTOR
76

FIG. 6

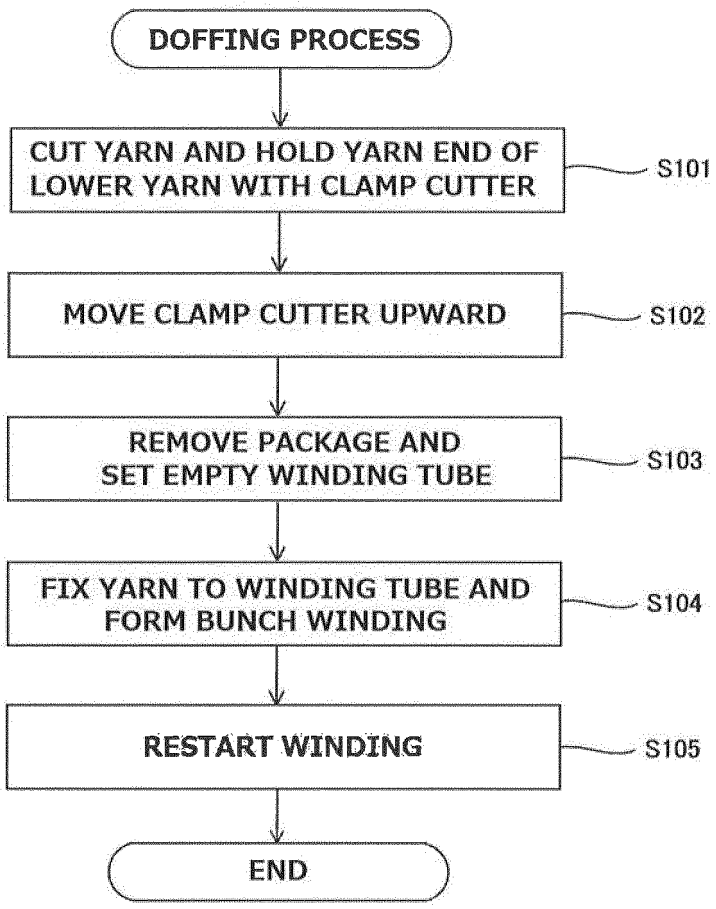

DOFFING PROCESS
CUT YARN AND HOLD YARN END OF LOWER YARN WITH CLAMP CUTTER
S101
MOVE CLAMP CUTTER UPWARD
S102
REMOVE PACKAGE AND SET EMPTY WINDING TUBE
S103
FIX YARN TO WINDING TUBE AND FORM BUNCH WINDING
S104
RESTART WINDING
S105
END

FIG. 7A

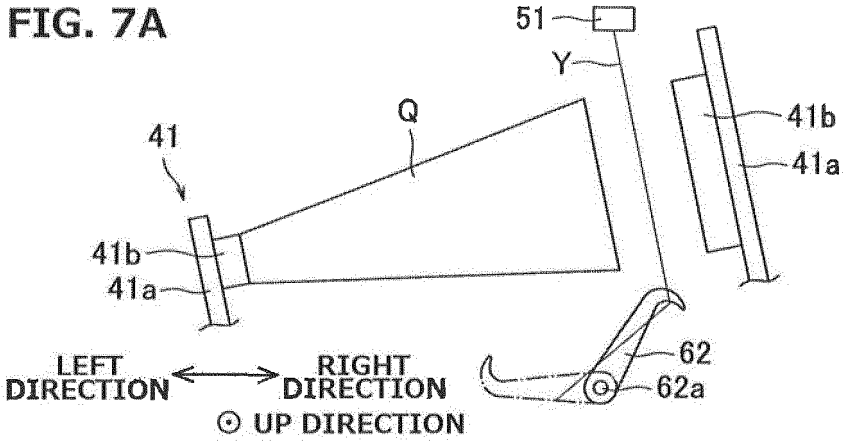


FIG. 7B

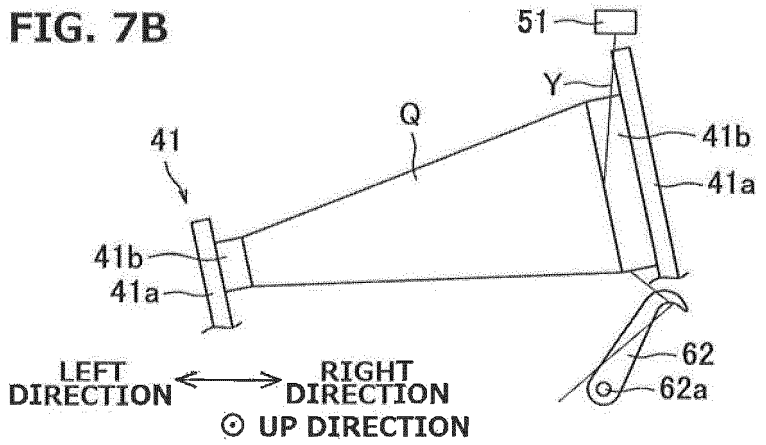


FIG. 7C

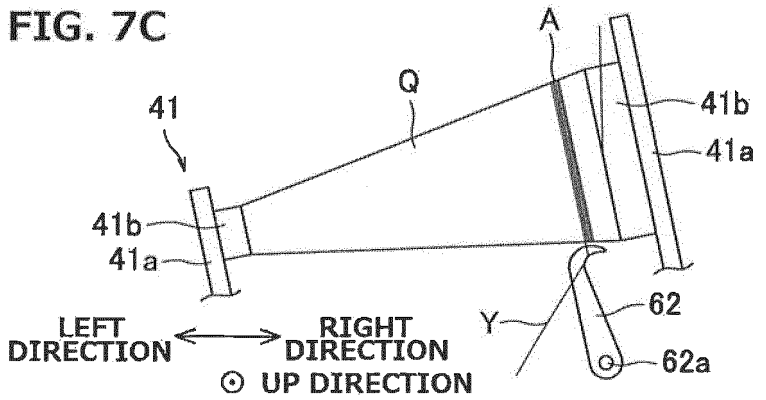


FIG. 8

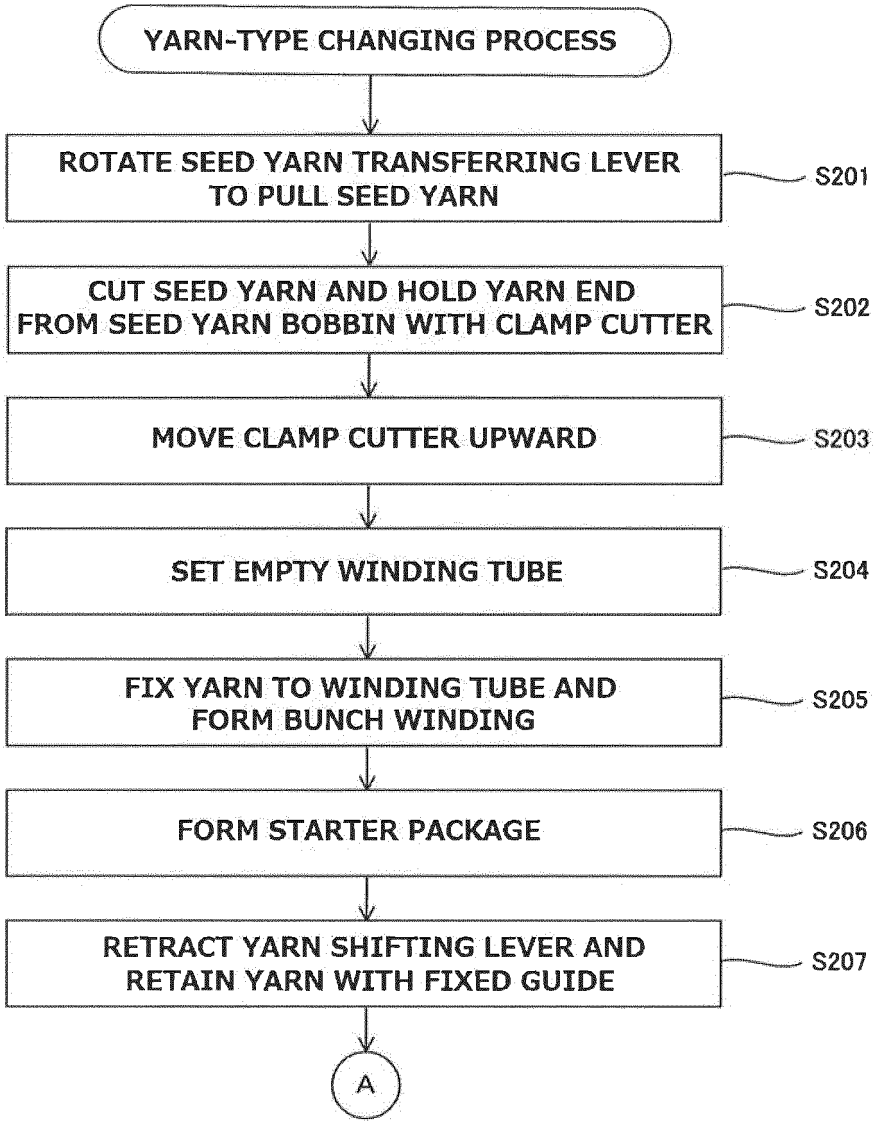

YARN-TYPE CHANGING PROCESS
ROTATE SEED YARN TRANSFERRING LEVER TO PULL SEED YARN
S201
CUT SEED YARN AND HOLD YARN END FROM SEED YARN BOBBIN WITH CLAMP CUTTER
S202
MOVE CLAMP CUTTER UPWARD
S203
SET EMPTY WINDING TUBE
S204
FIX YARN TO WINDING TUBE AND FORM BUNCH WINDING
S205
FORM STARTER PACKAGE
S206
RETRACT YARN SHIFTING LEVER AND RETAIN YARN WITH FIXED GUIDE
S207
A

FIG. 9

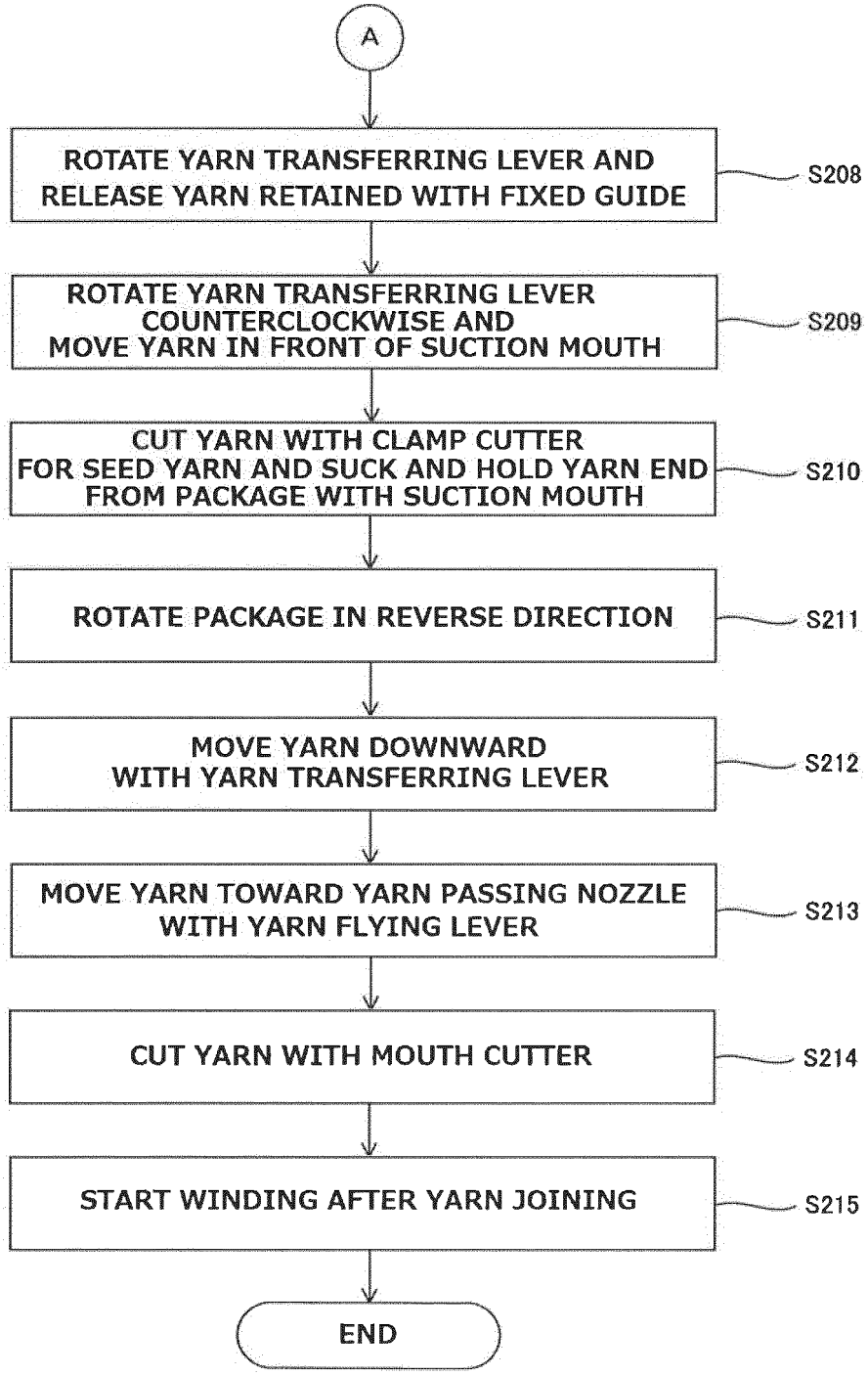

A
ROTATE YARN TRANSFERRING LEVER AND RELEASE YARN RETAINED WITH FIXED GUIDE
S208
ROTATE YARN TRANSFERRING LEVER COUNTERCLOCKWISE AND MOVE YARN IN FRONT OF SUCTION MOUTH
S209
CUT YARN WITH CLAMP CUTTER FOR SEED YARN AND SUCK AND HOLD YARN END FROM PACKAGE WITH SUCTION MOUTH
S210
ROTATE PACKAGE IN REVERSE DIRECTION
S211
MOVE YARN DOWNWARD WITH YARN TRANSFERRING LEVER
S212
MOVE YARN TOWARD YARN PASSING NOZZLE WITH YARN FLYING LEVER
S213
CUT YARN WITH MOUTH CUTTER
S214
START WINDING AFTER YARN JOINING
S215
END

FIG. 10A

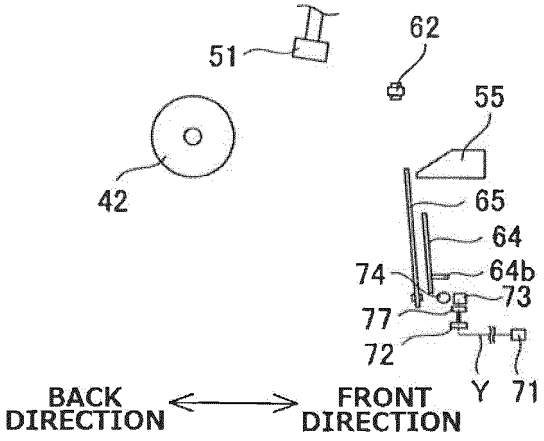


FIG. 10B

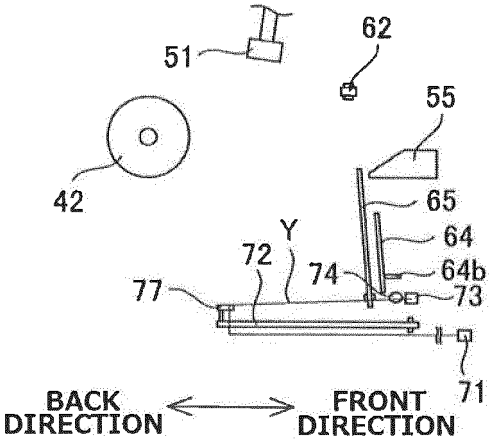


FIG. 10C

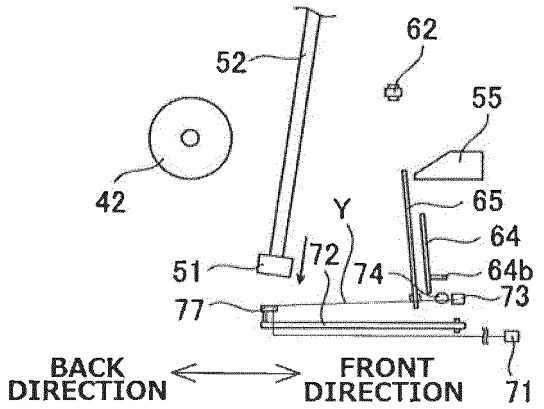


FIG. 10D

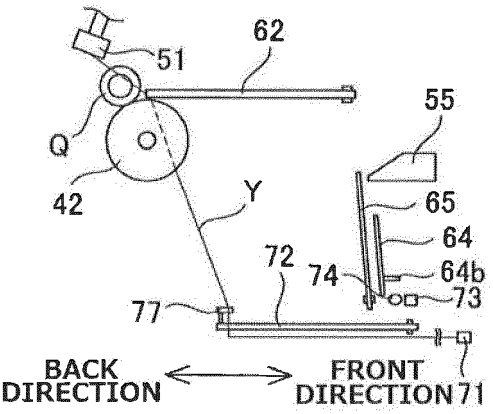


FIG. 10E

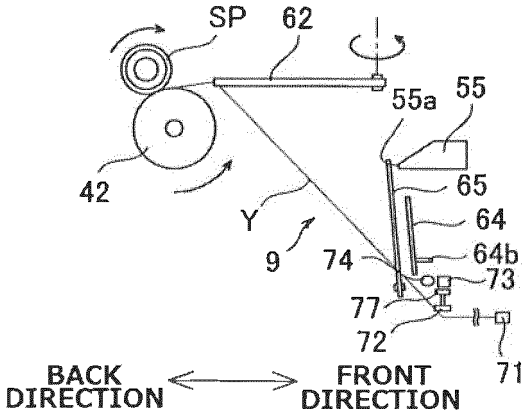


FIG. 10F

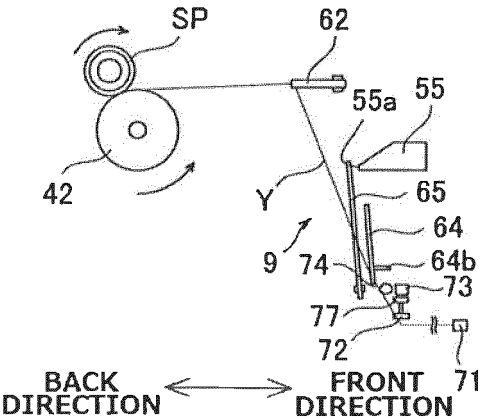


FIG. 11A

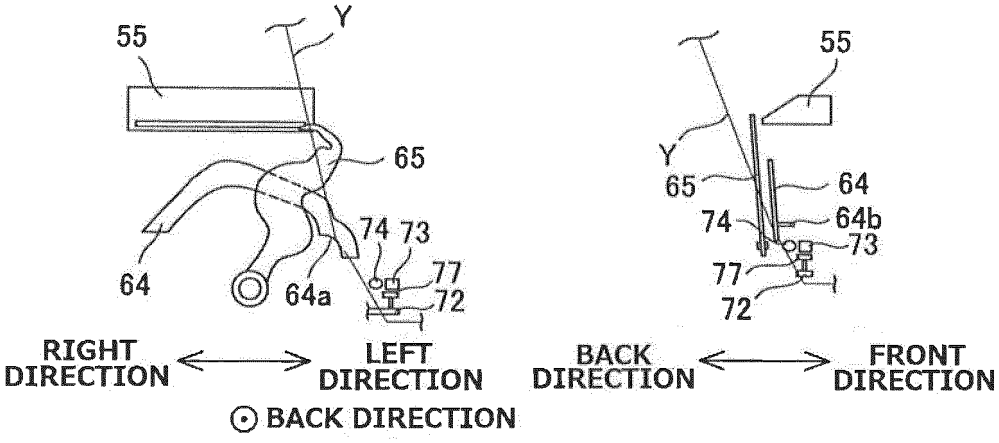


FIG. 11B

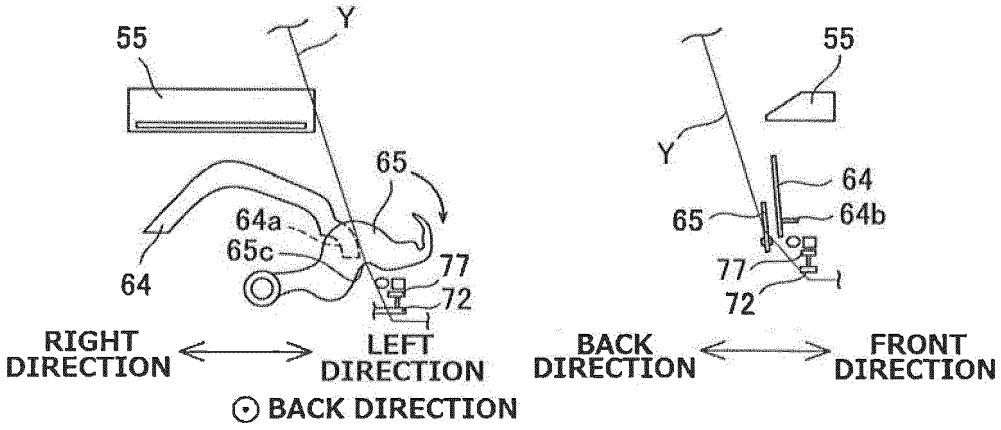


FIG. 11C

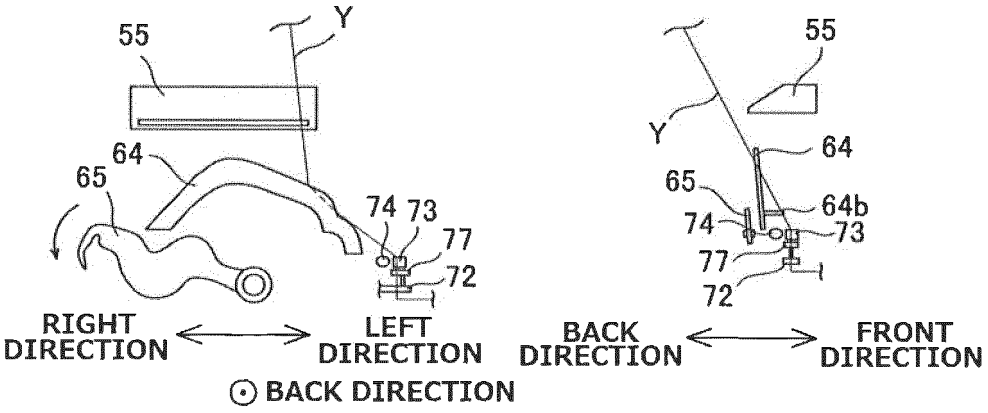


FIG. 12A

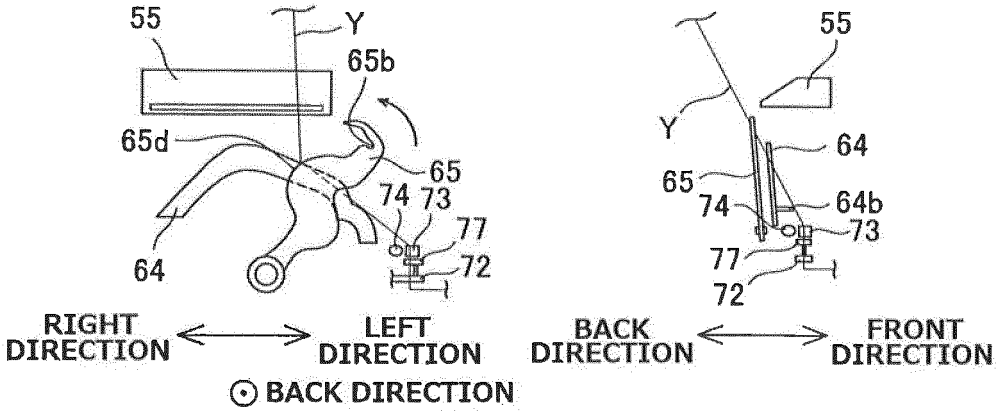


FIG. 12B

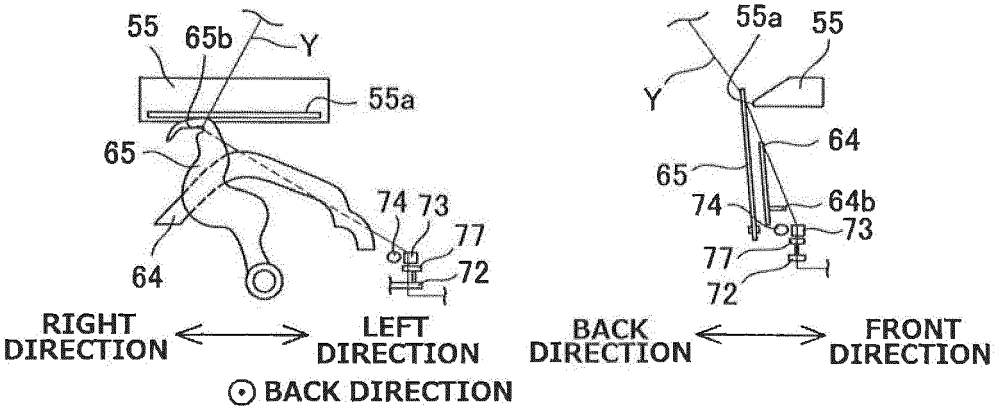


FIG. 12C

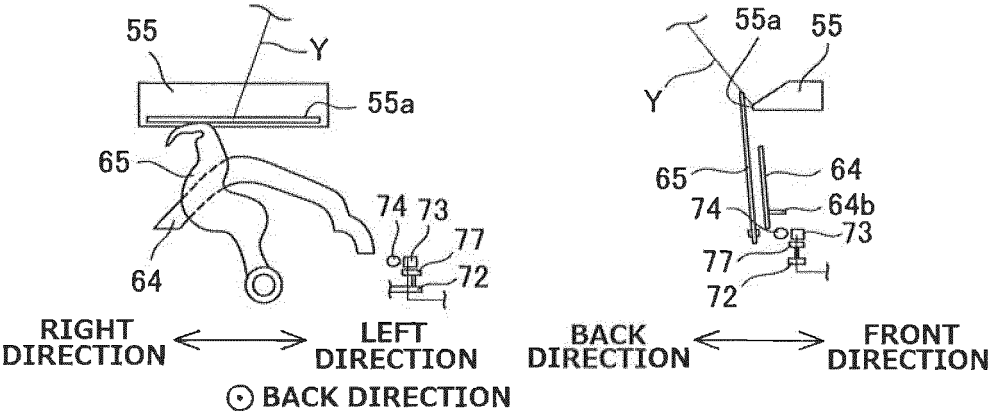


FIG. 13A

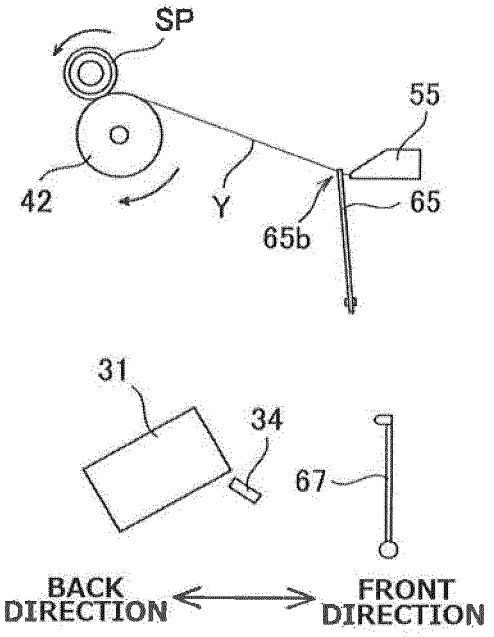


FIG. 13B

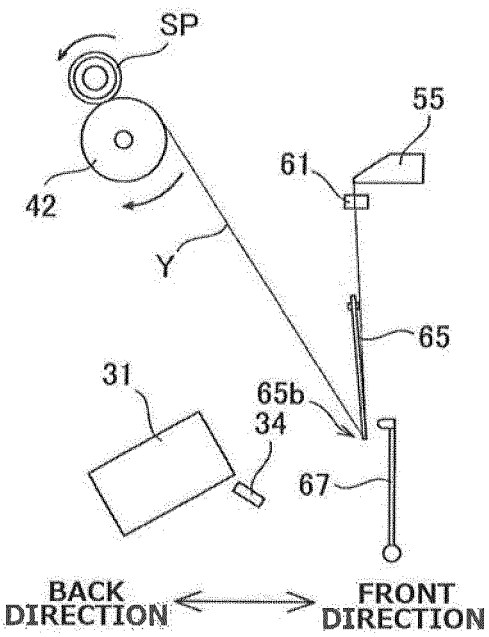


FIG. 13C

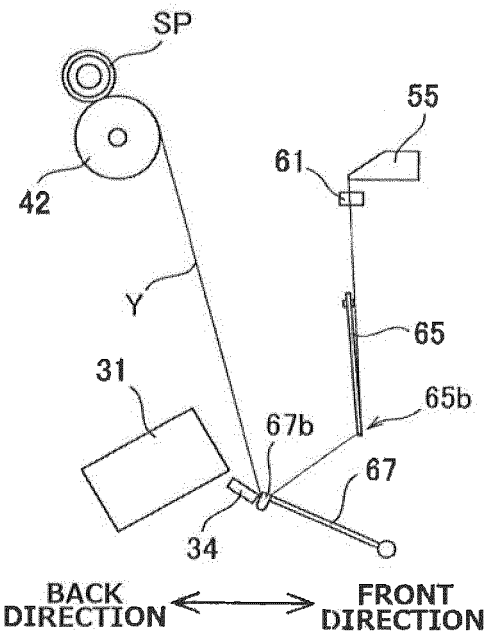


FIG. 13D

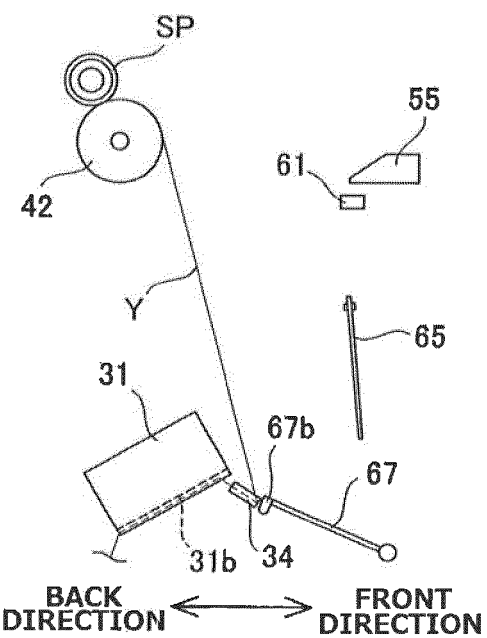
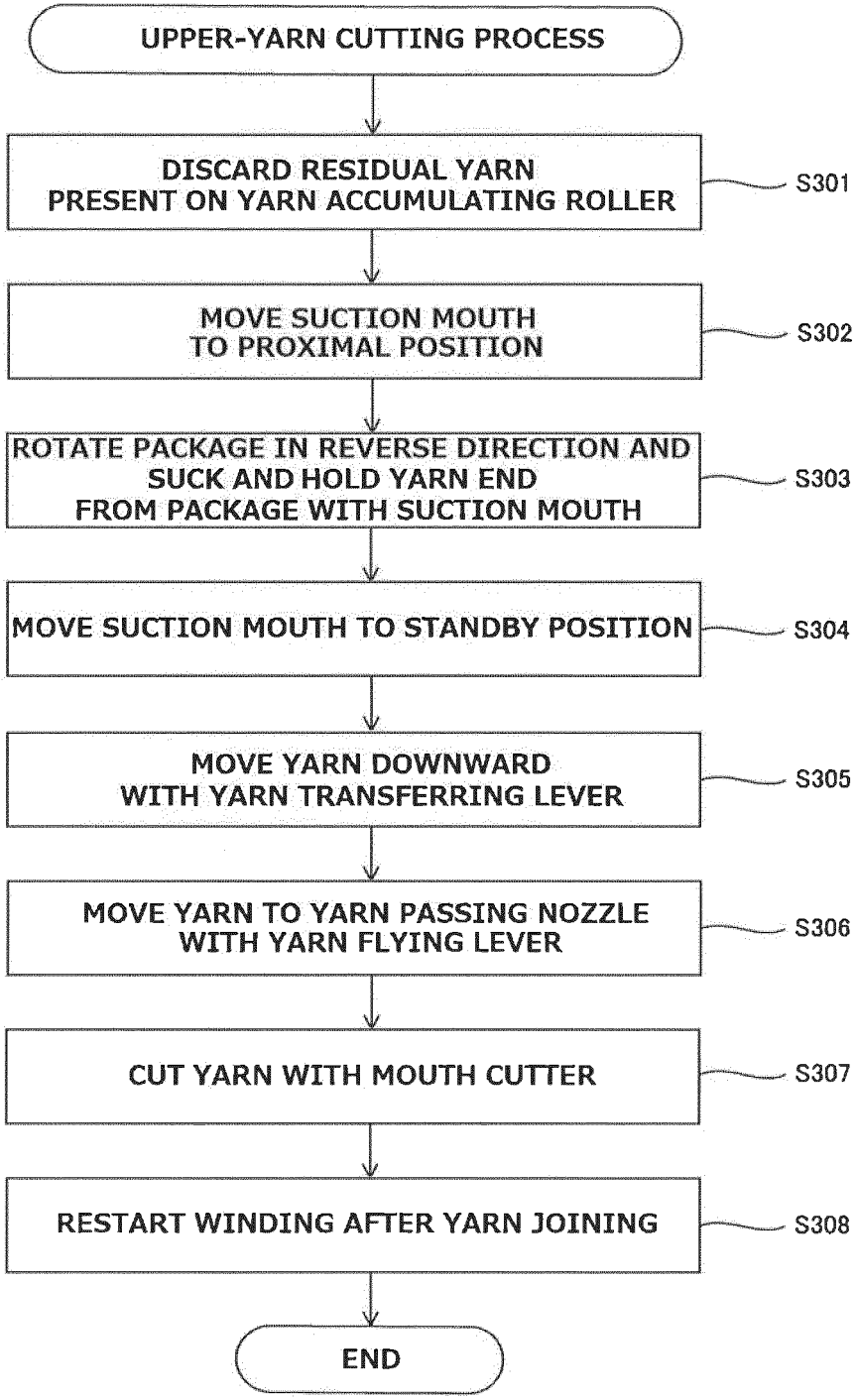


FIG. 14


UPPER-YARN CUTTING PROCESS
DISCARD RESIDUAL YARN PRESENT ON YARN ACCUMULATING ROLLER
S301
MOVE SUCTION MOUTH TO PROXIMAL POSITION
S302
ROTATE PACKAGE IN REVERSE DIRECTION AND SUCK AND HOLD YARN END FROM PACKAGE WITH SUCTION MOUTH
S303
MOVE SUCTION MOUTH TO STANDBY POSITION
S304
MOVE YARN DOWNWARD WITH YARN TRANSFERRING LEVER
S305
MOVE YARN TO YARN PASSING NOZZLE WITH YARN FLYING LEVER
S306
CUT YARN WITH MOUTH CUTTER
S307
RESTART WINDING AFTER YARN JOINING
S308
END

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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