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(54) **SPINNING MACHINE AND SPINNING METHOD**

SPINNMASCHINE UND SPINNVERFAHREN

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention generally relates to a spinning machine that includes an air-jet spinning device that performs yarn discharge spinning and that pools the yarn formed by the air-jet spinning device on a yarn pooling roller.

2. Description of the Related Art

[0002] Air-jet spinning devices that perform yarn discharge spinning are known in the art. Yarn discharge spinning is a process different from regular spinning performed at the start of the spinning whereby a yarn is formed without inserting a seed yarn in the air-jet spinning device.

[0003] Japanese Patent Application Laid-open No. 2003-278035 (Patent Document 1) discloses a spinning machine that performs the yarn discharge spinning. The disclosed spinning machine includes plural draft rollers (sequentially from upstream, a back roller, a third roller, a second roller, and a front roller) and plural opposing rollers. Patent Document 1 discloses a technique for increasing a success rate of the yarn discharge spinning by changing a draft ratio thereby increasing the thickness of a count of a yarn when performing the yarn discharge spinning. Patent Document 1 discloses exerting control to change rotation speeds of the draft rollers, such as the front roller, as a method for changing the draft ratio. The spinning machine includes a slack tube that sucks and pools the yarn supplied from an air-jet spinning device when performing yarn joining.

[0004] Japanese Patent Application Laid-open No. 2004-277943 (Patent Document 2) discloses a spinning machine that includes plural spinning units. Each spinning unit includes a yarn pooling roller that winds and pools a yarn supplied from an air-jet spinning device. A front roller and a second roller of each of the spinning units are driven by a common driving source for all the spinning units. Consequently, the front roller and the second roller of all the spinning units are driven at the same rotation speed. Respective driving sources are arranged individually in each spinning unit for driving a third roller and a back roller of each spinning unit. Consequently, the rotation of the third roller and the back roller can be controlled as the situation demands.

[0005] The spinning machines disclosed in Patent Documents 1 and 2 pull the yarn formed by the air-jet spinning device using a delivery roller and a nip roller. In such a spinning machine, when the yarn is being pulled from the air-jet spinning device, at times the yarn slips against the delivery roller due to inadequate clamping force. Spinning machines that have been designed by taking the above problem into consideration are known in the art. In such a spinning machine (delivery rollerless spinning machine), the delivery roller is omitted, and a yarn pooling roller is arranged downstream of the air-jet spinning device (see Japanese Patent Application Laid-open No. 2010-77576).

SUMMARY OF THE INVENTION

[0006] Depending on conditions such as the raw material of the yarn, yarn count, spinning speed and the like, yarn breakage can easily occur in the air-jet spinning device when performing the yarn discharge spinning, resulting in reduction in a success rate of the yarn discharge spinning. Particularly, there is a disadvantage that the yarn discharge spinning cannot be performed at spinning speeds faster than a predetermined spinning speed.

[0007] In Patent Document 2, the rotation speed of the front roller and the spinning speed of all the spinning units are same and hence, cannot be changed in accordance with the situation. Hence, if a spinning speed leading to a successful yarn discharge spinning is set, the spinning speed for the regular spinning would become slow, resulting in decreased productivity. If a fast spinning speed is set to enhance productivity, the probability of failure of the yarn discharge spinning increases, and consequently, productivity decreases.

[0008] It is an object of the present invention to provide a spinning machine that includes a yarn pooling roller and that can enhance productivity without reducing the success rate of the yarn discharge spinning.

[0009] A spinning machine according to an aspect of the present invention includes a drafting device, an air-jet spinning device, and a yarn pooling roller. The drafting device includes plural draft rollers, including a front roller, and drafts a fiber bundle. The air-jet spinning device performs spinning whereby a yarn is formed by twisting the fiber bundle drafted by the drafting device. The yarn pooling roller pools the yarn formed by the air-jet spinning device by winding the yarn around a surface thereof. A peripheral speed of the front roller during yarn discharge spinning and during regular spinning performed after the yarn discharge spinning is different. A peripheral speed of the yarn pooling roller during the yarn discharge spinning and during the regular spinning is different. A peripheral speed of the front roller during the yarn discharge spinning is slower than a peripheral speed of the front roller during the regular spinning, and a peripheral speed of the yarn pooling roller during the yarn discharge spinning is slower than a peripheral speed of the yarn pooling roller during the regular spinning.

[0010] According to another aspect of the present invention, in a spinning method, the peripheral speed of the front roller included in the drafting device that drafts the fiber bundle is caused to differ during yarn discharge spinning performed by the air-jet spinning device that performs spinning to form the yarn by twisting the fiber bundle and during regular spinning performed by the air-jet spinning device after the yarn discharge spinning. The

peripheral speed of the yarn pooling roller that pools the yarn by winding the yarn formed by the air-jet spinning device on a surface thereof is caused to differ during the yarn discharge spinning and during the regular spinning. A peripheral speed of the front roller during the yarn discharge spinning is slower than a peripheral speed of the front roller during the regular spinning, and a peripheral speed of the yarn pooling roller during the yarn discharge spinning is slower than a peripheral speed of the yarn pooling roller during the regular spinning.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a side view of a spinning unit arranged in a spinning machine according to an embodiment of the present invention.
FIG. 2 is cross-sectional view of internal configuration of an air-jet spinning device.
FIG. 3 is an enlarged perspective view of a yarn pooling device and a first guide.
FIG. 4 is a side view of the spinning unit when performing yarn joining and yarn discharge spinning.
FIG. 5A is a graph for explaining a change in a peripheral speed of a yarn pooling roller.
FIG. 5B is a graph for explaining a change in a peripheral speed of a front roller.
FIG. 5C is a graph for explaining a change in a ratio of the peripheral speed of the yarn pooling roller to the peripheral speed of the front roller.
FIG. 6A is a graph for explaining a change in the peripheral speed of the front roller.
FIG. 6B is a graph for explaining a change in the peripheral speed of a middle roller.
FIG. 6C is a graph for explaining a change in a ratio of the peripheral speed of the front roller to the peripheral speed of the middle roller.
FIGS. 7A to 7C are tables listing setting parameters that are set in a setting section.

DETAILED DESCRIPTION

[0012] Exemplary embodiments of a spinning frame (spinning machine) according to the present invention are explained in detail below with reference to the accompanying drawings. In this specification, the terms "upstream" and "downstream" refer to upstream and downstream in a traveling direction of a fiber bundle and a spun yarn during spinning.

[0013] The spinning machine includes plural spinning units 2 arranged side by side and a main control device 5 that performs centralized management of the spinning units 2. The main control device 5 includes a setting section 6 and spinning conditions (such as a count and spinning speed of a spinning yarn 10) can be set by using the setting section 6. In each spinning unit 2, an air-jet spinning device 9 spins a fiber bundle 8 conveyed from a drafting device 7 to form a spun yarn 10 and a winding section 26 winds the spun yarn 10 to form a package 50.

[0014] As shown in FIG. 1, each spinning unit 2 includes, sequentially from upstream to downstream, the drafting device 7, the air-jet spinning device 9, a yarn pooling device 22, a yarn joining device 23, a yarn monitoring device 25, and the winding section 26. All the parts of the spinning unit 2 are controlled by a unit controller (controller) 90 arranged in the spinning unit 2. All the parts of the spinning unit 2 can instead be controlled by the main control device 5.

[0015] The drafting device 7 includes, sequentially from the upstream, four draft rollers, namely, a back roller 16, a third roller 17, a middle roller (second roller) 19 with a rubber apron belt 18, and a front roller 20. Each of the draft rollers is driven to rotate at a predetermined rotation speed. The drafting device 7 includes plural opposing rollers arranged respectively facing the draft rollers.

[0016] The drafting device 7 includes a front driving section (first driving section) 91 that drives the front roller 20, a middle driving section (third driving section) 92 that drives the middle roller 19, and an upstream driving section 93 that drives the third roller 17 and the back roller 16. Each of the driving sections is constituted by a motor (for example, a brushless motor) a rotation speed of which can be changed in accordance with a control signal of the unit controller 90. Because each spinning unit 2 of the spinning machine has its own front driving section 91, middle driving section 92, and upstream driving section 93, the rotation speed of each draft roller of each spinning unit 2 can be controlled independently. In an alternative configuration, the draft rollers of plural spinning unit 2 can be simultaneously driven by a common driving source for all the spinning units 2. In the spinning unit 2 according to the present embodiment, a single driving source (upstream driving section 93) drives the third roller 17 and the back roller 16. A driving source can, however, be arranged individually for the third roller 17 and the back roller 16 for driving the respective rollers.

[0017] The drafting device 7 forms the fiber bundle 8 from a sliver 15 by transporting the sliver 15, supplied from a not shown sliver case via a sliver guide, sandwiched between plural draft rollers and plural opposing rollers and stretching (drafting) the sliver 15 till a predetermined fiber amount (or thickness) is attained. A regulating member 21 is arranged between the third roller 17 and the middle roller 19. A through hole is formed in the regulating member 21. A width of the sliver 15 being drafted is regulated when the sliver 15 passes through the through hole of the regulating member 21.

[0018] The air-jet spinning device 9 is arranged immediately downstream of the front roller 20. The air-jet spinning device 9 forms the spun yarn 10 by twisting the fiber bundle 8 supplied from the drafting device 7. In the present embodiment, an air-jet spinning device that twists the fiber bundle 8 by the action of a swirling air current is employed. As shown in FIG. 2, the air-jet spinning device 9 includes a nozzle block 30 and a hollow

guide shaft 34. The nozzle block 30 includes a fiber guide 31, a spinning chamber 32, and a first nozzle 33. The hollow guide shaft 34 includes a yarn passageway 35 and a second nozzle 36. The structural components of the air-jet spinning device 9 are controlled by the unit controller 90.

[0019] The fiber guide 31 guides the fiber bundle 8 drafted by the drafting device 7 toward the interior of the air-jet spinning device 9. A fiber guiding opening 31a and a guide needle 31b are formed in the fiber guide 31. The fiber bundle 8 drafted by the drafting device 7 is guided from the fiber guiding opening 31a in a state of being wound over the guide needle 31b into the spinning chamber 32. Air is blown from the first nozzle 33 into the spinning chamber 32 to generate the swirling air current that acts on the fiber bundle 8 present inside the spinning chamber 32.

[0020] The hollow guide shaft 34 is a cylindrical member and has the yarn passageway 35 formed therein. A swirling air current is generated inside the yarn passageway 35 when air is blown from the second nozzle 36 into the yarn passageway 35. The direction of the swirling air current generated by the air blown from the second nozzle 36 is opposite to the direction of the swirling air current generated by the air blowing from the first nozzle 33.

[0021] During the yarn discharge spinning, a swirling air current is generated by the air being blown from both the first nozzle 33 and the second nozzle 36. The fiber bundle 8 drafted by the drafting device 7 is guided into the air-jet spinning device 9 by the fiber guide 31. The air blown from the first nozzle 33 flows swirlingly in a feeding direction of the fiber bundle 8. The fiber bundle 8 acquires a loose false twist by the action of the swirling air current and is conveyed to the hollow guide shaft 34 in this state.

[0022] The yarn passageway 35 is formed such that a cross-sectional area thereof at any given point is larger than a cross-sectional area thereof at any point upstream of the given point. Consequently, the swirling air current inside the yarn passageway 35 flows downstream. With this configuration, the fiber bundle 8 can be conveyed in the downstream direction inside the yarn passageway 35. Because the direction of the swirling air current generated inside the yarn passageway 35 is opposite to the direction of the swirling air current inside the spinning chamber 32, the fiber bundle 8 is conveyed from the hollow guide shaft 34 to the outside while being spun into a bundled fiber form. Any known spinning method can be used to perform the spinning.

[0023] The regular spinning is performed after the yarn discharge spinning. During the regular spinning, the air is blown only from the first nozzle 33 to generate the swirling air current inside the spinning chamber 32. That is, when shifting from the yarn discharge spinning to the regular spinning (during the shift), air is blown from the second nozzle 36, but during the regular spinning, air is not blown from the second nozzle 36. The trailing ends of the fibers of the fiber bundle 8 supplied from the drafting device 7 swing around the tip of the hollow guide shaft 34 by the action of the swirling air current generated inside the spinning chamber 32. The swinging action twists the fiber bundle 8 to form the spun yarn 10. The spun yarn 10 passes through the yarn passageway 35 of the hollow guide shaft 34 and is conveyed to the outside of the air-jet spinning device 9 through a not shown yarn outlet located on the downstream side.

[0024] In the manner explained above, the spun yarn 10 is formed by applying twists to the fiber bundle 8 when performing the yarn discharge spinning and the regular spinning.

[0025] A first guide 61 (guide member, see FIG. 3) that guides the spun yarn 10 is arranged downstream of the air-jet spinning device 9. The first guide 61 guides the spun yarn 10 to the yarn pooling device 22. The first guide 61 is movable so that it can pull the spun yarn 10 to the yarn pooling device 22 for performing yarn joining or the like.

[0026] The yarn pooling device 22 is arranged downstream of the first guide 61. The yarn pooling device 22 includes a yarn pooling roller 41, a roller driving section (second driving section) 42, a yarn hooking member 43, and a yarn amount detection sensor 44. The roller driving section 42 is a motor that drives the yarn pooling roller 41 to rotate. The roller driving section 42 is a motor (for example, a stepping motor) a rotation speed of which can be changed in accordance with a control signal of the unit controller 90. The spun yarn 10 is wound onto the surface of the yarn pooling roller 41 with the driving of the rotation of the yarn pooling roller 41 by the roller driving section 42. The spun yarn 10 is temporarily pooled by being wound around the yarn pooling roller 41.

[0027] The yarn hooking member 43 is mounted on a downstream end portion of the yarn pooling roller 41. The yarn hooking member 43 is supported in a rotatable manner relatively to the yarn pooling roller 41. A permanent magnet is attached to any one of the yarn hooking member 43 and the yarn pooling roller 41, and a magnetic hysteresis member is attached to the other of the yarn hooking member 43 and the yarn pooling roller 41. These magnetic means generate a torque against a relative rotation of the yarn hooking member 43 with respect to the yarn pooling roller 41. Therefore, only when a force overcoming the torque is applied (when a tension of a predetermined amount or larger is applied) on the yarn hooking member 43, the yarn hooking member 43 is rotated relatively to the yarn pooling roller 41 so that the spun yarn 10 wound around the yarn pooling roller 41 can be unwound. On the other hand, when such a force is not applied to the yarn hooking member 43, the yarn pooling roller 41 and the yarn hooking member 43 are integrally rotated so that the spun yarn 10 is wound around the yarn pooling roller 41.

[0028] In this manner, the yarn pooling device 22 operates such that the spun yarn 10 is unwound when the yarn tension on the downstream is increased, and the spun yarn 10 is prevented from being unwound when the

yarn tension is decreased (when the spun yarn 10 is about to have a slack). With this operation, the yarn pooling device 22 can remove the slack of the spun yarn 10 and apply an appropriate tension on the spun yarn 10. Furthermore, because the yarn hooking member 43 operates to absorb a variation of the tension applied on the spun yarn 10 between the yarn pooling device 22 and the winding section 26, the variation of the tension is prevented from affecting the spun yarn 10 between the air-jet spinning device 9 and the yarn pooling device 22.

[0029] The yarn amount detection sensor 44 is an optical sensor that detects whether a pooled amount in the yarn pooling device 22 is a predetermined amount or more.

[0030] A second guide 62 that regulates the spun yarn 10 unwound from the yarn pooling roller 41 is arranged downstream of the yarn pooling roller 41. The yarn joining device 23 is arranged downstream of the second guide 62. The yarn joining device 23 joins the spun yarn 10 from the air-jet spinning device 9 (first yarn) and the spun yarn 10 from the package 50 (second yarn) when the spun yarn 10 is disconnected between the air-jet spinning device 9 and the package 50 due to any reason. In the present embodiment, the yarn joining device 23 is a splicer device that twists and joins the yarn ends by the action of a swirling air current generated by compressed air. The yarn joining device 23, however, is not limited to the splicer device, and can be, for example, a mechanical knotter and the like.

[0031] The spinning unit 2 includes a catching and guiding device that guides the spun yarn 10 to the yarn joining device 23. The catching and guiding device is constituted by a first catching and guiding device 27 that guides the first yarn and a second catching and guiding device 28 that guides the second yarn.

[0032] The first catching and guiding device 27 includes a base portion that is pivotably supported, and is able to pivot in a vertical direction around the base portion as a center. The first catching and guiding device 27 is hollow, connected to a not shown blower, and can generate a suction airflow. The first catching and guiding device 27 catches an end of the first yarn by pivoting downward (see FIG. 4). After catching the first yarn, the first catching and guiding device 27 guides the first yarn to the yarn joining device 23 by pivoting upward.

[0033] The second catching and guiding device 28 includes a base portion that is pivotably supported, and is able to pivot in the vertical direction around the base portion as a center. The second catching and guiding device 28 is also hollow, connected to a not shown blower, and can generate a suction airflow. The second catching and guiding device 28 catches an end of the second yarn by pivoting upward (see FIG. 4). After catching the second yarn, the second catching and guiding device 28 guides the second yarn to the yarn joining device 23 by pivoting downward.

[0034] The first yarn (the spun yarn 10 formed by the regular spinning) and the second yarn are joined by the yarn joining device 23 being driven with the first yarn and the second yarn guided to the yarn joining device 23. With this action, continuity of the spun yarn 10 is restored between the air-jet spinning device 9 and the package 50 and the winding of the spun yarn 10 onto the package 50 can be resumed.

[0035] The yarn monitoring device 25 is arranged downstream of the yarn joining device 23. The yarn monitoring device 25 monitors a thickness of the traveling spun yarn 10 with a not shown optical transmission type sensor. On detecting a yarn defect (a portion of the spun yarn 10 where the thickness or the like is abnormal) in the spun yarn 10, the yarn monitoring device 25 transmits a yarn defect detection signal to the unit controller 90. On receiving the yarn defect detection signal, the unit controller 90 drives a cutter 24 arranged near the yarn monitoring device 25 to cut the spun yarn 10. The sensor with which the yarn monitoring device 25 monitors the thickness of the spun yarn 10 is not limited to an optical transmission type sensor, and can, for example, be a capacitance type sensor. A foreign matter included in the spun yarn 10 can be detected as the yarn defect. In an alternative configuration, the cutter 24 can be arranged inside the yarn monitoring device 25. Alternatively, the cutter 24 can be omitted, and the spun yarn 10 can be cut by stopping spinning by the air-jet spinning device 9. When spinning is suspended due to yarn breakage and/or yarn cutting or the like, after the spinning by the air-jet spinning device 9 is stopped, a rotation speed of the yarn pooling roller 41 is decreased and the rotation of the yarn pooling roller 41 is eventually stopped.

[0036] The winding section 26 is arranged downstream of the yarn pooling device 22. The winding section 26 includes a cradle arm 52, and a winding drum 53. A direction of a yarn path from the yarn pooling device 22 to the winding section 26 is bent and guided by a downstream guide 63.

[0037] The cradle arm 52 rotatably supports a winding tube 51 on which the spun yarn 10 is to be wound. The cradle arm 52 is pivotable around a base portion as a center of pivoting. With this configuration, even when a diameter of the package 50 increases with the winding of the spun yarn 10 around the winding tube 51, the winding of the spun yarn 10 can be continued properly.

[0038] The winding drum 53 rotates while being in contact with an outer circumferential surface of the winding tube 51 or the package 50 by a driving force transmitted from a not shown winding-drum driving motor. A not shown traverse groove is formed on an outer circumferential surface of the winding drum 53 and the spun yarn 10 can be traversed to a predetermined width using this traverse groove. With this configuration, the winding section 26 can form the package 50 by winding the spun yarn 10 around the winding tube 51 while traversing the spun yarn 10.

[0039] A process performed by the spinning unit 2 during the shift from the yarn discharge spinning to the regular spinning is explained below with reference to FIGS.

4 to 7C.

[0040] When spinning is initially started or when spinning is resumed after temporary suspension due to yarn breakage or the like (that is, when the spun yarn 10 needs to be conveyed anew from the air-jet spinning device 9), the air-jet spinning device 9 performs the yarn discharge spinning. The spun yarn 10 formed by the air-jet spinning device 9 through the yarn discharge spinning is guided to the yarn joining device 23 by the first catching and guiding device 27, as shown in FIG. 4. The spun yarn 10 formed subsequently by the air-jet spinning device 9 is guided to a position near the yarn pooling device 22 by the first guide 61. With this action, the yarn hooking member 43 of the yarn pooling device 22 can rotate with the spun yarn 10 hooked thereto.

[0041] As a result, the yarn pooling device 22 pulls the spun yarn 10 from the air-jet spinning device 9 and pools the spun yarn 10 on the yarn pooling roller 41. When the yarn amount detection sensor 44 detects that the pooled amount of the spun yarn 10 on the yarn pooling roller 41 has reached a predetermined amount, the spinning unit 2 shifts from the yarn discharge spinning to the regular spinning. The timing at which the shift from the yarn discharge spinning to the regular spinning is made can be decided by any means other than the yarn amount detection sensor 44. For example, a yarn detection sensor can be arranged inside the first catching and guiding device 27, and the shift from the yarn discharge spinning to the regular spinning can be made at the timing when the yarn detection sensor detects the spun yarn 10.

[0042] In the present embodiment, the spinning unit 2 exerts control such that the yarn pooling roller 41, the front roller 20, and the middle roller 19 rotate at different peripheral speeds (a distance by which a point on an outer periphery of the roller progresses in a predetermined time period) during the yarn discharge spinning and during the regular spinning. Particularly, in the present embodiment, the respective peripheral speeds of the front roller 20, the middle roller 19, and the yarn pooling roller 41 of each spinning unit 2 can be independently controlled. Consequently, the spun yarn 10 is formed at the peripheral speeds suitable for the regular spinning in the spinning unit 2 in which the regular spinning is performed and at the peripheral speeds suitable for the yarn discharge spinning in the spinning unit 2 in which the yarn discharge spinning is performed.

[0043] In the examples shown in FIGS. 5A and 5B, the peripheral speeds of the yarn pooling roller 41 and the front roller 20 are constant during the yarn discharge spinning but gradually increase during the shift. During the regular spinning, the peripheral speeds of the front roller 20 and the yarn pooling roller 41 once again become constant at faster speeds than the peripheral speeds during the yarn discharge spinning. In FIGS. 5A and 5B, an acceleration of the yarn pooling roller 41 and the front roller 20 is uniform during the shift. The acceleration of the yarn pooling roller 41 and the front roller 20 can, however, be changed.

[0044] Generally, performing the yarn discharge spinning at predetermined or faster spinning speeds leads to a reduction in a success rate of the yarn discharge spinning, though this differs according to the spinning conditions. Performing spinning at slower spinning speeds will lead to decreased productivity during the regular spinning. Hence, by increasing the peripheral speeds during the shift, as shown in FIGS. 5A and 5B, reduction in the success rate of the yarn discharge spinning can be prevented and at the same time the productivity can be enhanced.

[0045] The spun yarn 10 formed by the air-jet spinning device 9 is wound on the yarn pooling roller 41. Hence, when the peripheral speed of the yarn pooling roller 41 is faster than the peripheral speed of the front roller 20, the spun yarn 10 is subjected to excessive tension, resulting in the breakage of the spun yarn 10. On the other hand, when the peripheral speed of the yarn pooling roller 41 is slower than the peripheral speed of the front roller 20, slackening of the spun yarn 10 occurs. In the spinning unit 2, a change mode (which determines how the peripheral speed is to be changed) of the peripheral speed of the yarn pooling roller 41 and a change mode of the peripheral speed of the front roller 20 during the shift are same. That is, in the spinning unit 2, the front driving section 91 and the roller driving section 42 are controlled such that the peripheral speeds of the front roller 20 and the yarn pooling roller 41 are synchronized with each other. In the present specification, the mode in which the peripheral speeds of the yarn pooling roller 41 and the front roller 20 are changed so as not to cause breakage or slackening of the spun yarn 10 is called "same change mode".

[0046] FIG. 5C is a graph for explaining a change in a ratio of the peripheral speed of the yarn pooling roller 41 to the peripheral speed of the front roller 20 (a value obtained by dividing the peripheral speed of the yarn pooling roller 41 by the peripheral speed of the front roller 20) (first peripheral speed ratio, feed ratio). It is preferable that the first peripheral speed ratio is close to 1 for preventing breakage or slackening of the spun yarn 10. However, at times, depending on the yarn count, spinning speed, intended yarn specifications and the like, it is preferable that the first peripheral speed ratio is greater than 1 or less than 1. In the example shown in FIG. 5C, the first peripheral speed ratio has been adjusted to be greater than 1 during the yarn discharge spinning and less than 1 during the regular spinning.

[0047] The peripheral speeds of the front roller 20 and the yarn pooling roller 41 during the shift can be decreased, i.e., reverse to what is shown in FIGS. 5A and 5B. The first peripheral speed ratio can be adjusted to be less than 1 during the yarn discharge spinning and greater than 1 during the regular spinning, i.e., reverse to what is shown in FIG. 5C.

[0048] In the example shown in FIG. 6B, the peripheral speed of the middle roller 19 is constant during the yarn discharge spinning, gradually increases during the shift,

and during the regular spinning once again becomes constant at a faster speed than the peripheral speed during the yarn discharge spinning.

[0049] Generally, the success rate during the yarn discharge spinning also depends on the fiber amount of the fiber bundle 8 supplied to the air-jet spinning device 9. Consequently, for example, changing the peripheral speeds of the back roller 16 and the third roller 17 during the yarn discharge spinning can be considered as an approach for adjusting the fiber amount of the fiber bundle 8 supplied to the air-jet spinning device 9. However, the peripheral speeds of the back roller 16 and the third roller 17 are relatively slower, even with a small amount of change of the peripheral speeds, there is a drastic change in the fiber amount of the fiber bundle 8 supplied to the air-jet spinning device 9. Consequently, the success rate during the yarn discharge spinning reduces. Furthermore, in the above case, the fiber amount of the fiber bundle 8 supplied to the middle roller 19 also changes drastically. Hence, for example, when there is an increase in the fiber amount of the fiber bundle 8 supplied to the middle roller 19, the fiber bundle 8 can get caught in the regulating member 21 arranged between the third roller 17 and the middle roller 19.

[0050] In the present embodiment, the fiber amount of the fiber bundle 8 supplied to the air-jet spinning device 9 is adjusted by changing a ratio of the peripheral speed of the front roller 20 to the peripheral speed of the middle roller 19 (a value obtained by dividing the peripheral speed of the front roller 20 by the peripheral speed of the middle roller 19) (second peripheral speed ratio, main draft ratio). The spinning unit 2 controls the front driving section 91 and the middle driving section 92 so as to realize a predetermined second peripheral speed ratio. With this control, the fiber amount of the fiber bundle 8 supplied to the air-jet spinning device 9 or the like is prevented from changing drastically even if there is a slight shift in the value of the peripheral speed set for the front roller 20 or the middle roller 19.

[0051] As explained above, because it is preferable to carry out the regular spinning at high spinning speed, the spinning unit 2 increases the speed of the front roller 20 and the middle roller 19 during the shift. The preferred values of the second peripheral speed ratio during the yarn discharge spinning and during the regular spinning differ. Hence, the spinning unit 2 changes the peripheral speeds of the front roller 20 and the middle roller 19 to realize a preferred second peripheral speed ratio based on the yarn count or the like of the spun yarn 10. In the example shown in FIG. 6C, the peripheral speeds of the front roller 20 and the middle roller 19 are changed such that the second peripheral speed ratio during the regular spinning is greater than the second peripheral speed ratio during the yarn discharge spinning.

[0052] The peripheral speeds of the front roller 20 and the middle roller 19 during the shift can be decreased, i.e., reverse to what is shown in FIGS. 6A and 6B. The second peripheral speed ratio during the regular spinning can be adjusted to be less than the second peripheral speed ratio during the yarn discharge spinning, i.e., reverse to what is shown in FIG. 6C.

[0053] As explained above, in the present embodiment, the peripheral speeds of the yarn pooling roller 41, the front roller 20, and the middle roller 19 are changed. The peripheral speeds can be set automatically based on the spinning conditions or the like entered by an operator, or can be set by the operator. The operator can specify the peripheral speed of each roller by entering a predetermined value in the setting section 6 of the main control device 5.

[0054] FIGS. 7A to 7C are tables listing setting parameters that can be set in the setting section 6. As shown in FIGS. 7A to 7C, setting parameters can be set for the yarn discharge spinning, for the shift, and for the regular spinning.

[0055] In addition to the peripheral speeds of the yarn pooling roller 41, the front roller 20, and the middle roller 19, the first peripheral speed ratio and the second peripheral speed ratio can also be set as the setting parameters for the yarn discharge spinning and the regular spinning. The operator can set the peripheral speeds or the peripheral speed ratio by selecting a setting parameter and entering a desired value. On specifying any two of the peripheral speed of the yarn pooling roller 41, the peripheral speed of the front roller 20, and the first peripheral speed ratio, the remaining parameter setting is automatically entered. The same is the case with the peripheral speed of the front roller 20, the peripheral speed of the middle roller 19, and the second peripheral speed ratio.

[0056] A rate of change of the peripheral speeds of the yarn pooling roller 41, the front roller 20, and the middle roller 19 can be set as a setting parameter for the shift. The rate of change of the peripheral speed is a value that indicates the acceleration by which the peripheral speed of the yarn pooling roller 41 and the like is to be changed (or the time period in which the shift from the yarn discharge spinning to the regular spinning is to be made). Significantly increasing or decreasing the first peripheral speed ratio or the second peripheral speed ratio can result in undesirable consequences, such as yarn breakage, yarn slackening, a drastic increase or decrease in the fiber amount of the fiber bundle 8 and the like. To prevent the above consequences from arising, the present embodiment allows the setting of a single rate of change of the peripheral speed for the yarn pooling roller 41, the front roller 20, and the middle roller 19.

[0057] The setting parameters can be set by the operator by entering specific values or selecting desired levels from among plural levels. The spun yarn 10 can be wound under conditions suitable for the yarn count of the spun yarn 10 and the intended yarn specifications by setting the numerous setting parameters as explained above.

[0058] As explained above, the spinning machine includes the drafting device 7, the air-jet spinning device 9, and the yarn pooling roller 41. The drafting device 7

includes plural draft rollers, including the front roller 20, and drafts the fiber bundle 8. The air-jet spinning device 9 performs spinning whereby the spun yarn 10 is formed by twisting the fiber bundle 8 drafted by the drafting device 7. The yarn pooling roller 41 pools the spun yarn 10 formed by the air-jet spinning device 9 by winding the spun yarn 10 around the surface thereof. The peripheral speed of the front roller 20 during the yarn discharge spinning and during the regular spinning performed after the yarn discharge spinning differs. The peripheral speed of the yarn pooling roller 41 during the yarn discharge spinning and during the regular spinning differs. That is, in the time period from a time point when the yarn discharge spinning ends to a time point when the regular spinning starts, the spinning machine increases or decreases the peripheral speed of the front roller 20 and the peripheral speed of the yarn pooling roller 41.

[0059] With the above adjustment, productivity can be enhanced without reducing the success rate of the yarn discharge spinning. By changing the peripheral speed of not only the front roller 20 but also the yarn pooling roller 41, yarn breakage or yarn slackening that accompanies a change in the peripheral speed of the front roller 20 can be prevented.

[0060] In the spinning machine according to the present embodiment, the change mode of the peripheral speed of the front roller 20 and the change mode of the peripheral speed of the yarn pooling roller 41 are same in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts.

[0061] By having same change modes for the front roller 20 and the yarn pooling roller 41, yarn breakage or yarn slackening that accompanies a change in the peripheral speed of the front roller 20 can be more reliably prevented.

[0062] In the spinning machine according to the present embodiment, the drafting device 7 includes the middle roller 19 that is arranged second from downstream. The peripheral speed of the middle roller 19 during the yarn discharge spinning and during the regular spinning differs.

[0063] The draft ratio of, for example, the middle roller 19 and the front roller 20 can be changed by changing the peripheral speed of the middle roller 19. Accordingly, the fiber amount of the fiber bundle 8 being transported can be adjusted. Unlike the adjustment of the fiber amount of the fiber bundle 8 with the back roller 16 or the like, an increase or decrease in the quantity of the fiber amount of the fiber bundle 8 can be minimized by changing the peripheral speed of the middle roller 19. Hence, the fiber bundle 8 can be prevented from getting caught in the regulating member 21.

[0064] Exemplary embodiments of the present invention are explained above. The above configuration can also be modified as explained below.

[0065] In the above embodiment, the yarn pooling roller 41, the front roller 20, and the middle roller 19 are driven by different driving sections. Alternatively, by using a speed reduction gear or the like, at least two of the above rollers can be driven by the same driving section.

[0066] The setting section 6 can be arranged in the main control device 5 as arranged in the above embodiment or can be arranged individually for each spinning unit 2. A single controller for controlling all the driving sections can be arranged in the main control device 5 or the controller can be arranged individually for each spinning unit 2 or for each driving section.

[0067] In the above embodiment, the present invention is applied to a spinning machine in which the package 50 is formed at a position that is above the spinning unit 2. The present invention can, however, be applied to a spinning machine in which the package 50 is formed at a position below the spinning unit 2 (Japanese Patent Application Laid-open No. 2010-77576 or the like).

[0068] A spinning machine according to an aspect of the present invention includes a drafting device, an air-jet spinning device, and a yarn pooling roller. The drafting device includes plural draft rollers, including a front roller, and drafts a fiber bundle. The air-jet spinning device performs spinning whereby a yarn is formed by twisting the fiber bundle drafted by the drafting device. The yarn pooling roller pools the yarn formed by the air-jet spinning device by winding the yarn around a surface thereof. A peripheral speed of the front roller during yarn discharge spinning and during regular spinning performed after the yarn discharge spinning is different. A peripheral speed of the yarn pooling roller during the yarn discharge spinning and during the regular spinning is different.

[0069] According to another aspect of the present invention, in a time period from a time point when the yarn discharge spinning ends to a time point when the regular spinning starts, the spinning machine increases or decreases the peripheral speeds of the front roller and the yarn pooling roller.

[0070] By changing the peripheral speed of the front roller during the yarn discharge spinning and the regular spinning, the yarn discharge spinning can be performed at a spinning speed suitable for the yarn discharge spinning and the regular spinning can be performed at a spinning speed suitable for the regular spinning. With the above adjustment, productivity can be enhanced without reducing the success rate of the yarn discharge spinning. By changing the peripheral speed of not only the front roller but also the yarn pooling roller, yarn breakage or yarn slackening that accompanies a change in the peripheral speed of the front roller can be prevented.

[0071] It is preferable that in the spinning machine, the yarn pooling roller is arranged such that it can pull the yarn from the air-jet spinning device and pool the yarn.

[0072] In a spinning machine that does not include a delivery roller, the yarn pooling roller pulls the yarn from the air-jet spinning device. Hence, by changing the peripheral speed of the yarn pooling roller, yarn breakage or yarn slackening that accompanies a change in the peripheral speed of the front roller can be more reliably

prevented.

[0073] It is preferable that the spinning machine includes a first driving section that drives the front roller to rotate and a second driving section that drives the yarn pooling roller to rotate.

[0074] With this configuration, the front roller and the yarn pooling roller can be driven at different peripheral speeds with a simple structure and without requiring a speed reduction gear or the like.

[0075] The spinning machine includes plural spinning units. Each of the spinning units includes the first driving section and the second driving section. The first driving section and the second driving section of each spinning unit are capable of performing driving independently of the first driving section and the second driving section of other spinning units.

[0076] With this configuration, the peripheral speeds of the front roller and the yarn pooling roller in each spinning unit can be independently controlled. Hence, the spinning unit that performs the regular spinning can form the yarn at a peripheral speed that is suitable for the regular spinning and the spinning unit that performs the yarn discharge spinning can form the yarn at a peripheral speed that is suitable for the yarn discharge spinning.

[0077] It is preferable that in the spinning machine, the peripheral speed of the front roller during the yarn discharge spinning is slower than the peripheral speed of the front roller during the regular spinning and the peripheral speed of the yarn pooling roller during the yarn discharge spinning is slower than the peripheral speed of the yarn pooling roller during the regular spinning.

[0078] With this control, when performing spinning under typical spinning conditions, productivity can be enhanced without reducing the success rate of the yarn discharge spinning.

[0079] It is preferable that in the spinning machine, a change mode of the peripheral speed of the front roller and a change mode of the peripheral speed of the yarn pooling roller are same in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts.

[0080] With this adjustment, yarn breakage or yarn slackening that accompanies a change in the peripheral speed of the front roller can be more reliably prevented.

[0081] It is preferable that the spinning machine includes a setting section that sets a rate of change of the peripheral speed of the front roller and a rate of change of the peripheral speed of the yarn pooling roller for the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts.

[0082] With this configuration, the rate of change of the peripheral speeds can be adjusted by taking into consideration the time period from the end of the yarn discharge spinning to the start of the regular spinning, a load on the yarn, and the like.

[0083] It is preferable that in the spinning machine, a ratio of the peripheral speed of the yarn pooling roller to the peripheral speed of the front roller during the yarn discharge spinning and during the regular spinning differs.

[0084] With this control, the fiber bundle can be drafted and the yarn can be pulled from the air-jet spinning device at the ratio of peripheral speeds suitable for a count of the yarn, the spinning speed, and the like.

[0085] In the spinning machine, a second roller arranged second from the downstream is included in the plural draft rollers of the drafting device. A peripheral speed of the second roller during the yarn discharge spinning and during the regular spinning is different.

[0086] By changing the peripheral speed of the second roller, for example, a draft ratio of the second roller and the front roller can be changed. Hence, a fiber amount of the fiber bundle conveyed to the drafting device can be adjusted.

[0087] It is preferable that the spinning machine includes a third driving section that drives the second roller.

[0088] With this configuration, the peripheral speeds of the front roller and the second roller can be individually changed with a simple structure and without requiring a speed reduction gear or the like.

[0089] It is preferable in the spinning machine that, in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts, the peripheral speed of the front roller and the peripheral speed of the second roller change and a ratio of the peripheral speed of the front roller to the peripheral speed of the second roller changes.

[0090] With this control, during the yarn discharge spinning the front roller and the second roller are driven at peripheral speeds suitable for the yarn discharge spinning, and during the regular spinning the front roller and the second roller are driven at a ratio of peripheral speeds suitable for the regular spinning.

[0091] It is preferable that the spinning machine includes a controller that controls at least the drafting device and the yarn pooling roller.

[0092] With this configuration, because various structural components can be controlled with a single controller, control can be performed smoothly.

[0093] According to still another aspect of the present invention, in a spinning method, the peripheral speed of the front roller included in the drafting device that drafts the fiber bundle is caused to differ during yarn discharge spinning performed by the air-jet spinning device that performs spinning to form the yarn by twisting the fiber bundle and during regular spinning performed by the air-jet spinning device after the yarn discharge spinning. The peripheral speed of the yarn pooling roller that pools the yarn by winding the yarn formed by the air-jet spinning device on a surface thereof is caused to differ during the yarn discharge spinning and during the regular spinning.

[0094] With this method, productivity can be enhanced without reducing the success rate of yarn discharge spinning. By changing the peripheral speed of not only the front roller but also the yarn pooling roller, yarn breakage

or yarn slackening that accompanies a change in the peripheral speed of the front roller can be prevented.

Claims

1. A spinning machine comprising:

a drafting device (7) that includes plural draft rollers (16, 17, 19, 20), including a front roller (20), and is adapted to draft a fiber bundle (8);
an air-jet spinning device (9) adapted to perform spinning to form a yarn (10) by twisting the fiber bundle (8) drafted by the drafting device (7); and
a yarn pooling roller (41) adapted to pool the yarn (10) by winding the yarn (10) formed by the air-jet spinning device (9) on a surface thereof while pulling the yarn (10) from the air-jet spinning device (9), **characterized in that**
a peripheral speed of the front roller (20) during yarn discharge spinning and during regular spinning performed after the yarn discharge spinning is different, and
a peripheral speed of the yarn pooling roller (41) during the yarn discharge spinning and during the regular spinning is different; wherein

a peripheral speed of the front roller (20) during the yarn discharge spinning is slower than a peripheral speed of the front roller during (20) the regular spinning, and
a peripheral speed of the yarn pooling roller (41) during the yarn discharge spinning is slower than a peripheral speed of the yarn pooling roller (41) during the regular spinning.

2. A spinning machine comprising:

a drafting device (7) that includes plural draft rollers (16. 17, 19, 20), including a front roller (20), and is adapted to draft a fiber bundle (8);
an air-jet spinning device (9) adapted to perform spinning to form a yarn (10) by twisting the fiber bundle (8) drafted by the drafting device (7); and
a yarn pooling roller (41) adapted to pool the yarn (10) by winding the yarn (10) formed by the air-jet spinning device (9) on a surface thereof while pulling the yarn (10) from the air-jet spinning device (9), **characterized in that**
a peripheral speed of the front roller (20) is increased in a time period from a time point when yarn discharge spinning ends to a time point when regular spinning starts, and
a peripheral speed of the yarn pooling roller (41) is increased in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts; wherein

a peripheral speed of the front roller (20) during the yarn discharge spinning is slower than a peripheral speed of the front roller during (20) the regular spinning, and
a peripheral speed of the yarn pooling roller (41) during the yarn discharge spinning is slower than a peripheral speed of the yarn pooling roller (41) during the regular spinning.

3. The spinning machine as claimed in Claim 1 or Claim 2, further comprising:

a first driving section (91) adapted to drive the front roller (20) to rotate; and
a second driving section (42) adapted to drive the yarn pooling roller (41) to rotate.

4. The spinning machine as claimed in Claim 3, further comprising plural spinning units (2) each of which includes the first driving section (91) and the second driving section (42),
wherein the first driving section (91) and the second driving section (42) of each spinning unit (2) being adapted to perform independently driving of the first driving section (91) and the second driving section (42) of other spinning units (2).

5. The spinning machine as claimed in any one of Claims 1 to 4, wherein a change mode of the peripheral speed of the front roller (20) and a change mode of the peripheral speed of the yarn pooling roller (41) are the same in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts.

6. The spinning machine as claimed in Claim 5, further comprising a setting section (6) adapted to set a rate of change of the peripheral speed of the front roller (20) and a rate of change of the peripheral speed of the yarn pooling roller (41) for the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts.

7. The spinning machine as claimed in any one of Claims 1 to 6, wherein a ratio of the peripheral speed of the yarn pooling roller (41) to the peripheral speed of the front roller (20) during the yarn discharge spinning and during the regular spinning is different.

8. The spinning machine as claimed in any one of Claims 1 to 7, wherein a second roller (19) arranged second from the downstream is included in the plural draft rollers (16, 17, 19, 20) of the drafting device (7), and a peripheral speed of the second roller (19) during the yarn discharge spinning and during the regular spinning is different.

9. The spinning machine as claimed in Claim 8, further

comprising a third driving section (92) adapted to drive the second roller (19).

10. The spinning machine as claimed in Claim 8 or Claim 9, wherein, in the time period from the time point when the yarn discharge spinning ends to the time point when the regular spinning starts, the peripheral speed of the front roller (20) and the peripheral speed of the second roller (19) change and a ratio of the peripheral speed of the front roller (20) to the peripheral speed of the second roller (19) changes.

11. The spinning machine as claimed in any one of Claims 1 to 10, further comprising a controller (90) adapted to control at least the drafting device (7) and the yarn pooling roller (41) .

12. The spinning machine as claimed in any one of Claims 3 to 11, wherein the first driving section (91) and the second driving section (42) are controlled such that the peripheral speeds of the front roller (20) and the yarn pooling roller (41) are synchronized with each other

13. A spinning method comprising:

causing a peripheral speed of a front roller (20) included in a drafting device (7) adapted to draft a fiber bundle (8) to differ during yarn discharge spinning performed by an air-jet spinning device (9) adapted to perform spinning to form a yarn (10) by twisting the fiber bundle (8) and during regular spinning performed by the air-jet spinning device (9) after yarn discharge spinning; and

causing a peripheral speed of a yarn pooling roller (41) adapted to pool the yarn (10) by winding the yarn (10) formed by the air-jet spinning device (9) on a surface thereof while pulling the yarn (10) from the air-jet spinning device (9) to differ during the yarn discharge spinning and during the regular spinning; wherein a peripheral speed of the front roller (20) during the yarn discharge spinning is slower than a peripheral speed of the front roller during (20) the regular spinning, and a peripheral speed of the yarn pooling roller (41) during the yarn discharge spinning is slower than a peripheral speed of the yarn pooling roller (41) during the regular spinning.

14. The spinning method according to claim 13, wherein the peripheral speeds of the front roller (20) and the yarn pooling roller (41) are synchronized with each other.

Patentansprüche

1. Spinnmaschine, umfassend:

ein Ziehwerk (7), das mehrere Ziehwalzen (16, 17, 19, 20) einschließt, einschließlich einer vorderen Walze (20), und angepasst ist, um ein Faserbündel (8) zu ziehen;
eine Luftspinnvorrichtung (9), die angepasst ist, um ein Spinnen durchzuführen, um ein Garn (10) durch Verdrehen des Faserbündels (8), das durch das Ziehwerk (7) gezogen wurde, zu bilden; und
eine Garn-Zusammenführwalze (41), die angepasst ist, um das Garn (10) durch Wickeln des Garns (10), das durch die Luftspinnvorrichtung (9) auf der Oberfläche davon gebildet wird, zusammenzuführen, während das Garn (10) von der Luftspinnvorrichtung (9) gezogen wird, **dadurch gekennzeichnet, dass**
eine periphere Geschwindigkeit der vorderen Walze (20) während eines Garnabgabespinnens und während eines regulären Spinnens, das nach dem Garnabgabespinnen durchgeführt wird, unterschiedlich ist, und
eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des Garnabgabespinnens und während des regulären Spinnens, das nach dem Garnabgabespinnen durchgeführt wird, unterschiedlich ist; wobei
eine periphere Geschwindigkeit der vorderen Walze (20) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der vorderen Walze (20) während des regulären Spinnens, und
eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des regulären Spinnens.

2. Spinnmaschine, umfassend:

ein Ziehwerk (7), das mehrere Ziehwalzen (16. 17, 19, 20) einschließt, einschließlich einer vorderen Walze (20), und angepasst ist, um ein Faserbündel (8) zu ziehen;
eine Luftspinnvorrichtung (9), die angepasst ist, um ein Spinnen durchzuführen, um ein Garn (10) durch Verdrehen des Faserbündels (8), das durch das Ziehwerk (7) gezogen wurde, zu bilden; und
eine Garn-Zusammenführwalze (41), die angepasst ist, um das Garn (10) durch Wickeln des Garns (10), das durch die Luftspinnvorrichtung (9) auf der Oberfläche davon gebildet wird, zusammenzuführen, während das Garn (10) von der Luftspinnvorrichtung (9) gezogen wird, **da-**

durch gekennzeichnet, dass
eine periphere Geschwindigkeit der vorderen Walze (20) in einem Zeitraum von einem Zeitpunkt, zu dem das Garnabgabespinnen endet, bis zu einem Zeitpunkt, zu dem das reguläre Spinnen beginnt, erhöht wird, und
eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) in dem Zeitraum von einem Zeitpunkt, zu dem das Garnabgabespinnen endet, bis zu einem Zeitpunkt, zu dem das reguläre Spinnen beginnt, erhöht wird; wobei
eine periphere Geschwindigkeit der vorderen Walze (20) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der vorderen Walze (20) während des regulären Spinnens, und
eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des regulären Spinnens.

3. Spinnmaschine nach Anspruch 1 oder Anspruch 2, weiter umfassend:

einen ersten Antriebsabschnitt (91), der angepasst ist, um die vordere Walze (20) anzutreiben, sodass sie rotiert; und
einen zweiten Antriebsabschnitt (42), der angepasst ist, um die Garn-Zusammenführwalze (41) anzutreiben, sodass sie rotiert.

4. Spinnmaschine nach Anspruch 3, weiter umfassend mehrere Spinneinheiten (2), von denen jede den ersten Antriebsabschnitt (91) und den zweiten Antriebsabschnitt (42) einschließt,
wobei der erste Antriebsabschnitt (91) und der zweite Antriebsabschnitt (42) jeder Spinneinheit (2) angepasst sind, um unabhängig voneinander den Antrieb des ersten Antriebsabschnitts (91) und des zweiten Antriebsabschnitts (42) anderer Spinneinheiten (2) durchzuführen.

5. Spinnmaschine nach einem der Ansprüche 1 bis 4, wobei ein Änderungsmodus der peripheren Geschwindigkeit der vorderen Walze (20) und ein Änderungsmodus der peripheren Geschwindigkeit der Garn-Zusammenführwalze (41) in dem Zeitraum von dem Zeitpunkt, zu dem das Garnabgabespinnen endet, bis zu dem Zeitpunkt, zu dem das reguläre Spinnen beginnt, gleich sind.

6. Spinnmaschine nach Anspruch 5, weiter umfassend einen Regelabschnitt (6), der angepasst ist, um eine Änderungsrate der peripheren Geschwindigkeit der vorderen Walze (20) und eine Änderungsrate der peripheren Geschwindigkeit der Garn-Zusammenführwalze (41) für den Zeitraum von dem Zeitpunkt, zu dem das Garnabgabespinnen endet, bis zu dem Zeitpunkt, zu dem das reguläre Spinnen beginnt, zu regeln.

7. Spinnmaschine nach einem der Ansprüche 1 bis 6, wobei ein Verhältnis der peripheren Geschwindigkeit der Garn-Zusammenführwalze (41) zu der peripheren Geschwindigkeit der vorderen Walze (20) während des Garnabgabespinnens und während des regulären Spinnens unterschiedlich ist.

8. Spinnmaschine nach einem der Ansprüche 1 bis 7, wobei eine zweite Walze (19), die als Zweites von der stromabwärts angeordnet ist, in den mehreren Ziehwalzen (16, 17, 19, 20) des Ziehwerks (7) eingeschlossen ist, und eine periphere Geschwindigkeit der zweiten Walze (19) während des Garnabgabespinnens und während des regulären Spinnens unterschiedlich ist.

9. Spinnmaschine nach Anspruch 8, weiter umfassend einen dritten Antriebsabschnitt (92), der angepasst ist, um die zweite Walze (19) anzutreiben.

10. Spinnmaschine nach Anspruch 8 oder Anspruch 9, wobei in dem Zeitraum von dem Zeitpunkt, zu dem das Garnabgabespinnen endet, bis zu dem Zeitpunkt, zu dem das reguläre Spinnen beginnt, die periphere Geschwindigkeit der vorderen Walze (20) und die periphere Geschwindigkeit der zweiten Walze (19) sich verändern und ein Verhältnis der peripheren Geschwindigkeit der vorderen Walze (20) zu der peripheren Geschwindigkeit der zweiten Walze (19) sich verändert.

11. Spinnmaschine nach einem der Ansprüche 1 bis 10, weiter umfassend eine Steuerung (90) die angepasst ist, um mindestens das Ziehwerk (7) und die Garn-Zusammenführwalze (41) zu steuern.

12. Spinnmaschine nach einem der Ansprüche 3 bis 11, wobei der erste Antriebsabschnitt (91) und der zweite Antriebsabschnitt (42) so gesteuert werden, dass die peripheren Geschwindigkeiten der vorderen Walze (20) und der Garn-Zusammenführwalze (41) miteinander synchronisiert sind.

13. Spinnverfahren, umfassend:

Verursachen, dass eine periphere Geschwindigkeit einer vorderen Walze (20), die in einem Ziehwerk (7) eingeschlossen ist, das angepasst ist, um ein Faserbündel (8) zu ziehen, sich während eines Garnabgabespinnens, das durch eine Luftspinnvorrichtung (9) durchgeführt wird, die angepasst ist, das Spinnen durchzuführen, um ein Garn (10) durch Verdrehen des Faserbündels (8) zu bilden, und während des regulä-

ren Spinnens, das durch die Luftspinnvorrichtung (9) durchgeführt wird, nachdem das Garnabgabespinnen beendet wurde, unterscheidet; und

Verursachen, dass eine periphere Geschwindigkeit einer Garn-Zusammenführwalze (41), die angepasst ist, um das Garn (10) durch Wickeln des Garns (10), das durch die Luftspinnvorrichtung (9) auf einer Oberfläche davon gebildet wird, während das Garn (10) von der Luftspinnvorrichtung (9) gezogen wird, sich während des Garnabgabespinnens und während des regulären Spinnens unterscheidet; wobei eine periphere Geschwindigkeit der vorderen Walze (20) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der vorderen Walze (20) während des regulären Spinnens, und eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des Garnabgabespinnens langsamer ist als eine periphere Geschwindigkeit der Garn-Zusammenführwalze (41) während des regulären Spinnens.

14. Spinnverfahren nach Anspruch 13, wobei die peripheren Geschwindigkeiten der vorderen Walze (20) und der Garn-Zusammenführwalze (41) miteinander synchronisiert sind.

Revendications

1. Métier à filer comprenant :

un dispositif d'étirage (7) qui inclut plusieurs cylindres étireurs (16, 17, 19, 20), incluant un cylindre avant (20), et est adapté pour étirer un faisceau de fibres (8) ;

un dispositif de filage à jet d'air (9) adapté pour réaliser un filage pour former un fil (10) en torsadant le faisceau de fibres (8) étiré par le dispositif d'étirage (7) ; et

un cylindre de stockage de fil (41) adapté pour stocker le fil (10) en enroulant le fil (10) formé par le dispositif de filage à jet d'air (9) sur une surface de celui-ci tout en tirant le fil (10) du dispositif de filage à jet d'air (9), **caractérisé en ce que**

une vitesse périphérique du cylindre avant (20) pendant le filage de décharge de fil et pendant le filage normal réalisé après le filage de décharge de fil est différente, et

une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage de décharge de fil et pendant le filage normal est différente ; dans lequel

une vitesse périphérique du cylindre avant (20) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre avant (20) pendant le filage normal, et

une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage normal.

2. Métier à filer comprenant :

un dispositif d'étirage (7) qui inclut plusieurs cylindres étireurs (16. 17, 19, 20), incluant un cylindre avant (20), et est adapté pour étirer un faisceau de fibres (8) ;

un dispositif de filage à jet d'air (9) adapté pour réaliser un filage pour former un fil (10) en torsadant le faisceau de fibres (8) étiré par le dispositif d'étirage (7) ; et

un cylindre de stockage de fil (41) adapté pour stocker le fil (10) en enroulant le fil (10) formé par le dispositif de filage à jet d'air (9) sur une surface de celui-ci tout en tirant le fil (10) du dispositif de filage à jet d'air (9), **caractérisé en ce que**

une vitesse périphérique du cylindre avant (20) est augmentée durant une période à partir d'un point dans le temps où le filage de décharge de fil se termine jusqu'à un point dans le temps où le filage normal commence, et

une vitesse périphérique du cylindre de stockage de fil (41) est augmentée durant la période à partir du point dans le temps où le filage de décharge de fil se termine jusqu'au point dans le temps où le filage normal commence ; dans lequel

une vitesse périphérique du cylindre avant (20) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre avant (20) pendant le filage normal, et

une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage normal.

3. Métier à filer selon la revendication 1 ou la revendication 2, comprenant en outre :

une première section d'entraînement (91) adaptée pour entraîner la rotation du cylindre avant (20) ; et

une deuxième section d'entraînement (42) adaptée pour entraîner la rotation du cylindre de stockage de fil (41).

4. Métier à filer selon la revendication 3, comprenant en outre plusieurs unités de filage (2) dont chacune inclut la première section d'entraînement (91) et la

seconde section d'entraînement (42),
dans lequel la première section d'entraînement (91) et la deuxième section d'entraînement (42) de chaque unité de filage (2) étant adaptées pour réaliser indépendamment l'entraînement de la première section d'entraînement (91) et de la deuxième section d'entraînement (42) d'autres unités de filage (2).

5. Métier à filer selon l'une quelconque des revendications 1 à 4, dans lequel un mode de changement de la vitesse périphérique du cylindre avant (20) et un mode de changement de la vitesse périphérique du cylindre de stockage de fil (41) sont les mêmes dans la période à partir du point dans le temps où le filage de décharge de fil se termine jusqu'au point dans le temps où le filage normal commence.

6. Métier à filer selon la revendication 5, comprenant en outre une section de paramétrage (6) adaptée pour paramétrer un taux de changement de la vitesse périphérique du cylindre avant (20) et un taux de changement de la vitesse périphérique du cylindre de décharge de fil (41) pour la période à partir du point dans le temps où le filage de décharge de fil se termine jusqu'au point dans le temps où le filage normal commence.

7. Métier à filer selon l'une quelconque des revendications 1 à 6, dans lequel un rapport de la vitesse périphérique du cylindre de stockage de fil (41) à la vitesse périphérique du cylindre avant (20) pendant le filage de décharge de fil et pendant le filage normal est différent.

8. Métier à filer selon l'une quelconque des revendications 1 à 7, dans lequel un second cylindre (19) agencé en second depuis l'aval est inclus dans les plusieurs cylindres étireurs (16, 17, 19, 20) du dispositif d'étirage (7), et une vitesse périphérique du second cylindre (19) pendant le filage de décharge de fil et pendant le filage normal est différente.

9. Métier à filer selon la revendication 8, comprenant en outre une troisième section d'entraînement (92) adaptée pour entraîner le second cylindre (19).

10. Métier à filer selon la revendication 8 ou la revendication 9, dans lequel, dans la période à partir du point dans le temps où le filage de décharge de fil se termine jusqu'au point dans le temps où le filage normal commence, la vitesse périphérique du cylindre avant (20) et la vitesse périphérique du second cylindre (19) changent et un rapport de la vitesse périphérique du cylindre avant (20) à la vitesse périphérique du second cylindre (19) change.

11. Métier à filer selon l'une quelconque des revendications 1 à 10, comprenant en outre un dispositif de commande (90) adapté pour commander au moins le dispositif d'étirage (7) et le cylindre de stockage de fil (41).

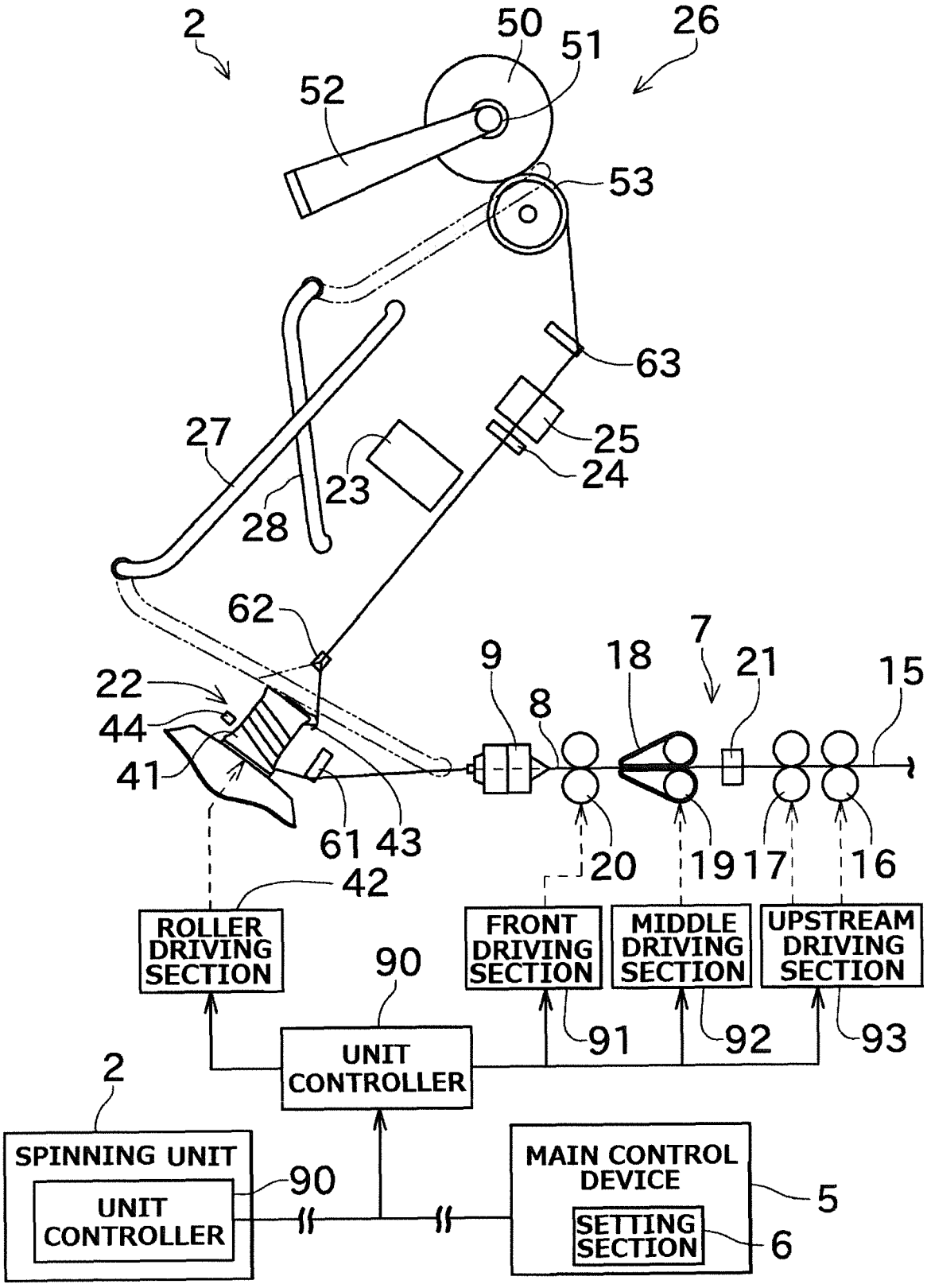
12. Métier à filer selon l'une quelconque des revendications 3 à 11, dans lequel la première section d'entraînement (91) et la deuxième section d'entraînement (42) sont commandées de sorte que les vitesses périphériques du cylindre avant (20) et du cylindre de stockage de fil (41) sont synchronisées l'une avec l'autre.

13. Procédé de filage comprenant :

le fait de faire différer une vitesse périphérique d'un cylindre avant (20) inclus dans un dispositif d'étirage (7) adapté pour étirer un faisceau de fibres (8) pendant le filage de décharge de fil réalisé par un dispositif de filage à jet d'air (9) adapté pour réaliser un filage pour former un fil (10) en torsadant le faisceau de fibres (8) et pendant le filage normal réalisé par le dispositif de filage à jet d'air (9) après le filage de décharge de fil ; et
le fait de faire différer une vitesse périphérique d'un cylindre de stockage de fil (41) adapté pour stocker le fil (10) en enroulant le fil (10) formé par le dispositif de filage à jet d'air (9) sur une surface de celui-ci tout en tirant le fil (10) du dispositif de filage à jet d'air (9) pendant le filage de décharge de fil et pendant le filage normal ; dans lequel une vitesse périphérique du cylindre avant (20) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre avant (20) pendant le filage normal, et une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage de décharge de fil est plus faible qu'une vitesse périphérique du cylindre de stockage de fil (41) pendant le filage normal.

14. Procédé de filage selon la revendication 13, dans lequel les vitesses périphériques du cylindre avant (20) et du cylindre de stockage de fil (41) sont synchronisées l'une avec l'autre.

FIG.1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7
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44
41
61
43
20
19
17
16
42
ROLLER DRIVING SECTION
90
FRONT DRIVING SECTION
MIDDLE DRIVING SECTION
UPSTREAM DRIVING SECTION
91
92
93
UNIT CONTROLLER
2
SPINNING UNIT
UNIT CONTROLLER
90
MAIN CONTROL DEVICE
5
SETTING SECTION
6

FIG.2

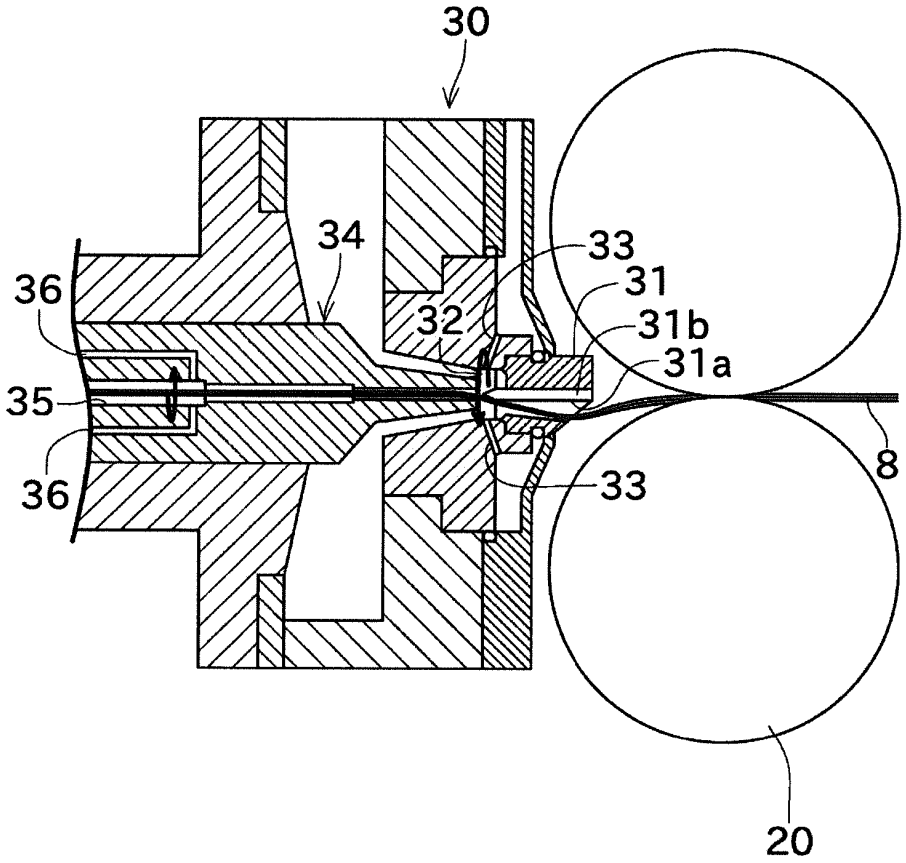

FIG.3

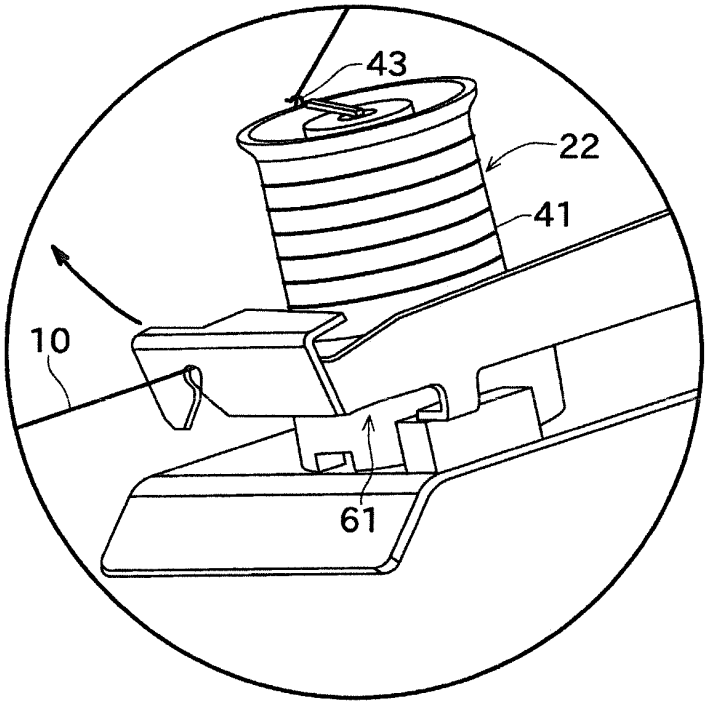

FIG.4

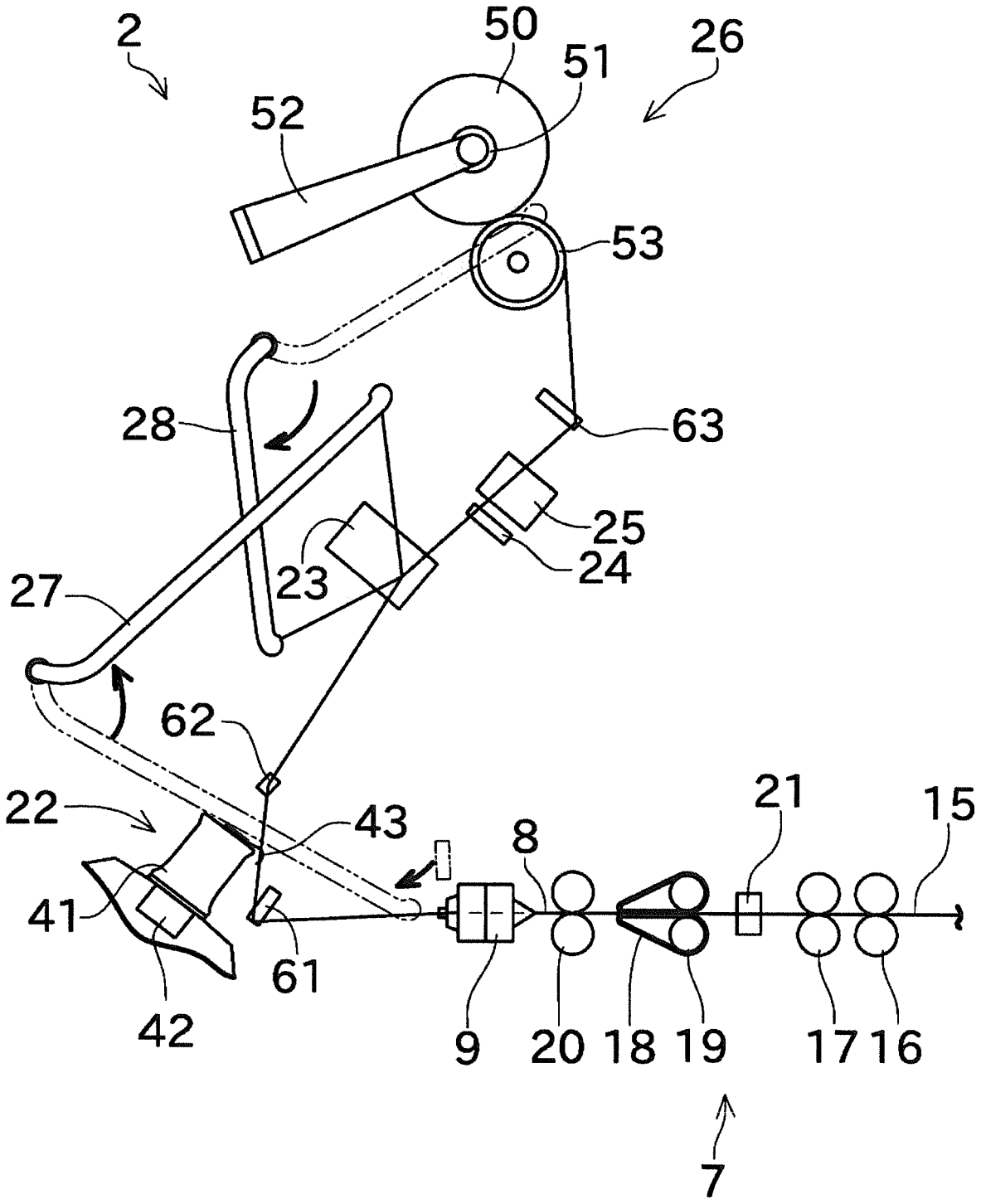
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FIG.5A

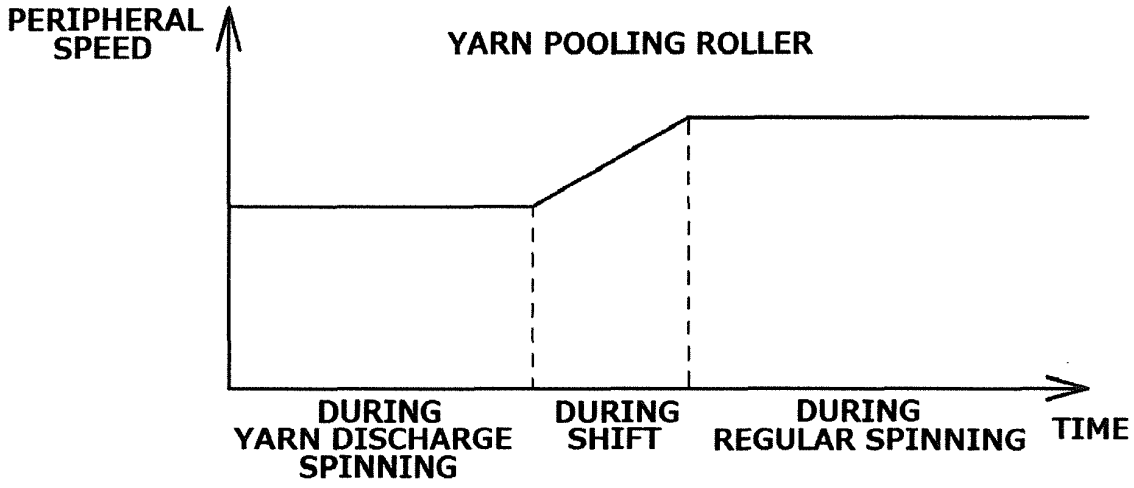

FIG.5B

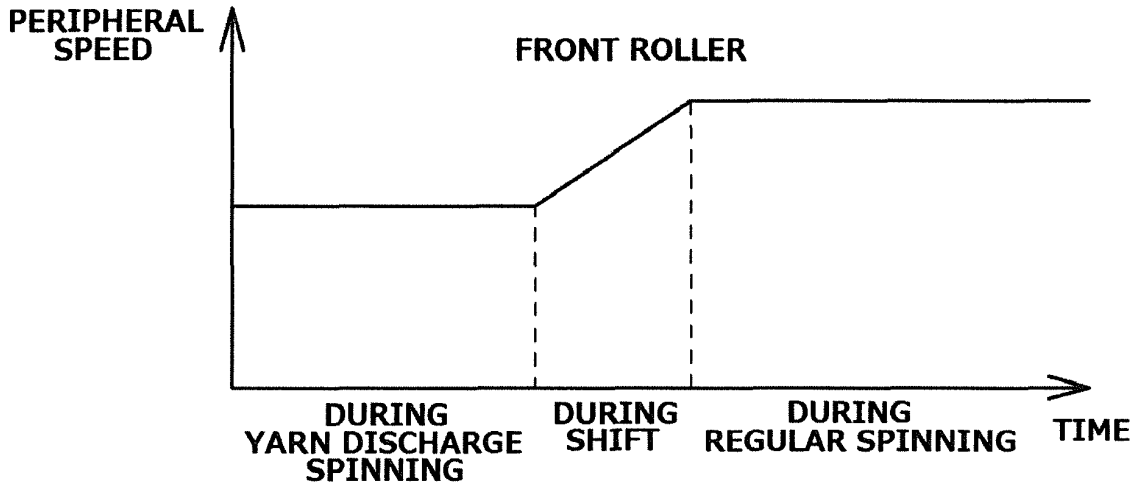

FIG.5C

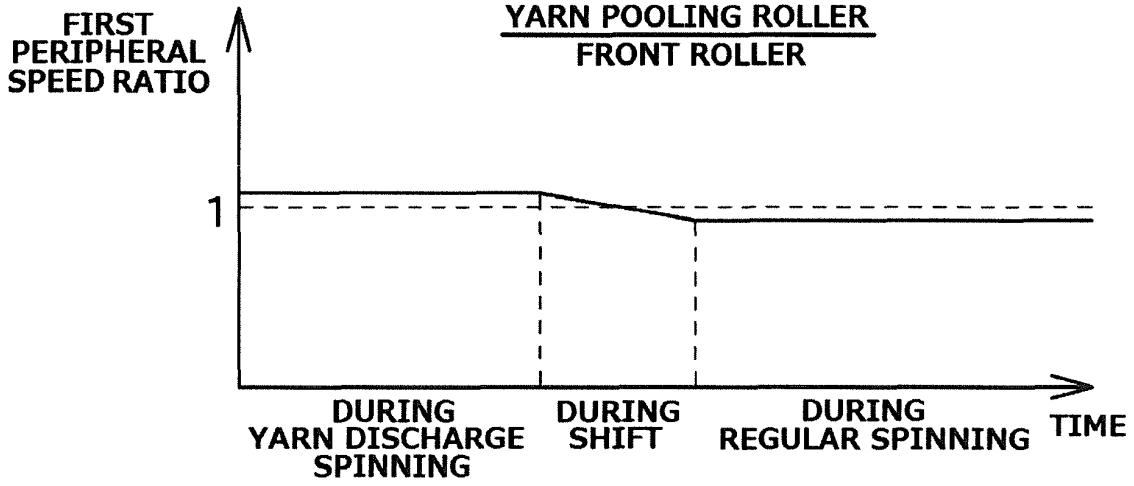

FIG.6A

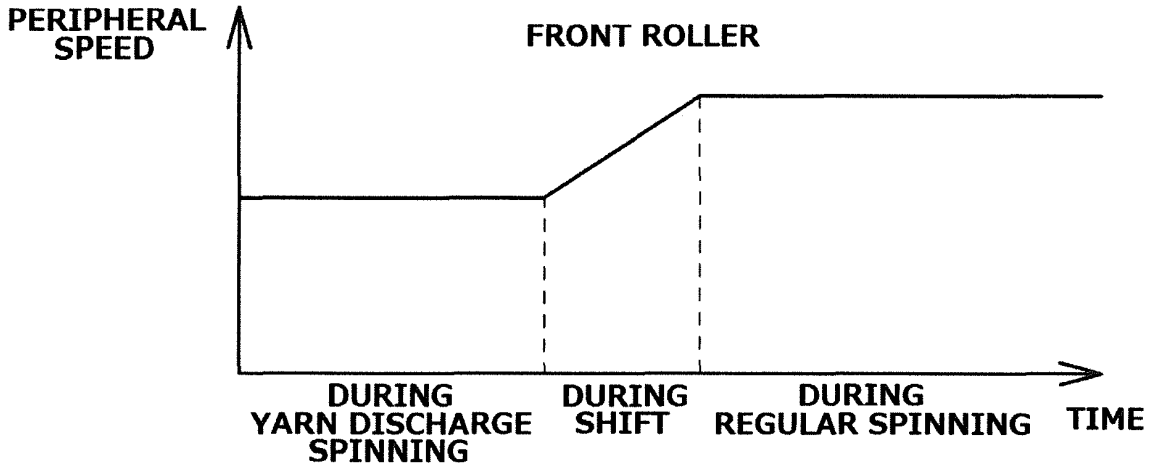

FIG.6B

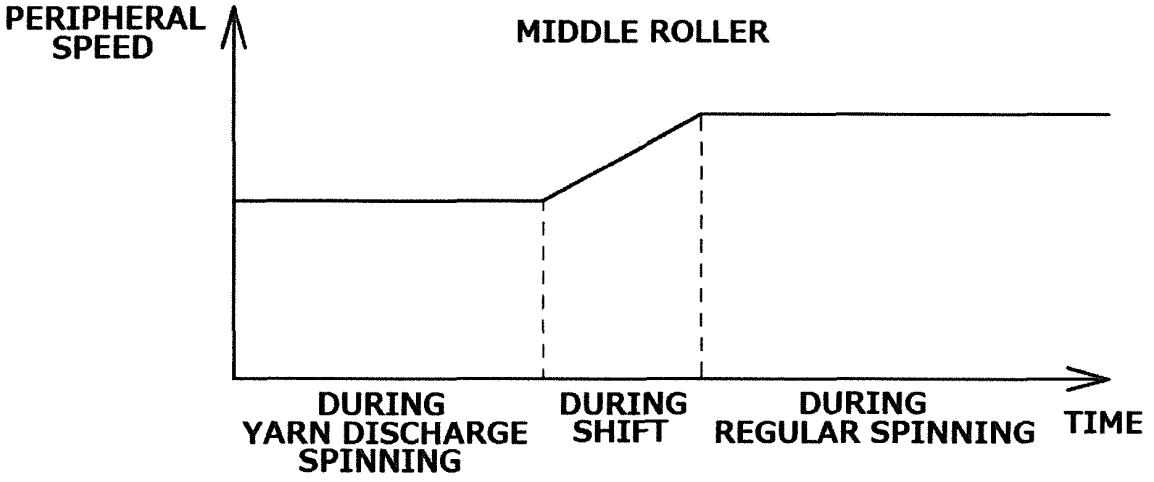

FIG.6C

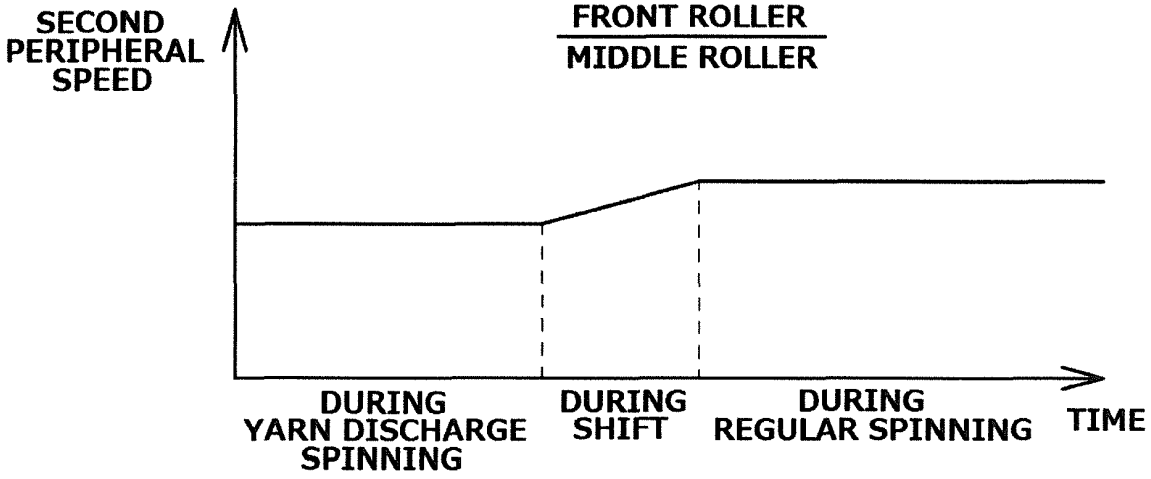

FIG.7A

DURING YARN DISCHARGE SPINNING	
PERIPHERAL SPEED OF YARN POOLING ROLLER	•••
PERIPHERAL SPEED OF FRONT ROLLER	•••
PERIPHERAL SPEED OF MIDDLE ROLLER	•••
FIRST PERIPHERAL SPEED RATIO(YARN POOLING ROLLER/FRONT ROLLER)	•••
SECOND PERIPHERAL SPEED RATIO(FRONT ROLLER/MIDDLE ROLLER)	•••

FIG.7B

DURING SHIFT	
RATE OF CHANGE OF PERIPHERAL SPEED OF YARN POOLING ROLLER RATE OF CHANGE OF PERIPHERAL SPEED OF FRONT ROLLER RATE OF CHANGE OF PERIPHERAL SPEED OF MIDDLE ROLLER	•••

FIG.7C

DURING REGULAR SPINNING	
PERIPHERAL SPEED OF YARN POOLING ROLLER	•••
PERIPHERAL SPEED OF FRONT ROLLER	•••
PERIPHERAL SPEED OF MIDDLE ROLLER	•••
FIRST PERIPHERAL SPEED RATIO (YARN POOLING ROLLER/FRONT ROLLER)	•••
SECOND PERIPHERAL SPEED RATIO (FRONT ROLLER/MIDDLE ROLLER)	•••

REFERENCES CITED IN THE DESCRIPTION

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- JP 2010077576 A **[0005] [0067]**