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(54) **Yarn processing method and spinning machine**

Garnverarbeitungsverfahren und Spinnmaschine

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn processing method and a spinning machine. More specifically, the present invention relates to a method and a structure for feeding spun yarn from a spinning device by a yarn accumulating roller.

2. Description of the Related Art

[0002] Japanese Unexamined Patent Application Publication No. 2004-124333 discloses a spinning machine including a spinning device, a delivery roller, a yarn defect detecting device, and a yarn accumulating device (yarn slack eliminating device). A nip roller is arranged to face the delivery roller. Spun yarn is nipped between the delivery roller and the nip roller. When the delivery roller is driven and rotated, tension directed to a downstream side of a yarn traveling direction is applied to the nipped spun yarn, and thus, the spun yarn is fed from the spinning device. The yarn accumulating device is arranged downstream of the delivery roller, and includes a yarn accumulating roller (yarn slack eliminating roller) arranged to wind the spun yarn around an outer periphery thereof. The yarn accumulating roller is driven and rotated to temporarily accumulate the spun yarn sequentially fed from the spinning device around the outer periphery thereof. Thus, the yarn accumulating roller prevents slackening of the spun yarn generated during a yarn splicing operation. The yarn defect detecting device is arranged between the delivery roller and the yarn accumulating device, and monitors a thickness of the spun yarn in order to detect a yarn defect in the spun yarn.

[0003] In such a spinning machine, when the spun yarn of sufficient length is not wound around the yarn accumulating roller, a contact area between the yarn accumulating roller and the spun yarn becomes insufficient. As a result, the spun yarn slips on the yarn accumulating roller, and yarn tension at an upstream side of the yarn accumulating device decreases. Therefore, it is preferable to drive and rotate the yarn accumulating roller under a state in which at least a certain amount of the spun yarn is always accumulated on the yarn accumulating roller. However, during a yarn splicing operation, because the spun yarn is wound around an empty yarn accumulating roller, a state of insufficient yarn accumulated amount cannot be avoided. As a result, the yarn tension decreases at the upstream side of the yarn accumulating roller during the yarn splicing operation (particularly at the start of the yarn splicing operation).

[0004] As described above, when the yarn tension decreases, an accuracy of detecting a yarn defect by the yarn defect detecting device is reduced. That is, since a yarn defect detecting device detects a yarn defect by monitoring the yarn thickness, when the visual thickness of the spun yarn increases due to the decrease in the yarn tension, thickness unevenness that should be normally allowed may be detected as a yarn defect. As a result, a spinning operation may be frequently stopped. In order to prevent such a stoppage, a detection level of yarn defect detection may be temporarily moderated than usual at the start of the yarn splicing operation. However, in such a method, a yarn defect that should be normally removed may not be detected, which thereby can reduce a yarn quality. Accordingly, the yarn defect could not be detected accurately during the yarn splicing operation in such a spinning machine including the yarn accumulating roller.

[0005] When feeding the spun yarn from the spinning device, the spun yarn tends to slip on the nip roller due to an insufficient nipping force of the nip roller. Meanwhile, the yarn accumulating roller can stably pull (feed) the spun yarn as long as the yarn accumulating roller is driven and rotated under the state in which the spun yarn of sufficient length is wound around the outer periphery thereof. Thus, the delivery roller may be omitted, and the spun yarn may be directly fed (pulled out) from the spinning device by the yarn accumulating device. In the description, such a spinning machine including the above-described features will be referred to as a spinning machine without a delivery roller.

[0006] Such a spinning machine without a delivery roller can feed the spun yarn from the spinning device with more stable tension as compared with a spinning machine using a delivery roller. Therefore, it can be assumed that packages with consistent quality are formed. However, even in the spinning machine without a delivery roller, a yarn accumulated amount on the yarn accumulating roller may become insufficient during a yarn splicing operation. In such a case, in addition to the above-described problem in which the accuracy of detecting the yarn defect is reduced, the following problem may occur. That is, since the spinning machine without a delivery roller directly feeds the spun yarn from the spinning device by the yarn accumulating device, when a force of the yarn accumulating device pulling the spun yarn changes, a quality of the yarn to be spun is greatly affected. Accordingly, when the yarn accumulated amount becomes insufficient and the yarn tension is resultantly reduced at the start of the yarn splicing operation or the like, the quality of the spun yarn becomes unstable. In the following description, a stable state and an unstable state of a spinning quality of the spun yarn in the spinning device may be simply referred to as "stable" and "unstable", respectively.

[0007] From US 4,553,709 A, EP 1 598 295 A, EP 2 028 149 A and EP 1 717 182 A a yarn processing method comprising a yarn guiding step of guiding spun yarn fed from a spinning device to an outer peripheral surface of a yarn accumulating roller; an accumulated amount increasing step of feeding the spun yarn from the spinning device by winding the spun yarn around the outer periph-

eral surface of the yarn accumulating roller and increasing an accumulated amount of the spun yarn accumulated on the yarn accumulating roller as well as a spinning machine comprising a spinning device which forms a spun yarn by applying twists to a fiber bundle; a winding device which forms a package by winding the spun yarn fed from the spinning device and a yarn accumulating roller which winds the spun yarn around an outer peripheral surface thereof and rotates with the spun yarn wound around to feed the spun yarn from the spinning device while applying tension to the spun yarn is already known.

[0008] A similar yarn processing method for a yarn winder Is disclosed in EP 1 764 333 A2.

[0009] As described above, in the spinning machine without a delivery roller, the accuracy of detecting the yarn defect during the yarn splicing operation may become insufficient, and moreover, the spun yarn with unstable quality may be wound into a package.

SUMMARY OF THE INVENTION

[0010] In order to overcome the problems described above, the present invention provides a spinning machine without a delivery roller that can prevent a portion having unstable yarn quality from being mixed into a package during a yarn splicing operation and a corresponding yarn processing method.

[0011] According to a first aspect of the present invention, a yarn processing method includes a yarn catching step, a yarn hooking step, an accumulated amount increasing step, and a yarn disposing step. In the yarn catching step, before winding spun yarn fed from a spinning device around a yarn accumulating roller, a yarn catching section sucks and catches the spun yarn. In the yarn hooking step, the spun yarn extending from the spinning device to the yarn catching section is engaged with a yarn hooking section that is integrally rotated with the yarn accumulating roller, and thus the spun yarn is guided to an outer peripheral surface of the yarn accumulating roller. In the accumulated amount increasing step, while feeding the spun yarn from the spinning device by winding the spun yarn around the outer peripheral surface of the yarn accumulating roller, an accumulated amount of the spun yarn accumulated on the yarn accumulating roller is increased. In the yarn disposing step, after the accumulated amount reaches a prescribed amount, the spun yarn accumulated on the yarn accumulating roller is disposed while maintaining the accumulated amount to be at least the prescribed amount. After the yarn disposing step, the process proceeds to a subsequent operation.

[0012] Accordingly, yarn feeding tension is stabilized by winding at least a certain amount of the spun yarn around the yarn accumulating roller, and thus, the spun yarn can be stably fed from the spinning device. When the amount of the spun yarn on the yarn accumulating roller is insufficient, the spun yarn cannot be stably fed from the spinning device, and the yarn quality may become unstable, however, in the present invention, such occurrences of unstable yarn can be appropriately handled. That is, in the above-described yarn processing method, after a yarn portion having unstable yarn quality is once wound around the yarn accumulating roller so as to obtain a sufficient accumulated amount, while winding the spun yarn having stable quality, the unstable yarn portion may be disposed. Accordingly, when proceeding to the subsequent operation, only the stable spun yarn is accumulated on the yarn accumulating roller.

[0013] In the above-described yarn processing method, the following method is preferably adopted. That is, in the yarn disposing step, by removing the spun yarn from the yarn hooking section, the spun yarn accumulated on the yarn accumulating roller is sucked and disposed by the yarn catching section. Accordingly, by a simple operation of removing the yarn from the yarn hooking section, the spun yarn can be sucked and disposed by the yarn catching section.

[0014] In the above-described yarn processing method, when the tension is stabilized by winding at least the prescribed amount of the spun yarn engaged with the yarn hooking section, the yarn hooking section unwinds the spun yarn from the yarn accumulating roller. In the yarn disposing step, by increasing a suction force of the yarn catching section, the yarn tension between the yarn catching section and the yarn hooking section is increased, and the spun yarn accumulated on the yarn accumulating roller is sucked and disposed. Accordingly, since the yarn catching section can suck and dispose the spun yarn simply by increasing the suction force of the yarn catching section, a special movable member is not necessary for disposing the spun yarn, which thereby can reduce a cost.

[0015] According to a second aspect of the present invention, a spinning machine includes a spinning device, a winding device, a yarn accumulating roller, a yarn hooking section, and an accumulated yarn disposing section. The spinning device forms spun yarn by applying twists to a fiber bundle. The winding device forms a package by winding the spun yarn fed from the spinning device. The yarn accumulating roller winds the spun yarn around an outer peripheral surface thereof and rotates with the spun yarn wound around to feed the spun yarn from the spinning device while applying tension to the spun yarn. The yarn hooking section can be engaged with the spun yarn, and rotates integrally with the yarn accumulating roller while being engaged with the spun yarn to wind the spun yarn around the outer peripheral surface of the yarn accumulating roller. The accumulated yarn disposing section disposes the spun yarn wound around the yarn accumulating roller.

[0016] Accordingly, the feeding tension is stabilized by winding at least a certain amount of the spun yarn around the yarn accumulating roller, and the spun yarn can be stably fed from the spinning device. When the amount of the spun yarn on the yarn accumulating roller is insufficient, the spun yarn may not be stably fed from the spin-

ning device, and the quality of the spun yarn may become unstable. However, in the present invention, such occurrences of unstable spinning operation can be appropriately handled. That is, according to the structure of the present invention, after a yarn portion having unstable spinning quality is once wound around the yarn accumulating roller so as to obtain a sufficient accumulated amount, while winding the spun yarn having stable quality, the unstable yarn portion can be disposed. Accordingly, only the stable spun yarn is accumulated on the yarn accumulating roller. Therefore, since the unstable portion of the spun yarn can be prevented from being mixed into a package, packages with good quality can be formed.

[0017] In the spinning machine, the accumulated yarn disposing section is a yarn removing member. The yarn removing member is arranged downstream of the yarn hooking section in a yarn feeding direction, and can be moved between a first position where the yarn removing member does not make contact with the spun yarn and a second position where the yarn removing member makes contact with the spun yarn. When the yarn removing member is located at the second position, the yarn removing member removes the spun yarn from the yarn hooking section. Accordingly, by a simple structure of moving the yarn removing member, the spun yarn can be removed from the yarn hooking section, and the unstable portion of the spun yarn can be unwound from the yarn accumulating roller.

[0018] In the spinning machine, the spinning device includes a yarn removal driving section that drives the yarn removing member. When the spun yarn wound around the yarn accumulating roller is less than the prescribed amount, the yarn removal driving section moves the yarn removing member to the first position. After at least the prescribed amount of the spun yarn is wound around the yarn accumulating roller, the yarn removal driving section moves the yarn removing member to the second position.

[0019] That is, if an operation of unwinding the spun yarn from the yarn accumulating roller is started under a state in which a sufficient amount of the spun yarn has not been wound around the yarn accumulating roller, a yarn portion having unstable yarn quality is sequentially wound around the yarn accumulating roller, and as a result, the spun yarn having stable quality cannot be accumulated on the yarn accumulating roller. However, according to the structure of the present invention, after the spun yarn is sufficiently wound around the yarn accumulating roller so as to feed the spun yarn stably from the spinning device, the spun yarn on the yarn accumulating roller can be unwound. Accordingly, the unstable portions of the spun yarn on the yarn accumulating roller are sequentially replaced with portions having stable quality, and after all the unstable yarn portions are unwound, only the spun yarn stably fed from the spinning device is wound around the yarn accumulating roller.

[0020] The spinning machine includes a yarn defect detecting device that monitors a presence or an absence of a yarn defect in the spun yarn. When the spun yarn wound on the yarn accumulating roller is less than the prescribed amount, the yarn defect detecting device temporarily stops the monitoring of the yarn defect. After at least the prescribed amount of the spun yarn is wound on the yarn accumulating roller, the yarn defect detecting device restarts the monitoring of the yarn defect.

[0021] That is, if the monitoring of the yarn defect is started under the state in which a sufficient amount of the spun yarn has not been wound on the yarn accumulating roller, an accurate detection result cannot be expected due to unstable yarn tension. On this point, according to the structure of the present invention, if the yarn amount on the yarn accumulating roller is insufficient, the monitoring of the yarn defect is temporarily stopped, and after the spun yarn is sufficiently wound on the yarn accumulating roller so as to stably feed the spun yarn from the spinning device, the monitoring of the yarn defect can be restarted. Accordingly, after the unstable portions are unwound, only the spun yarn in which the presence and/or the absence of the yarn defect has been properly detected is wound on the yarn accumulating roller. Moreover, since the monitoring of the yarn defect may be performed only after the yarn tension becomes stable, it is not necessary to change a setting for yarn defect detection for when the yarn tension is unstable, and a control operation can be simplified.

[0022] In the spinning machine, after the elapse of a prescribed period of time after the yarn removing member is moved to the second position, the yarn removal driving section preferably moves back the yarn removing member to the first position. Thus, after all the unstable portions of the spun yarn are unwound from the yarn accumulating roller, the unwinding of the spun yarn can be stopped, and only the spun yarn stably fed from the spinning device can be accumulated on the yarn accumulating roller.

[0023] The spinning machine includes a yarn splicing device and a yarn catching section. The yarn catching section catches the spun yarn from the spinning device by suction airflow and guides the spun yarn to the yarn splicing device. After the spun yarn is guided to the yarn splicing device by the yarn catching section, and the spun yarn wound around the yarn accumulating roller reaches at least the prescribed amount, and before the yarn splicing device starts a yarn splicing operation, the yarn removal driving section moves the yarn removing member to the second position.

[0024] Accordingly, after the spun yarn is wound on the yarn accumulating roller to a degree that the spun yarn can be stably fed from the spinning device, and before the yarn splicing operation is performed, the spun yarn can be unwound from the yarn accumulating roller. By sucking the unwound spun yarn by the yarn catching section, the unstable portions of the spun yarn can be disposed. Accordingly, after the unstable portions are unwound and disposed, only the spun yarn stably fed from

the spinning device is wound on the yarn accumulating roller. By performing the yarn splicing operation in this state, the unstable spun yarn can be prevented from being mixed into a package from the yarn accumulating roller.

[0025] The spinning machine includes a plurality of spinning units and an operation cart. The spinning unit includes the spinning device, the winding device, the yarn accumulating roller, the yarn hooking section, and the yarn removing member. The operation cart can travel among the plurality of spinning units, and includes the yarn removal driving section. Accordingly, it is not necessary to provide each of the spinning units with the yarn removal driving section, which thereby can reduce a cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 is a front view of an entire structure of a spinning machine according to an embodiment of the present invention.

Fig. 2 is a longitudinal cross-sectional view of the spinning machine.

Fig. 3 is a longitudinal cross-sectional view of a yarn accumulating device.

Fig. 4 is an external perspective view of the yarn accumulating device.

Fig. 5 is a longitudinal cross-sectional view illustrating a state in which a suction pipe and a suction mouth respectively catch an upper yarn and a lower yarn.

Fig. 6 is a longitudinal cross-sectional view illustrating a state that is immediately after the upper yarn and the lower yarn are guided to a splicer.

Fig. 7 is a longitudinal cross-sectional view illustrating a state that is immediately after a yarn accumulating roller starts winding of the spun yarn.

Fig. 8 is a longitudinal cross-sectional view illustrating a state in which the spun yarn is being accumulated on the yarn accumulating roller.

Fig. 9 is a longitudinal cross-sectional view illustrating a state in which an unstable portion of the yarn is being unwound from the yarn accumulating roller.

Fig. 10 is a graph schematically illustrating changes in yarn feeding tension from a spinning device and changes in an accumulated amount of the yarn on the yarn accumulating roller.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0027] Next, a spinning machine according to an embodiment of the present invention will be described with reference to the drawings. In the description, "upstream" and "downstream" respectively refer to upstream and downstream in a direction in which a yarn travels during a spinning operation.

[0028] A spinning machine 1 of Fig. 1 includes a plurality of aligned units (spinning units) 2. The spinning machine 1 includes a yarn splicing cart 3, a blower box 80, and a motor box 5.

[0029] As illustrated in Fig. 1, each of the spinning units 2 primarily includes a draft device 7, a spinning device 9, a yarn accumulating device 12, and a winding device 13, which are arranged in this order from the upstream to the downstream. The draft device 7 is provided near an upper end of a frame 6 of the spinning machine 1. The spinning device 9 spins a fiber bundle 8 fed from the draft device 7. After a spun yarn 10 fed from the spinning device 9 passes through a later-described yarn clearer 52, the spun yarn 10 is fed by the yarn accumulating device 12. Then, the spun yarn 10 is wound by the winding device 13 and formed into a package 45 (winding step) .

[0030] The draft device 7 drafts a sliver 15 into the fiber bundle 8. As illustrated in Fig. 2, the draft device 7 includes a back roller 16, a third roller 17, a middle roller 19, and a front roller 20. Further, an apron belt 18 is wound around the middle roller 19.

[0031] Although a detailed structure of the spinning device 9 is not illustrated, the spinning device 9 according to the present embodiment is a pneumatic type that uses whirling airflow to apply twists to the fiber bundle 8 and forms the spun yarn 10.

[0032] The yarn accumulating device 12 is provided downstream of the spinning device 9. The yarn accumulating device 12 includes a function of applying prescribed tension to the spun yarn 10 and feeding the spun yarn 10 from the spinning device 9. The yarn accumulating device 12 also includes a function of preventing yarn slackening by accumulating the spun yarn 10 fed from the spinning device 9 during a yarn splicing operation or the like performed by the yarn splicing cart 3 (to be described later). The yarn accumulating device 12 further includes a function of adjusting the tension such that a change in the tension at the winding device 13 (to be described later) is not transmitted to the spinning device 9. As illustrated in Fig. 2, the yarn accumulating device 12 includes a yarn accumulating roller 21, a yarn hooking member (yarn hooking section) 22, an upstream guide 23, an electric motor 25, a downstream guide 26, a yarn accumulated amount sensor (accumulated amount detecting section) 27, and a yarn removing lever (yarn removing member) 28.

[0033] The yarn hooking member 22 can be engaged with (can hook) the spun yarn 10. By integrally rotating with the yarn accumulating roller 21 while being engaged with the spun yarn 10, the yarn hooking member 22 can guide the spun yarn 10 to an outer peripheral surface of the yarn accumulating roller 21.

[0034] The yarn accumulating roller 21 can wind and accumulate the spun yarn 10 around the outer peripheral surface thereof. The yarn accumulating roller 21 is rotationally driven at a constant rotation speed by the electric motor 25. When the yarn accumulating roller 21 is rotat-

ed, the spun yarn 10 guided to the outer peripheral surface of the yarn accumulating roller 21 by the yarn hooking member 22 is wound as if to tighten the yarn accumulating roller 21, and pulls the spun yarn 10 located upstream of the yarn accumulating device 12. Thus, the yarn accumulating device 12 can sequentially pull out the spun yarn 10 from the spinning device 9.

[0035] As an amount of the spun yarn 10 accumulated on the yarn accumulating roller 21 increases, a force of feeding (pulling) the spun yarn 10 from the spinning device 9 becomes stable. That is, as the amount of the spun yarn 10 wound around the outer peripheral surface of the yarn accumulating roller 21 increases, a contact area between the yarn accumulating roller 21 and the spun yarn 10 increases, and slips or the like are unlikely to occur. When at least a certain amount of the spun yarn 10 is accumulated on the yarn accumulating roller 21, such slips are less likely to occur. Accordingly, by rotationally driving the yarn accumulating roller 21 under the state in which at least the certain amount of the spun yarn 10 is accumulated on the yarn accumulating roller 21, the spun yarn 10 can be fed from the spinning device 9 at a stable speed without generating the slips or the like. Accordingly, since the spinning machine 1 according to the present embodiment can feed the spun yarn 10 with stable tension at stable speed by the yarn accumulating device 12, the spun yarn 10 with consistent quality can be produced. Hereinafter, the certain amount (which is the yarn accumulated amount that does not generate the slips and that stabilizes the force of feeding the spun yarn 10) may be referred to as a minimal accumulated amount.

[0036] The yarn accumulated amount sensor 27 contactlessly detects the accumulated amount of the spun yarn 10 on the yarn accumulating roller 21, and transmits a detection signal to a not-illustrated unit controller (control section).

[0037] The upstream guide 23 is arranged slightly upstream of the yarn accumulating roller 21. The upstream guide 23 is a guide member that appropriately guides the spun yarn 10 to the outer peripheral surface of the yarn accumulating roller 21. Further, the upstream guide 23 includes a twist stopping function that prevents the twists of the spun yarn 10 transmitted from the spinning device 9 from being transmitted to the downstream of the upstream guide 23.

[0038] The downstream guide 26 is arranged slightly downstream of the yarn accumulating roller 21. The downstream guide 26 is a guide member that guides the spun yarn 10 by regulating a path of the spun yarn 10 swung around by the rotating yarn hooking member 22 and stabilizing the yarn travel path located downstream thereof.

[0039] The yarn removing lever 28 is arranged in the vicinity of a downstream end of the yarn accumulating roller 21 and arranged upstream of the downstream guide 26. The yarn removing lever 28 can be swung around a swing shaft 28b.

[0040] The yarn clearer (yarn defect detecting section) 52 is arranged at a position that is located on a front side of the frame 6 of the spinning machine 1 and between the spinning device 9 and the yarn accumulating device 12. The spun yarn 10, which has been spun by the spinning device 9, passes through the yarn clearer 52 before being wound by the yarn accumulating device 12. The yarn clearer 52 monitors a thickness of the traveling spun yarn 10. When a yarn defect of the spun yarn 10 is detected, the yarn clearer 52 transmits a yarn defect detection signal to the not-illustrated unit controller.

[0041] As illustrated in Figs. 1 and 2, the yarn splicing cart 3 includes a splicer (yarn splicing device) 43, a suction pipe (accumulated yarn disposing section) 44, a suction mouth 46, an uplifting arm 47, and a pneumatic cylinder (yarn removal driving section) 49. When a yarn cutting or a yarn breakage generates in a certain spinning unit 2, the yarn splicing cart 3 travels on a rail 41 fixed on the frame 6 and stops at such a spinning unit 2 to perform a yarn splicing operation (yarn splicing step).

[0042] The suction pipe 44 can vertically swing around a shaft. The suction pipe 44 sucks and catches a yarn end (upper yarn) discharged from the spinning device 9, and then guides the yarn end to the splicer 43. The suction mouth 46 can vertically swing around a shaft. The suction mouth 46 sucks and catches a yarn end (lower yarn) from the package 45, which is supported by the winding device 13, and then the suction mouth 46 guides the yarn end to the splicer 43. Although a detailed structure of the splicer 43 is omitted, the splicer 43 twists the yarn ends together by whirling airflow to splice the upper yarn and the lower yarn.

[0043] The uplifting arm 47 is arranged at a tip end portion of the pneumatic cylinder 49 defined as an actuator. By driving the pneumatic cylinder 49, the uplifting arm 47 is moved to an upper advanced position to press the yarn removing lever 28, and thus, the yarn removing lever 28 can be driven to move to a lifted position (refer to Fig. 9).

[0044] The winding device 13 includes a cradle arm 71 that is supported on a supporting shaft 70 in a manner that the cradle arm 71 can swing around the supporting shaft 70. The cradle arm 71 can support a bobbin 48, around which the spun yarn 10 is wound, in a manner that the bobbin 48 can be rotated.

[0045] The winding device 13 includes a winding drum 72 and a traverse device 75. The winding drum 72 is driven in contact with an outer peripheral surface of the bobbin 48 or the package 45, which is formed by winding the spun yarn 10 around the bobbin 48. The traverse device 75 includes a traverse guide 76 that can be engaged with the spun yarn 10. By driving the winding drum 72 by a not-illustrated electric motor while reciprocating the traverse guide 76 by a not-illustrated driving section, the package 45 that is in contact with the winding drum 72 is rotated, and the spun yarn 10 is wound while being traversed.

[0046] With reference to Figs. 3 and 4, a detailed structure of the yarn accumulating device 12 will be described.

The yarn accumulating roller 21 is a roller member made from high abrasion-resistant material, and is fixed on a motor shaft 25a of the electric motor 25. A side on which the yarn accumulating roller 21 has the yarn hooking member 22 will be referred to as a tip end, and a side on which the electric motor 25 is provided will be referred to as a base end. An outer peripheral surface 21a of the yarn accumulating roller 21 includes a base-end taper portion 21b, a cylindrical portion 21c, and a tip-end taper portion 21d in this order from the base end to the tip end.

[0047] The cylindrical portion 21c slightly tapers toward the tip end. The cylindrical portion 21c is flatly connected (without difference in level) with the taper portions 21b and 21d. In order to accumulate at least the minimal accumulated amount of the spun yarn 10, the size of the cylindrical portion 21c is appropriately determined. The yarn accumulated amount sensor 27 faces the cylindrical portion 21c. The yarn accumulated amount sensor 27 detects an accumulated amount of the spun yarn 10 wound around the yarn accumulating roller 21, and then transmits a detected yarn accumulated amount to the unit controller.

[0048] Each of the base-end taper portion 21b and the tip-end taper portion 21d has a slightly tapered shape with a larger diameter at a corresponding end side. Around the outer peripheral surface 21a of the yarn accumulating roller 21, the base-end taper portion 21b smoothly moves the supplied spun yarn 10 from a larger diameter portion to a smaller diameter portion towards the cylindrical portion 21c so as to orderly wind the spun yarn 10 around the surface of the cylindrical portion 21c. The tip-end taper portion 21d has a function of preventing a sloughing phenomenon in which the wound spun yarn 10 sloughs all at once when unwinding the spun yarn 10. The tip-end taper portion 21d also has a function of sequentially rewinding the spun yarn 10 from the smaller diameter portion to the larger diameter portion at the end side so as to smoothly feed the spun yarn 10.

[0049] As illustrated in Figs. 3 and 4, the yarn hooking member 22 on the tip end of the yarn accumulating roller 21 is arranged coaxially with the yarn accumulating roller 21. The yarn hooking member 22 includes a flyer axis 33 and a flyer 38 fixed to a tip end of the flyer axis 33.

[0050] The flyer axis 33 is supported in a manner that the flyer axis 33 can be rotated relative to the yarn accumulating roller 21. A permanent magnet is attached to either one of the flyer axis 33 and the yarn accumulating roller 21, and a magnetic hysteresis member is attached to another one of the flyer axis 33 and the yarn accumulating roller 21. A resistance torque is generated against the rotation of the yarn hooking member 22 relative to the yarn accumulating roller 21 by these magnetic mechanisms. The yarn hooking member 22 is rotated accompanying the rotation of the yarn accumulating roller 21 by the resistance torque, and as a result, the yarn hooking member 22 and the yarn accumulating roller 21 can be integrally rotated. When a force surpassing the resistance torque is applied to the yarn hooking member 22, the yarn hooking member 22 is rotated relative to the yarn accumulating roller 21.

[0051] The flyer 38 is formed to appropriately curve towards the outer peripheral surface 21a of the yarn accumulating roller 21. Accordingly, the flyer 38 can be engaged with (can hook) the spun yarn 10. When the flyer 38 is rotated integrally with the yarn accumulating roller 21 under a state in which the spun yarn 10 is not wound around the yarn accumulating roller 21, the flyer 38 becomes engaged with the spun yarn 10. The spun yarn 10 engaged with the rotating flyer 38 is swung around by the flyer 38, and guided to and wound around the outer peripheral surface 21a of the rotating yarn accumulating roller 21.

[0052] The spun yarn 10 wound around the yarn accumulating roller 21 will be described. After passing through the upstream guide 23, the spun yarn 10 is guided from the base end to the outer peripheral surface 21a, and then wound around the cylindrical portion 21c several times. Then, after passing through the flyer 38, the spun yarn 10 fed from the tip end of the outer peripheral surface 21a is fed downstream through the downstream guide 26.

[0053] Under a state in which the spun yarn 10 is wound around the yarn accumulating roller 21 as illustrated in Fig. 4, when a force is applied to feed the spun yarn 10 engaged with the flyer 38 towards the downstream side, a force is applied to the flyer 38 in a manner that the yarn hooking member 22 is rotated to unwind the spun yarn 10 from the tip end of the yarn accumulating roller 21. Therefore, when the yarn tension at the downstream side of the yarn accumulating device 12 (i.e., the yarn tension between the yarn accumulating device 12 and the winding device 13) is great enough to surpass the resistance torque (i.e., when yarn tension of at least a predetermined value is applied to the spun yarn 10 engaged with the flyer 38), the yarn hooking member 22 is rotated independently from the yarn accumulating roller 21, and thus, the spun yarn 10 is gradually unwound from the tip end of the yarn accumulating roller 21 via the flyer 38.

[0054] In contrast, if the yarn tension at the downstream side of the yarn accumulating device 12 is not great enough to surpass the resistance torque, the yarn hooking member 22 is rotated integrally with the yarn accumulating roller 21. In such a case, the yarn hooking member 22 operates to prevent the spun yarn 10 from being unwound from the tip end of the rotating yarn accumulating roller 21.

[0055] When the yarn tension at the downstream side increases, the yarn accumulating device 12 unwinds the yarn. When the yarn tension decreases (i.e., when the yarn is likely to slacken), the yarn accumulating device 12 stops the unwinding of the yarn. Thus, the yarn accumulating device 12 can eliminate the yarn slackening and apply appropriate tension to the yarn. Moreover, since the yarn hooking member 22 operates to absorb changes in the tension applied to the spun yarn 10 located be-

tween the yarn accumulating device 12 and the winding device 13, such tension changes can be prevented from influencing on the spun yarn 10 located between the spinning device 9 and the yarn accumulating device 12. Thus, the spun yarn 10 can be fed at a more stable speed from the spinning device 9 by the yarn accumulating device 12.

[0056] Since the yarn accumulating roller 21 is driven and rotated at a prescribed speed, the spun yarn 10 is wound around the base end of the yarn accumulating roller 21 at the prescribed speed. Accordingly, when the speed at which the spun yarn 10 is unwound from the tip end of the yarn accumulating roller 21 is greater than the speed at which the spun yarn 10 is wound around the base end, the yarn accumulated amount decreases. When the spun yarn 10 is not unwound from the tip end, the yarn accumulated amount gradually increases.

[0057] As described above, the yarn accumulating device 12 includes the yarn removing lever 28. As illustrated in Fig. 4, the yarn removing lever 28 is formed as a substantially L-shaped member having a horizontally arranged elongate portion (action portion 28a). A base portion of the yarn removing lever 28 is supported on the swing shaft 28b, and the yarn removing lever 28 can be vertically swung around the swing shaft 28b between the lifted position and a lowered position. When the yarn removing lever 28 is located at the lowered position (first position or receded position, for example, as illustrated in Fig. 2), the yarn removing lever 28 is operated not to make contact with the yarn path of the spun yarn 10. When the yarn removing lever 28 is located at the lifted position (second position or advanced position, for example, as illustrated in Fig. 5), the action portion 28a presses up the yarn path of the spun yarn 10 so that the spun yarn 10 can be removed from the flyer 33. By being urged by a not-illustrated spring member, the yarn removing lever 28 can normally be held at the lowered position. When the pneumatic cylinder 29 of the yarn splicing cart 3 is driven, the yarn removing lever 28 is pressed by the uplifting arm 47 to be moved to the lifted position.

[0058] With the above-described structure, by moving the yarn removing lever 28 to the lifted position, the spun yarn 10 can be removed from the yarn hooking member 22. Thus, the resistance (i.e. the resistance torque applied to the yarn hooking member 22) applied when unwinding the spun yarn from the tip end of the yarn accumulating roller 21 does not act on the yarn. As a result, even when the yarn tension at the downstream side of the yarn accumulating roller 21 is weak, the spun yarn 10 can be unwound from the yarn accumulating roller 21. By moving the yarn removing lever 28 to the lifted position under the state in which the spun yarn 10 is not wound around the yarn accumulating roller 21, the flyer 38 can be prevented from being engaged with the spun yarn 10. Accordingly, the spun yarn 10 can be controlled not to be wound around the yarn accumulating roller 21.

[0059] In order to steadily transport the spun yarn 10 (i.e., in order to steadily feed the spun yarn 10 from the spinning device 9) by the yarn accumulating roller 21, at least a certain amount (i.e., at least a minimal accumulated amount) of the spun yarn 10 always needs to be wound around the yarn accumulating roller 21. Therefore, in the present embodiment, a feedback control is performed on the cradle arm 71 in accordance with a signal transmitted from the yarn accumulated amount sensor 27. Such an operation is specifically described below.

[0060] Basically, the tension applied to the spun yarn 10 (the spun yarn 10 located between the yarn accumulating device 12 and the winding device 13) hooked on the yarn hooking member 22 is defined by a yarn feeding speed of the yarn accumulating roller 21 (i.e., by a spinning speed of the spinning device 9) and a winding speed of the winding device 13. In other words, when the winding speed is greater than the yarn feeding speed, the tension applied to the spun yarn 10 increases, and the spun yarn 10 is gradually unwound from the yarn accumulating roller 21. When the winding speed is lower than the yarn feeding speed, the tension applied to the spun yarn 10 decreases, and the yarn accumulated amount on the yarn accumulating roller 21 gradually increases. Since the rotation speed of the yarn accumulating roller 21 (spinning speed) is normally constant, the tension applied to the spun yarn 10 hooked on the yarn hooking member 22 is changed mostly by the winding speed of the winding device 13.

[0061] In a normal winding operation, in order to apply appropriate winding tension to the spun yarn 10, the rotation speed of the winding drum 72 is set such that the winding speed is slightly greater than the yarn feeding speed of the yarn accumulating roller 21 (i.e., greater than the spinning speed of the spinning device 9). Accordingly, the spun yarn 10 wound around the yarn accumulating roller 21 is gradually unwound, and the yarn accumulated amount is reduced.

[0062] When the yarn accumulated amount sensor 27 detects that the yarn accumulated amount has fallen below the minimal accumulated amount, the unit controller of the spinning unit 2 controls the cradle arm 71 to swing towards the left in Fig. 2 by driving a not-illustrated lift cylinder, and the package 45 is moved away from the winding drum 72. Accordingly, the package 45 loses a driving force, and although inertial rotation continues, the winding speed thereof gradually decreases. As a result, the yarn accumulated amount of the yarn accumulating roller 21 gradually increases.

[0063] However, when the spun yarn 10 exceeding an amount that can be accumulated around the cylindrical portion 21c is wound around the yarn accumulating roller 21, a position where the spun yarn 10 is wound around the yarn accumulating roller 21 shifts to the base-end taper portion 21b, and a winding radius is greatly changed. As a result, the spun yarn 10 cannot be fed from the spinning device 9 at an accurate speed. Accordingly, in the yarn accumulating device 12, the yarn accumulated amount sensor 27 carries out a detection as to whether or not the accumulated amount of the spun yarn

10 exceeds a prescribed value. When the yarn accumulated amount sensor 27 detects that the accumulated amount of the spun yarn 10 has exceeded the prescribed value, the unit controller controls the cradle arm 71 to swing towards the right in Fig. 2, and the package 45 is made into contact with the winding drum 72. As a result, the winding speed is restored, and the spun yarn 10 is unwound from the yarn accumulating roller 21.

[0064] As described above, by swinging the cradle arm 71 by the lift cylinder so as to control the package 45 to make contact with or to move away from the winding drum 72, the winding speed of the winding device 13 can be adjusted. By detecting the yarn accumulated amount of the yarn accumulating roller 21 and controlling the winding speed of the winding device 13 while feeding back the detected yarn accumulated amount, the state in which at least the minimal accumulated amount of the spun yarn 10 is accumulated around the yarn accumulating roller 21 can always be maintained.

[0065] Next, with reference to Figs. 5 through 10, a description will be made of a yarn processing method carried out during a yarn splicing operation by the spinning machine 1 according to the present embodiment. In a graph of Fig. 10, a vertical axis represents the yarn feeding tension from the spinning device 9 and the yarn accumulated amount on the yarn accumulating roller 21, which are respectively referred to as the "yarn tension" and the "yarn accumulated amount" in the drawing. A horizontal axis represents time. Further, the solid line of the graph of Fig. 10 represents the yarn accumulated amount on the yarn accumulating roller 21 (yarn accumulated amount), and the dashed-line represents the yarn feeding tension (yarn tension) from the spinning device 9.

[0066] When the yarn clearer 52 detects a yarn defect during the winding operation of the spun yarn 10, the yarn clearer 52 transmits a yarn defect detection signal to the unit controller. When such a yarn defect detection signal is received, the unit controller immediately cuts the spun yarn 10 by a cutter 57, and stops the draft device 7 and the spinning device 9 or the like. At this time, the yarn at the downstream side of such a cutting position is once wound into the package 45 by the winding device 13. Thus, the spun yarn 10 on the yarn accumulating roller 21 is also wound into the package 45, and the yarn accumulating roller 21 resultantly has no yarn thereon. A yarn portion including the yarn defect is also once wound into the package 45.

[0067] When the yarn defect detection signal is received, the unit controller switches into a mode in which the yarn clearer 52 temporarily stops the monitoring of the yarn defect.

[0068] Then, the unit controller transmits a control signal to the yarn splicing cart 3, and controls the yarn splicing cart 3 to travel to the front of the spinning unit 2 and to start a yarn splicing operation. First, the unit controller controls to swing the suction mouth 46 to the vicinity of the surface of the package 45 (refer to Fig. 5), generate suction airflow, and rotate the package 45 reversely by the winding device 13. Accordingly, the yarn end (lower yarn) is pulled out from an outer peripheral surface of the package 45, and sucked and caught by the suction mouth 46. At this time, the yarn including the yarn defect is pulled out from the package 45 and sucked by the suction mouth 46, which thereby can remove the yarn including the yarn defect from the package 45.

[0069] While reversely rotating the package 45, the unit controller controls the suction mouth 46 with the lower yarn sucked therein to swing upward so as to guide the lower yarn to the splicer 43 (refer to Fig. 6). When the lower yarn is guided to the splicer 43, the unit controller controls to stop the rotation of the package 45.

[0070] At approximately the same time as the swinging movement of the suction mouth 46, the unit controller operates the suction pipe 44 to swing to the vicinity of the downstream of the spinning device 9 (refer to Fig. 5). The unit controller re-drives the spinning device 9 or the like to resume a spinning operation, and controls the suction pipe 44 to generate suction airflow and to catch the yarn end (upper yarn) of the spinning device 9 (yarn catching step). The yarn tension and the yarn accumulated amount at this time are represented at time "A" in the graph of Fig. 10. As illustrated in Fig. 10, at the time "A", the yarn is being merely sucked by a suction force of the suction pipe 44. Therefore, the yarn tension is low, and the yarn accumulated amount is zero.

[0071] Then, while continuing the suction operation, the unit controller controls the suction pipe 44 to swing downward so as to pull out the spun yarn 10 from the spinning device 9 and guide the spun yarn 10 to the splicer 43. At this time, the unit controller drives the pneumatic cylinder 49 towards the advanced position as illustrated in Fig. 6 so as to move the yarn removing lever 28 to the lifted position. Accordingly, without the spun yarn 10 being engaged with the rotating flyer 38, the yarn end can be guided to the splicer 43.

[0072] The yarn removing lever 28 is moved upward for the following reasons. That is, the suction force of the suction pipe 44 is not great enough to surpass the resistance torque of the yarn hooking member 22. Therefore, the spun yarn 10 cannot be unwound from the yarn accumulating roller 21 via the yarn hooking member 22 by the suction force of the suction pipe 44. Therefore, if the operation of winding the yarn around the yarn accumulating roller 21 is started before the yarn end is guided to the splicer 43, the suction pipe 44 cannot pull the upper yarn any further. As a result, the upper yarn cannot be guided to the splicer 43, causing a failure of the yarn splicing operation. Accordingly, by placing the upstream guide 23 upward until the suction pipe 44 completes the guiding of the upper yarn to the splicer 43, the start of the winding of the spun yarn 10 around the yarn accumulating roller 21 is prevented.

[0073] Although it is illustrated in Figs. 5 and 6 that the suction pipe 44 and the suction mouth 46 simultaneously perform the swinging movement, the timing of such

swinging movement may be flexible.

[0074] When the upper yarn is guided to the splicer 43, the yarn removing lever 28 is controlled to immediately move downward. Accordingly, the spun yarn 10 extending between the spinning device 9 and the suction pipe 44 becomes engaged with the flyer 38, and the operation of winding the spun yarn 10 around the yarn accumulating roller 21 is started (as indicated in Fig. 7, yarn hooking step (yarn guiding step)). That is, during the yarn splicing operation, although the winding by the winding device 13 is stopped, the spun yarn 10 is continuously fed from the spinning device 9. As a result, the yarn slackens if the spun yarn 10 is kept being fed. Therefore, by winding the spun yarn 10 around the yarn accumulating roller 21, the slackening of the spun yarn 10 can be prevented. That is, the yarn accumulating device 12 serves as a yarn slack eliminating device during the yarn splicing operation. The time "B" of the graph of Fig. 10 indicates the state in which the yarn removing lever 28 is moved downward (to the lowered position). As illustrated in Fig. 10, after the time "B", the yarn accumulated amount on the yarn accumulating roller 21 increases, and accompanying such increase, the yarn feeding tension of the spun yarn 10 from the spinning device 9 also increases (accumulated amount increasing step).

[0075] As described above, until at least the minimal accumulated amount of the spun yarn 10 is accumulated on the yarn accumulating roller 21, slipping is likely to occur between the yarn accumulating roller 21 and the spun yarn 10, and the yarn feeding tension from the spinning device 9 is unstable. Accordingly, until a sufficient amount (minimal accumulated amount) of the yarn is accumulated on the yarn accumulating roller 21 (between the time "B" and the time "C"), the spun yarn 10 fed from the spinning device 9 may be unstable in terms of yarn quality.

[0076] In a conventional spinning machine, when a yarn end is guided to the splicer 43 by the suction pipe 44, the splicer 43 immediately starts a yarn splicing operation on the yarn ends. However, as described above, since the yarn accumulating roller 21 has the unstable yarn portion thereon, if the yarn splicing operation is performed in such a state, the unstable yarn portion is wound into the package 45.

[0077] Accordingly, in order to prevent the unstable yarn portion from being mixed into the package 45, the spinning machine 1 according to the present embodiment has the following structure.

[0078] When the upper yarn is guided to the splicer 43 by the suction pipe 44, the yarn splicing operation is not started immediately, but the unit controller monitors the yarn accumulated amount on the yarn accumulating roller 21 by the yarn accumulated amount sensor 27 and determines whether or not the yarn accumulated amount has reached the minimal accumulated amount. When the yarn accumulated amount is less than the minimal accumulated amount, the spun yarn 10 is wound around the yarn accumulating roller 21 by keeping the yarn removing lever 28 at the lowered position. When the yarn accumulated amount sensor 27 detects that the yarn accumulated amount has reached the minimal accumulated amount (time "C" of Fig. 10), the unit controller moves the yarn removing lever 28 to the lifted position by the pneumatic cylinder 49 and removes the spun yarn 10 from the flyer 38 (Fig. 9). As illustrated for time subsequent to the time "C" of Fig. 10, after the yarn accumulated amount reaches the minimal accumulated amount, the feeding tension of the spun yarn 10 from the spinning device 9 becomes stable and substantially constant.

[0079] When the spun yarn 10 is removed from the flyer 38 while the yarn accumulating roller 21 is rotating, the resistance that prevents the spun yarn 10 from being unwound from the tip end of the yarn accumulating roller 21 becomes absent, and as a result, the spun yarn 10 can be unwound even by a weak suction force of the suction pipe 44. Accordingly, the spun yarn 10 on the yarn accumulating roller 21 is unwound and sucked by the suction pipe 44 in the state illustrated in Fig. 9. Thus, the unstable yarn on the yarn accumulating roller 21 can be disposed by the suction pipe 44 (yarn disposing step). When the yarn removing lever 28 is located at the lifted position, the spun yarn 10 slackens at the tip end of the yarn accumulating roller 21 by the amount for which the yarn accumulating roller 21 has been rotated, and the slackened amount is sucked by the suction pipe 44. Meanwhile, the spun yarn 10 is newly wound at the base end of the yarn accumulating roller 21 by the rotation of the yarn accumulating roller 21. That is, since the spun yarn 10 is newly wound by the amount that has been sucked by the suction pipe 44, as illustrated in the portion between the time "C" and the time "D" of Fig. 10, the yarn accumulated amount on the yarn accumulating roller 21 can be maintained substantially constant.

[0080] Accordingly, while maintaining the yarn accumulated amount to be at least the minimal accumulated amount, the spun yarn 10 is fed from the spinning device 9. Therefore, the quality of the spun yarn 10 that is newly wound around the base end of the yarn accumulating roller 21 is stable. Since the unstable spun yarn 10 is unwound from the tip end while the stable spun yarn 10 is wound from the base end, the spun yarn 10 on the yarn accumulating roller 21 is sequentially replaced with the spun yarn 10 having the stable quality.

[0081] After an elapse of a period of time that is necessary from when the unwinding of the unstable yarn is started by moving the yarn removing lever 28 upward to when all the spun yarn 10 on the yarn accumulating roller 21 is replaced with the spun yarn 10 having the stable quality (i.e., a period of time that is necessary for disposing all the spun yarn 10 having the unstable quality from the yarn accumulating roller 21), the unit controller controls the splicer 43 to perform the yarn splicing operation (at the time "D" of Fig. 10). Thus, the portions having the unstable quality do not remain in the spun yarn 10 after the completion of the yarn splicing operation.

[0082] In the above embodiment, the spun yarn 10 is

unwound by removing the spun yarn 10 from the flyer 38, however, if the suction force of the suction pipe 44 is great enough to surpass the resistance torque of the yarn hooking member 22, the spun yarn 10 can be unwound from the yarn accumulating roller 21 without removing the spun yarn 10 from the flyer 38. In such a case, however, by always generating the suction force surpassing the resistance torque of the yarn hooking member 22, energy is lost greatly. Considering such a point, by temporarily increasing the suction force of the suction pipe 44 only when unwinding the spun yarn 10 from the yarn accumulating roller 21 (i.e., only when the yarn removing lever 28 is located at the lifted position in the above-described embodiment) so as to suck the spun yarn 10 by the suction pipe 44, the spun yarn 10 on the yarn accumulating roller 21 may be disposed. In such a structure, the yarn removing lever 28 and the pneumatic cylinder 49 or the like may be omitted.

[0083] During the yarn splicing operation by the splicer 43, the splicer 43 clamps the yarn ends, and therefore, the suction pipe 44 does not perform the suction operation. Accordingly, if the yarn removing lever 28 is kept upward, the spun yarn 10 unwound from the tip end of the yarn accumulating roller 21 may slacken. In order to prevent such slackening, the yarn removing lever 28 is lowered while the splicer 43 operates (at the time "D" of Fig. 10). Accordingly, since the spun yarn 10 engages with the flyer 38, the spun yarn 10 is not unwound from the tip end of the yarn accumulating roller 21, which thereby gradually increases the yarn accumulated amount on the yarn accumulating roller 21 as illustrated in Fig. 10.

[0084] When the yarn splicing operation is completed, the unit controller resumes the winding of the spun yarn 10 by the winding device 13. The point of time when the yarn splicing operation is completed corresponds to the time "E" of Fig. 10. On and after the time "E", tension is applied to the spun yarn 10 by the winding device 13, and thus, the spun yarn 10 is unwound from the yarn accumulating roller 21, gradually decreasing the accumulated amount.

[0085] Subsequently, the unit controller performs the above-described feedback control of the yarn accumulated amount based on the detection result of the yarn accumulating roller 21. For example, when the yarn accumulated amount on the yarn accumulating roller 21 falls below the minimal accumulated amount (at the time "F" of Fig. 10), the package 45 is moved away from the winding drum 72 by driving the not-illustrated lift cylinder so as to restore the yarn accumulated amount. When the yarn accumulated amount becomes equal to or exceeds the prescribed value (at the time "G" of Fig. 10), the not-illustrated lift cylinder is driven to move the package 45 to make contact with the winding drum 72 and to decrease the yarn accumulated amount.

[0086] In the present embodiment, when the yarn accumulated amount on the yarn accumulating roller 21 becomes equal to or exceeds the minimal accumulated amount (i.e., after the time "C" of Fig. 10), the unit controller switches into a mode in which the yarn clearer 52 monitors the yarn defect. That is, as illustrated in Fig. 10, since the yarn tension becomes stable on or after the time "C", the yarn clearer 52 can accurately detect the yarn defect. Since the spun yarn 10 that passes through the yarn clearer 52 from the time "A" to the time "C" of Fig. 10 (i.e. the yarn having the unstable quality) is sucked and disposed by the suction pipe 44, it is not necessary to monitor the yarn defect. Meanwhile, since the spun yarn 10 that passes through the yarn clearer 52 after the time "C" is accumulated on the yarn accumulating roller 21 during the yarn splicing operation and eventually wound into the package 45, it is preferable to monitor the yarn defect of such spun yarn 10. For the above-described reasons, when the accumulated amount of the spun yarn 10 on the yarn accumulating roller 21 exceeds the minimal accumulated amount (after the time "C"), the monitoring of the yarn defect is resumed.

[0087] In a conventional spinning machine, since the yarn having unstable quality on the yarn accumulating roller 21 cannot be disposed but wound into the package, the yarn defect of the unstable yarn is also monitored. Since the yarn having the unstable yarn quality has been fed from the spinning device 9 by low yarn tension, the yarn tension of the spun yarn 10 when passing through the yarn clearer 52 is also low. As a result, the visual thickness of the yarn that is being monitored by the yarn clearer 52 becomes thick, and the detection operation of the yarn defect frequently occurs. In order to prevent such frequent detections, a condition setting for the yarn defect detection needs to be changed from that of a normal operation. On this point, in the present embodiment, since the spun yarn 10 having the unstable quality can be disposed, it becomes unnecessary to monitor the yarn defect of the unstable yarn. Accordingly, a control operation that particularly moderates the yarn defect detection condition for the unstable yarn can be omitted, which thereby can simplify the control operation.

[0088] More specifically, the spun yarn 10 on the yarn accumulating roller 21 can be disposed during the yarn splicing operation because the yarn removing lever 28 is provided as a yarn removing member at the downstream side of the yarn hooking member 22. Conventionally, in the spinning machine including the yarn hooking member 22 that can be rotated relative to the yarn accumulating roller 21, the upstream guide 23 can be advanced and receded, and by moving the upstream guide 23 to the advanced position, the spun yarn 10 is controlled to be disengaged from the flyer 38.

[0089] In such a structure, when no spun yarn is accumulated on the yarn accumulating roller 21, the spun yarn 10 can be controlled to be or not to be hooked on the yarn hooking member 22, however, once the spun yarn 10 starts to be wound around the yarn accumulating roller 21, the spun yarn 10 cannot be removed from the flyer 38. Accordingly, in the structure having the yarn removing member at the upstream side of the yarn hooking member 22, the unstable yarn wound around the yarn accu-

mulating roller 21 cannot be sucked and disposed by the suction of the suction pipe 44 during the yarn splicing operation. Therefore, in the present embodiment, by providing the yarn removing lever 28 at the downstream side of the yarn hooking member 22, the unstable yarn on the yarn accumulating roller 21 can be disposed.

[0090] As described above, the yarn processing method of the spinning machine 1 according to the present embodiment includes the yarn catching step, the yarn hooking step, the accumulated amount increasing step, and the yarn disposing step. In the yarn catching step, when the spun yarn 10 fed from the spinning device 9 starts to be wound around the yarn accumulating roller 21, the spun yarn 10 is sucked and caught by the suction pipe 44. In the yarn hooking step, the spun yarn 10 extending from the spinning device 9 to the suction pipe 44 is engaged with the yarn hooking member 22 that is integrally rotating with the yarn accumulating roller 21, and thus the spun yarn 10 is guided to the outer peripheral surface of the yarn accumulating roller 21. In the accumulated amount increasing step, while the spun yarn 10 is fed from the spinning device 9 by winding the spun yarn 10 around the outer peripheral surface of the yarn accumulating roller 21, the accumulated amount of the spun yarn 10 accumulated on the yarn accumulating roller 21 increases. In the yarn disposing step, after the accumulated amount exceeds the minimal accumulated amount, while maintaining the accumulated amount to be at least the minimal accumulated amount, the spun yarn 10 accumulated on the yarn accumulating roller 21 is disposed. Then, after the yarn disposing step, the process proceeds to the yarn splicing operation.

[0091] Thus, by winding at least a certain amount of the spun yarn 10 around the yarn accumulating roller 21, the feeding tension is stabilized, and the spun yarn 10 can be stably fed from the spinning device 9. If the yarn amount on the yarn accumulating roller 21 is insufficient, the spun yarn 10 cannot be stably fed from the spinning device 9, causing the yarn quality to be unstable, however, in the yarn processing method according to the present embodiment, such occurrences of unstable yarn can be appropriately handled. That is, in the present embodiment, after the portions having the unstable quality of the spun yarn 10 are once wound around the yarn accumulating roller 21 so as to obtain at least the minimal accumulated amount, while winding the spun yarn 10 having the stable quality, the unstable portions can be disposed. Thus, when proceeding to the yarn splicing operation, only the stable spun yarn 10 is accumulated on the yarn accumulating roller 21.

[0092] In the yarn processing method according to the present embodiment, in the yarn disposing step, by removing the spun yarn 10 from the yarn hooking member 22, the spun yarn 10 accumulated on the yarn accumulating roller 21 can be sucked and disposed by the suction pipe 44. Thus, the spun yarn 10 can be sucked and disposed by the suction pipe 44 by a simple operation of removing the yarn from the yarn hooking member 22.

[0093] In the yarn processing method according to the present embodiment, when at least the minimal accumulated amount of the spun yarn 10 engaged with the yarn hooking member 22 is wound around, and thus the tension is stabilized, the yarn hooking member 22 unwinds the spun yarn 10 from the yarn accumulating roller 21. In the yarn disposing step, by increasing the suction force of the suction pipe 44, the tension of the spun yarn 10 located between the suction pipe 44 and the yarn hooking member 22 is increased, and the spun yarn 10 accumulated on the yarn accumulating roller 21 is sucked and disposed. Thus, since the spun yarn 10 can be sucked and disposed by the suction pipe 44 by only increasing the suction force of the suction pipe 44, a special movable member for disposing the spun yarn 10 does not need to be provided, which thereby can reduce a cost.

[0094] The spinning machine 1 according to the present embodiment includes the spinning device 9, the winding device 13, the yarn accumulating roller 21, the yarn hooking member 22, and the yarn removing lever 28 as a yarn disposing section. The spinning device 9 forms the spun yarn 10 by applying twists to the fiber bundle 8. The winding device 13 forms the package 45 by winding the spun yarn 10 fed from the spinning device 9. The yarn accumulating roller 21 rotates with the spun yarn 10 wound around the outer peripheral surface thereof so as to feed the spun yarn 10 from the spinning device 9 while applying tension to the spun yarn 10. The yarn hooking member 22 can be engaged with the spun yarn 10, and by rotating integrally with the yarn accumulating roller 21 while being engaged with the spun yarn 10, the yarn hooking member 22 can prevent the spun yarn 10 from being unwound from the outer peripheral surface of the yarn accumulating roller 21. The yarn removing lever 28 is arranged downstream of the yarn hooking member 22 in the yarn transporting direction, and can be moved between the lowered position where the yarn removing lever 28 does not make contact with the spun yarn 10 and the lifted position where the yarn removing lever 28 makes contact with the spun yarn 10. When the yarn removing lever 28 is located at the lifted position, the yarn removing lever 28 removes the spun yarn 10 from the yarn hooking member 22.

[0095] Accordingly, by winding at least the certain amount of the spun yarn 10 around the yarn accumulating roller 21, the feeding tension is stabilized, and the spun yarn 10 can be stably fed from the spinning device 9. When the yarn amount on the yarn accumulating roller 21 is insufficient, the spun yarn 10 cannot be stably fed from the spinning device 9, causing unstable yarn quality, however, in the present embodiment, such occurrences of the unstable yarn can be handled. That is, in the present embodiment, after the portions having unstable quality of the spun yarn 10 are once wound around the yarn accumulating roller 21, such unstable portions can be disposed while winding the spun yarn 10 having the stable quality. Accordingly, when proceeding to the yarn splicing operation, only the stable yarn is accumulated

on the yarn accumulating roller 21. Therefore, since the unstable portions of the yarn can be prevented from being mixed into the package 45, the package 45 of good quality can be formed. Moreover, with the simple structure of moving the yarn removing lever 28, the spun yarn 10 can be removed from the yarn hooking member 22, and the unstable portions of the spun yarn 10 can be unwound from the yarn accumulating roller 21.

[0096] The spinning machine 1 according to the present embodiment includes the pneumatic cylinder 49 that drives the yarn removing lever 28 via the uplifting arm 47. When the spun yarn 10 wound around the yarn accumulating roller 21 is less than the minimal accumulated amount, the pneumatic cylinder 49 moves the yarn removing lever 28 to the lowered position. When the spun yarn 10 wound around the yarn accumulating roller 21 becomes equal to or exceeds the minimal accumulated amount, the pneumatic cylinder 49 moves the yarn removing lever 28 to the lifted position.

[0097] That is, if the unwinding of the spun yarn 10 from the yarn accumulating roller 21 is started under the state in which a sufficient amount of the spun yarn 10 has not been wound around the yarn accumulating roller 21, the portions of the spun yarn 10 having the unstable yarn quality are sequentially wound around the yarn accumulating roller 21. As a result, the spun yarn 10 having the stable quality cannot be accumulated on the yarn accumulating roller 21. On this point, according to the present embodiment, after a sufficient amount of the spun yarn 10 is accumulated on the yarn accumulating roller 21 so that the spun yarn 10 can be stably fed from the spinning device 9, the spun yarn 10 on the yarn accumulating roller 21 can be unwound. Accordingly, after the unstable portions of the spun yarn 10 on the yarn accumulating roller 21 are sequentially replaced with yarn portions having the stable quality, and after all the unstable yarn portions are unwound, only the spun yarn 10 stably fed from the spinning device 9 is accumulated on the yarn accumulating roller 21.

[0098] The spinning machine 1 according to the present embodiment includes the yarn clearer 52 that monitors a presence or an absence of the yarn defect of the spun yarn 10. When the spun yarn 10 wound around the yarn accumulating roller 21 is less than the minimal accumulated amount, the yarn clearer 52 temporarily stops the monitoring of the yarn defect. After the spun yarn 10 wound around the yarn accumulating roller 21 becomes equal to or exceeds the minimal accumulated amount, the yarn clearer 52 resumes the monitoring of the yarn defect.

[0099] That is, if the monitoring of the yarn defect is started under the state in which the sufficient amount of the spun yarn 10 has not been wound around the yarn accumulating roller 21, due to the unstable yarn tension, an accurate detection result cannot be expected. On this point, according to the present embodiment, if the yarn amount on the yarn accumulating roller 21 is insufficient, the monitoring of the yarn defect is temporarily stopped, and after the spun yarn 10 is sufficiently wound around the yarn accumulating roller 21 and the spun yarn 10 can be stably fed from the spinning device 9, the monitoring of the yarn defect can be resumed. Accordingly, after the unstable yarn portion is unwound from the yarn accumulating roller 21, only the spun yarn 10 in which the presence or the absence of the yarn defect has been properly detected is wound on the yarn accumulating roller 21. Further, since the monitoring of the yarn defect is started only after the yarn tension becomes stable, it is not necessary to change the setting for the yarn defect detection for when the yarn tension is unstable, which thereby can facilitate the controlling operation.

[0100] In the spinning machine 1 according to the present embodiment, when the prescribed period of time elapses after the yarn removing lever 28 is moved to the lifted position, the pneumatic cylinder 49 moves back the yarn removing lever 28 to the lowered position. Thus, after all the unstable portions of the spun yarn 10 are unwound from the yarn accumulating roller 21, the unwinding of the spun yarn 10 is stopped, and only the spun yarn 10 stably fed from the spinning device 9 can be accumulated on the yarn accumulating roller 21.

[0101] The spinning machine 1 according to the present embodiment includes the splicer 43 and the suction pipe 44 that can catch the spun yarn 10 from the spinning device 9 by suction airflow and guide the caught spun yarn 10 to the splicer 43. After the spun yarn 10 is guided to the splicer 43 by the suction pipe 44 and after at least the minimal accumulated amount of the spun yarn 10 is wound around the yarn accumulating roller 21, and before the splicer 43 starts the yarn splicing operation, the pneumatic cylinder 49 moves the yarn removing lever 28 to the lifted position.

[0102] Accordingly, after the spun yarn 10 is wound around the yarn accumulating roller 21 to a degree that the spun yarn 10 can be stably fed from the spinning device 9, and before the yarn splicing operation is started, the spun yarn 10 can be unwound from the yarn accumulating roller 21. By sucking the unwound spun yarn 10 by the suction pipe 44, the unstable portions of the spun yarn 10 can be disposed. Accordingly, after the unstable portions are unwound and disposed, only the spun yarn 10 stably fed from the spinning device 9 is wound around the yarn accumulating roller 21. By performing the yarn splicing operation in this state, the unstable spun yarn 10 can be prevented from being mixed into the package 45 from the yarn accumulating roller 21.

[0103] The spinning machine 1 according to the present embodiment includes the plurality of spinning units 2 and the yarn splicing cart 3. Each of the spinning units 2 includes the spinning device 9, the winding device 13, the yarn accumulating roller 21, the yarn hooking member 22, and the yarn removing lever 28. The yarn splicing cart 3 can travel among the plurality of spinning units 2, and includes the pneumatic cylinder 49. Accordingly, it is not necessary to provide the pneumatic cylinder 49 to each of the spinning units 2, and thus, the cost can

be reduced.

[0104] The preferred embodiment of the present invention has been described, however, for example, the above-described structure can be modified as follows.

[0105] In the above-described embodiment, a description is made of the yarn processing method in the yarn splicing operation performed when the yarn defect is detected, however, the yarn processing method of the present invention is not limited to the yarn splicing operation, and may be used when the spun yarn 10 starts to be wound around the yarn accumulating roller 21. For example, at the time of a doffing operation performed when the package 45 is fully wound and the bobbin 48 is replaced, the unstable yarn can be disposed from the yarn accumulating roller 21 by the yarn processing method of the present invention.

[0106] In the above-described embodiment, the yarn removing lever 28 as the yarn removing member swings around the shaft. However, for example, the spun yarn may be removed from the yarn hooking member 22 by parallely moving the yarn removing lever 28 back and forth.

[0107] Instead of providing a special member as the yarn removing member, for example, the downstream guide 26 may be advanced and receded, and the spun yarn 10 may be removed from the yarn hooking member 22 by advancing the downstream guide 26.

[0108] In the above-described embodiment, the yarn splicing cart 3 includes the uplifting arm 47 and the pneumatic cylinder 49 as a mechanism for driving the yarn removing lever 28. However, for example, each of the spinning units 2 may include a structure for driving the yarn removing lever 28. Further, in place of the pneumatic cylinder 49, the yarn removing lever 28 may be moved by an appropriate structure such as, for example, a rack and pinion mechanism, a cam mechanism or the like.

[0109] Instead of performing the yarn splicing operation by the yarn splicing cart 3, each of the spinning units 2 may include a structure for the yarn splicing operation.

[0110] The method of applying the torque between the yarn hooking member 22 and the yarn accumulating roller 21 is not limited to the above-described magnetic mechanism, and, for example, a frictional force or an electromagnetic mechanism may be used.

[0111] The yarn hooking member 22 and the yarn accumulating roller 21 may not be able to relatively rotate, and, for example, as the slack eliminating device disclosed in Japanese Unexamined Patent Application Publication No. 2004-124333, a cutout portion formed on the slack eliminating roller may serve as the yarn hooking section.

Claims

1. A yarn processing method comprising:

   a yarn guiding step of guiding spun yarn fed from a spinning device (9) to an outer peripheral surface of a yarn accumulating roller (21), and
   an accumulated amount increasing step of feeding the spun yarn by winding the spun yarn from the spinning device (9) around the outer peripheral surface of the yarn accumulating roller (21) and increasing an accumulated amount of the spun yarn accumulated on the yarn accumulating roller (21),
   characterized in that
   the yarn accumulated amount increasing step includes the function of applying a predetermined tension to the spun yarn and feeding the yarn from the spinning device (9) and **in that**
   a yarn disposing step of disposing the spun yarn accumulated on the yarn accumulating roller (21) after the accumulated amount increasing step and before proceeding onto a subsequent operation by sucking the spun yarn accumulated on the yarn accumulating roller (21) into a yarn catching member (44) by increasing the suction force of the yarn catching member (44) to surpass the resistance torque of the yarn hooking member (22).

2. A yarn processing method comprising:

   a yarn guiding step of guiding spun yarn fed from a spinning device (9) to an outer peripheral surface of a yarn accumulating roller (21), and
   an accumulated amount increasing step of feeding the spun yarn by winding the spun yarn from the spinning device (9) around the outer peripheral surface of the yarn accumulating roller (21) and increasing an accumulated amount of the spun yarn accumulated on the yarn accumulating roller (21),
   characterized in that
   the yarn accumulated amount increasing step includes the function of applying a predetermined tension to the spun yarn and feeding the yarn from the spinning device (9) and **in that**
   a yarn disposing step of disposing the spun yarn accumulated on the yarn accumulating roller (21) after the accumulated amount increasing step and before proceeding onto a subsequent operation by removing the yarn from a yarn hooking member (22) and sucking the spun yarn accumulated on the yarn accumulating roller (21) into a yarn catching member (44).

3. The yarn processing method according to claim 1 or 2, comprising:

   an accumulated amount detecting step of detecting the accumulated amount of the spun yarn on the yarn accumulating roller (21),
   such that in the yarn disposing step, after a de-

tection is made in the accumulated amount detecting step that the accumulated amount has reached a prescribed amount, the spun yarn accumulated on the yarn accumulating roller (21) is disposed while maintaining the accumulated amount to be at least the prescribed amount.

4. The yarn processing method according to claim 1, 2 or 3, such that in the yarn guiding step, the spun yarn is guided to the outer peripheral surface of the yarn accumulating roller (21) by a yarn catching member (44) that catches the spun yarn by suction airflow.

5. The yarn processing method according to claim 4, such that in the yarn disposing step, the spun yarn is disposed by the yarn catching member (44).

6. The yarn processing method according to any one of claim 1 through claim 5, comprising a yarn splicing step of performing a yarn splicing operation, after the yarn disposing step, on the spun yarn unwound from the yarn accumulating roller (21) and the spun yarn wound into a package.

7. The yarn processing method according to claim 6, comprising a winding step of winding the spun yarn into a package after the yarn splicing step.

8. A spinning machine comprising:

a spinning device (9) which forms a spun yarn by applying twist to a fiber bundle;
a winding device (13) which forms a package by winding the spun yarn fed from the spinning device (9);
a yarn accumulating roller (21) which winds the spun yarn around an outer peripheral surface thereof and rotates with the spun yarn wound around to feed the spun yarn from the spinning device (9) while applying tension to the spun yarn, **characterized by**
a yarn catching member (44) for disposing the spun yarn wound around the yarn accumulating roller (21) by sucking the spun yarn accumulated on the yarn accumulating roller (21) into the yarn catching member (44).

9. The spinning machine according to claim 8, comprising an accumulated amount detecting section (27) that detects an accumulated amount of the spun yarn wound around the yarn accumulating roller (21), such that after the accumulated amount detecting section (27) detects that at least a prescribed amount of the spun yarn has been accumulated, the yarn catching member (44) disposes the spun yarn accumulated on the yarn accumulating roller (21) while maintaining the accumulated amount to be at least the prescribed amount.

10. The spinning machine according to claim 8 or claim 9, such that the yarn catching member (44) catches the spun yarn by suction airflow and guides the caught spun yarn to the yarn accumulating roller (21).

11. The spinning machine according to claim 10, comprising:

a yarn splicing device (43) that splices the spun yarn unwound from the yarn accumulating roller (21) and the spun yarn of the package wound by the winding device (13); and
a control section that controls the yarn splicing device to perform a yarn splicing operation after the yarn catching member (44) disposes the spun yarn.

12. The spinning machine according to any one of claim 8 through claim 11, comprising a yarn defect detecting device (52) which monitors a presence or an absence of a yarn defect in the spun yarn,
such that when the spun yarn wound around the yarn accumulating roller (21) is less than the prescribed amount, the yarn defect detecting device (52) temporarily stops a monitoring of the yarn defect, and after at least the prescribed amount of the spun yarn is wound around the yarn accumulating roller (21), the yarn defect detecting device (52) restarts the monitoring of the yarn defect.

Patentansprüche

1. Garnverarbeitungsverfahren, enthaltend:

einen Garnführungsschritt, bei welchem von einer Spinneinrichtung (9) zu einer äußeren Umfangsfläche einer Garnsammelrolle (21) zugeliefertes Spinnfasergarn geführt wird, und
einen Erhöhungsschritt der angesammelten Menge des Zulieferns des Spinnfasergarns, indem das Spinnfasergarn von der Spinneinrichtung (9) um die äußere Umfangsfläche der Garnsammelrolle (21) gewickelt wird und eine angesammelte Menge des auf der Garnsammelrolle (21) angesammelten Garns erhöht wird,
dadurch gekennzeichnet, dass
der Erhöhungsschritt der angesammelten Garnmenge die Funktion des Anlegens einer vorbestimmten Spannung an das Spinnfasergarn und des Zulieferns des Garns von der Spinneinrichtung (9) einschließt, und durch
einen Garnbeseitigungsschritt zum Beseitigen des auf der Garnsammelrolle (21) angesammelten Spinnfasergarns nach dem Erhöhungsschritt der angesammelten Menge und vor dem

Weiterführen zu einem nachfolgenden Betriebsablauf, durch Aufsaugen des auf der Garnsammelrolle (21) angesammelten Garns in ein Garnfangelement (44) durch Erhöhung der Saugleistung des Garnfangelements (44) um das Widerstandmoment des Garnhakenelements (22) zu übertreffen.

2. Garnverarbeitungsverfahren, enthaltend:

einen Garnführungsschritt, bei welchem von einer Spinneinrichtung (9) zu einer äußeren Umfangsfläche einer Garnsammelrolle (21) zugeliefertes Spinnfasergarn geführt wird, und
einen Erhöhungsschritt der angesammelten Menge des Zulieferns des Spinnfasergarns, indem das Spinnfasergarn von der Spinneinrichtung (9) um die äußere Umfangsfläche der Garnsammelrolle (21) gewickelt wird und eine angesammelte Menge des auf der Garnsammelrolle (21) angesammelten Garns erhöht wird,
dadurch gekennzeichnet, dass
der Erhöhungsschritt der angesammelten Garnmenge die Funktion des Anlegens einer vorbestimmten Spannung an das Spinnfasergarn und des Zulieferns des Garns von der Spinneinrichtung (9) einschließt, und durch
einen Garnbeseitigungsschritt zum Beseitigen des auf der Garnsammelrolle (21) angesammelten Spinnfasergarns nach dem Erhöhungsschritt der angesammelten Menge und vor dem Weiterführen zu einem nachfolgenden Betriebsablauf, durch Entfernen des Garns von einem Garnhakenelement (22) und Aufsaugen des auf der Garnsammelrolle (21) angesammelten Garns in ein Garnfangelement (44).

3. Garnverarbeitungsverfahren nach Anspruch 1 oder 2, enthaltend:

einen Erfassungsschritt der angesammelten Menge zum Erfassen der angesammelten Menge des Spinnfasergarns auf der Garnsammelrolle (21), so dass in dem Garnbeseitigungsschritt, nachdem in dem Erfassungsschritt
der angesammelten Menge eine Feststellung erfolgte, dass die angesammelte Menge eine vorbestimmte Menge erreicht hat, das auf der Garnsammelrolle (21) angesammelte Spinnfasergarn beseitigt wird, während die angesammelte Menge zumindest auf der vorbestimmten Menge
gehalten wird.

4. Garnverarbeitungsverfahren nach Anspruch 1, 2 oder 3, wobei in dem Garnführungsschritt das Spinnfasergarn zu der äußeren Umfangsfläche der Garnsammelrolle (21) durch ein Garnfangelement (44) geführt wird, welches das Spinnfasergarn durch einen Saugluftstrom fängt.

5. Garnverarbeitungsverfahren nach Anspruch 3, wobei in dem Garnbeseitigungsschritt das Spinnfasergarn durch das Garnfangelement (44) beseitigt wird.

6. Garnverarbeitungsverfahren nach einem der Ansprüche 1 bis 5,
enthaltend einen Garnspleißschritt zum Durchführen eines Garnspleißvorgangs nach dem Garnbeseitigungsschritt an dem von der Garnsammelrolle (21) abgezogenen Spinnfasergarn und dem zu einer Auflaufspule aufgespulten Spinnfasergarn.

7. Garnverarbeitungsverflahren nach Anspruch 5, enthaltend einen Spulschritt zum Aufspulen des Spinnfasergarns zu einer Auflaufspule nach
dem Garnspleißschritt.

8. Spinnmaschine, enthaltend:

eine Spinneinrichtung (9), die ein Spinnfasergarn bildet, indem einem Faserband eine Drehung verlieren wird;
eine Spuleinrichtung (13), die eine Auflaufspule bildet, indem das von der Spinneinrichtung (9) zugelieferte Spinnfasergarn aufgespult wird; eine
Garnsammelrolle (21), welche das Spinnfasergarn um ihre äußere Umfangsfläche wickelt und sich mit dem darum gewickelten Spinnfasergarn dreht,
um das Spinnfasergarn von der Spinneinrichtung (9) zuzuliefern, während an das Spinnfasergarn Spannung angelegt wird, **gekennzeichnet durch**
ein Garnformelement (44) zum Beseitigen des um die Garnsammelrolle (21) gewickelten Spinnfasergarns, durch Aufsaugen des auf der Garnsammelrolle (21) aufgewickelten Garnes in das Garnfangelement (44).

9. Spinnmaschine nach Anspruch 8, enthaltend einen Erfassungsabschnitt (27) für die angesammelte Menge, der eine angesammelte Menge
des um die Garnsammelrolle (21) gewickelten Spinnfasergarns erfasst,
so dass, nachdem der Erfassungsabschnitt (27) für die angesammelte Menge festgestellt hat, dass mindestens eine vorbestimmte Menge des
Spinnfasergarns angesammelt wurde, das Garnfangelement (44) das auf der Garnsammelrolle (21) angesammelte
Spinnfasergarn beseitigt, während die angesammelte Menge mindestens auf der vorbestimmten Menge gehalten wird.

10. Spinnmaschine nach Anspruch 8 oder Anspruch 9, wobei das Garnfangelement (44) das Spinnfasergarn
durch einen Saugluftstrom fängt und das gefangene Spinnfasergarn zu der Garnsammelrolle (21) führt.

11. Spinnmaschine nach Anspruch 10, enthaltend:

eine Garnspleißeinrichtung (43), welche das von der Garnsammelrolle (21) abgespulte Spinnfasergarn und das Spinnfasergarn der Auflaufspule, das von der Spuleinrichtung (13) aufgewickelt wurde, spießt; und einen Steuerabschnitt, der
die Garnspleißvorrichtung so steuert, dass sie einen Garnspleißvorgang durchführt, nachdem das Garnfangelement (44) das Spinnfasergarn beseitigt.

12. Spinnmaschine nach einem der Ansprüche 8 bis 11, enthaltend eine Garnfehlererfassungseinrichtung (52), welche das Vorhandensein oder
das Fehlen eines Garnfehlers in dem Spinnfasergarn überwacht,
so dass dann, wenn das um die Garnsammelrolle (21) gewickelte Spinnfasergarn weniger ist als die vorbestimmte Menge, die
Garnfehlererfassungeinrichtung (42) eine Überwachung des Garnfehlers zeitweilig stoppt, und nachdem mindestens die vorbestimmte Menge des Spinnfasergarns um die Garnsammelrolle (21) gewickelt ist, die Garnfehlererfassungeinrichtung (52) die Überwachung des Garnfehlers erneut beginnt.

Revendications

1. Procédé de traitement de fils comprenant :

une étape de guidage de fil pour guider du fil filé acheminé d'un dispositif de filage (9) à la surface périphérique externe d'un rouleau accumulateur de fil (21), et
une étape d'augmentation de la quantité accumulée pour acheminer le fil filé en enroulant le fil filé provenant du dispositif de filage (9) autour de la surface périphérique externe du rouleau accumulateur de fil (21) et en augmentant la quantité accumulée du fil filé accumulé sur le rouleau accumulateur de fil (21),
caractérisé en ce que
l'étape d'augmentation de la quantité accumulée de fil comprend la fonction d'application d'une tension prédéterminée au fil filé et l'acheminement du fil à partir du dispositif de filage (9) et par
une étape de mise au rebut du fil pour mettre au rebut le fil filé accumulé sur le rouleau accumulateur de fil (21) après l'étape d'augmentation de la quantité de fil accumulée et avant de procéder à une opération ultérieure en aspirant le fil filé accumulé sur le rouleau accumulateur de fil (21) dans un élément de capture de fil (44) en augmentant la force d'aspiration de l'élément de capture de fil (44) pour dépasser le couple de résistance de l'élément d'accrochage de fil (22).

2. Procédé de traitement de fil, comprenant :

une étape de guidage de fil pour guider du fil filé acheminé d'un dispositif de filage (9) à une surface périphérique externe d'un rouleau accumulateur de fil (21), et
une étape d'augmentation de la quantité accumulée pour acheminer le fil filé en enroulant le fil filé provenant du dispositif de filage (9) autour de la surface périphérique externe du rouleau accumulateur de fil (21) et en augmentant la quantité accumulée du fil filé accumulé sur le rouleau accumulateur de fil (21), **caractérisé en ce que**
l'étape d'augmentation de la quantité accumulée de fil comprend la fonction d'application d'une tension prédéterminée au fil filé et l'acheminement du fil à partir du dispositif de filage (9) et par
une étape de mise au rebut du fil pour mettre au rebut le fil filé accumulé sur le rouleau accumulateur de fil (21) après l'étape d'augmentation de la quantité de fil accumulée et avant de procéder à une opération ultérieure en enlevant le fil d'un élément d'accrochage de fil (22) et en aspirant le fil filé accumulé sur le rouleau accumulateur de fil (21) dans un élément de capture de fil (44).

3. Procédé de traitement de fil selon les revendications 1 ou 2, comprenant :

une étape de détection de quantité accumulée pour détecter la quantité accumulée du fil filé sur le rouleau accumulateur de fil (21),
dans lequel, à l'étape de mise au rebut de fil, après une détection réalisée dans l'étape de détection de quantité accumulée montrant que la quantité accumulée a atteint une quantité prescrite, le fil filé accumulé sur le rouleau accumulateur de fil (21) est mis au rebut tout en maintenant la quantité accumulée pour qu'elle soit au moins la quantité prescrite.

4. Procédé de traitement de fils selon les revendications 1, 2 ou 3, de sorte qu'à l'étape de guidage de fil, le fil filé est guidé sur la surface périphérique externe du rouleau accumulateur de fil (21) par un élément de capture de fil (44) qui capture le fil filé par

écoulement d'air d'aspiration.

5. Procédé de traitement de fils selon la revendication 4, dans lequel, à l'étape de mise au rebut de fil, l'élément de capture de fil (44) met au rebut le fil filé.

6. Procédé de traitement de fils selon l'une quelconque des revendications 1 à 5, comprenant une étape d'épissage de fils pour réaliser une opération d'épissage de fils, après l'étape de mise au rebut de fil, sur le fil filé déroulé du rouleau accumulateur de fil (21) et sur le fil filé enroulé en paquet.

7. Procédé de traitement de fils selon la revendication 6, comprenant une étape d'enroulement pour enrouler le fil filé en paquet après l'étape d'épissage de fils.

8. Machine de filage comprenant :

un dispositif de filage (9) qui forme un fil filé en appliquant une torsion à un faisceau de fibres ;
un dispositif d'enroulement (13) qui forme un paquet en enroulant le fil filé acheminé depuis le dispositif de filage (9) ;
un rouleau accumulateur de fil (21) qui enroule le fil filé autour de sa surface périphérique externe et tourne avec le fil filé enroulé pour acheminer le fil filé depuis le dispositif de filage (9) tout en appliquant une tension au fil filé ; **caractérisée par** :
une section de mise au rebut de fil accumulé (44) pour mettre au rebut le fil filé enroulé autour du rouleau accumulateur de fil (21).

9. Machine de filage selon la revendication 8, comprenant une section de détection de quantité accumulée (27) qui détecte une quantité accumulée du fil filé enroulé autour du rouleau accumulateur de fil (21), dans laquelle, une fois que la section de détection de quantité accumulée (27) détecte qu'au moins une quantité prescrite du fil filé a été accumulée, la section de mise au rebut de fil accumulé (44) met au rebut le fil filé accumulé sur le rouleau accumulateur de fil (21) tout en maintenant la quantité accumulée pour qu'elle soit au moins la quantité prescrite.

10. Machine de filage selon la revendication 8 ou la revendication 9, dans laquelle la section de mise au rebut de fil accumulé (44) capture le fil filé par écoulement d'air d'aspiration et guide le fil filé capturé au rouleau accumulateur de fil (21).

11. Machine de filage selon la revendication 10, comprenant :

un dispositif d'épissage de fils (43) qui épisse le fil filé déroulé du rouleau accumulateur de fil (21) et le fil filé du paquet enroulé par le dispositif d'enroulement (13) ; et
une section de commande qui commande au dispositif d'épissage de fils d'effectuer une opération d'épissage de fils une fois que la section de mise au rebut de fil accumulé (44) met au rebut le fil filé.

12. Machine de filage selon l'une quelconque des revendications 8 à 11, comprenant un dispositif de détection de défaut de fil (52) qui surveille la présence ou l'absence d'un défaut dans le fil filé,
dans laquelle, lorsque le fil filé enroulé autour du rouleau accumulateur de fil (21) est en quantité inférieure à la quantité prescrite, le dispositif de détection de défaut de fil (52) arrête momentanément la surveillance du défaut de fil, et,
une fois qu'au moins la quantité prescrite du fil filé est enroulée autour du rouleau accumulateur de fil (21), le dispositif de détection de défaut de fil (52) relance la surveillance du défaut de fil.

FIG. 1

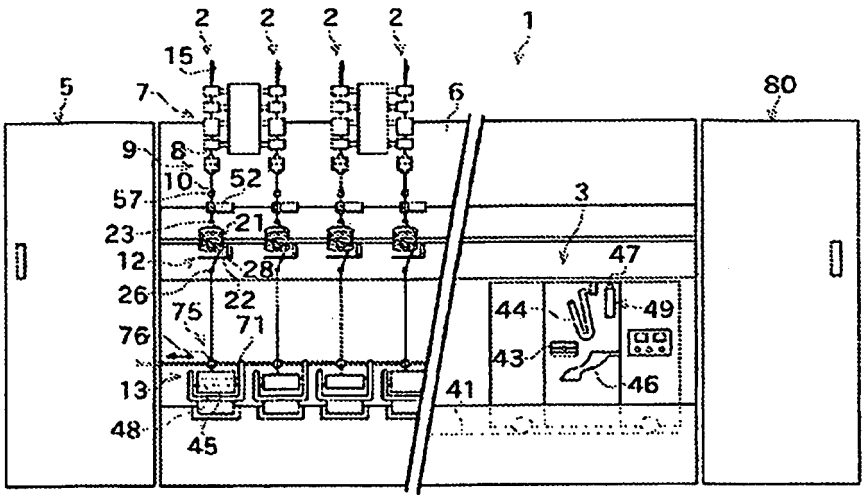
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FIG. 2

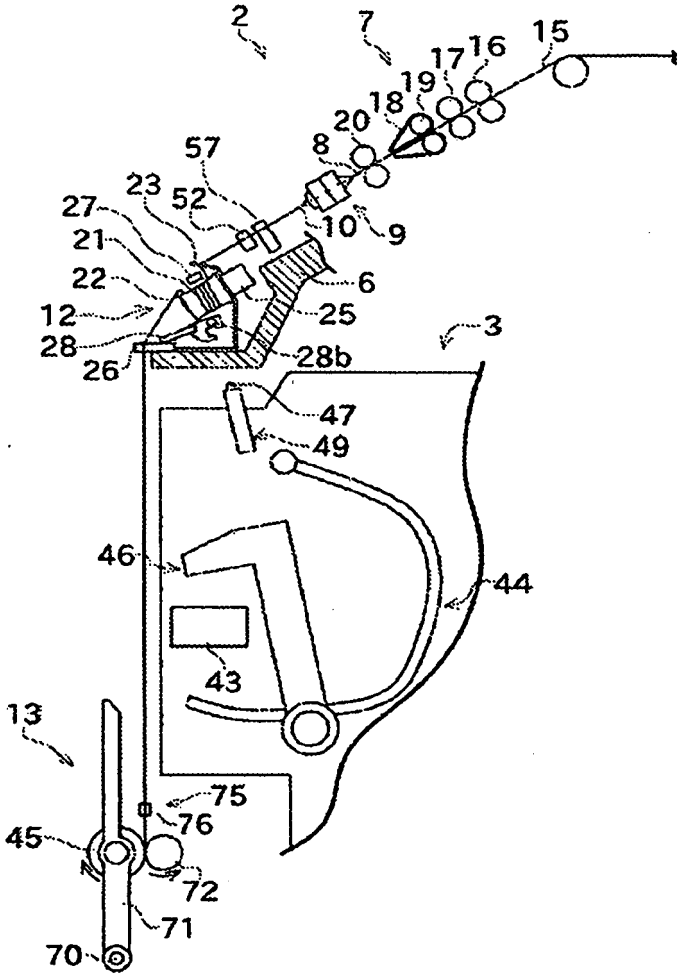
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FIG. 3

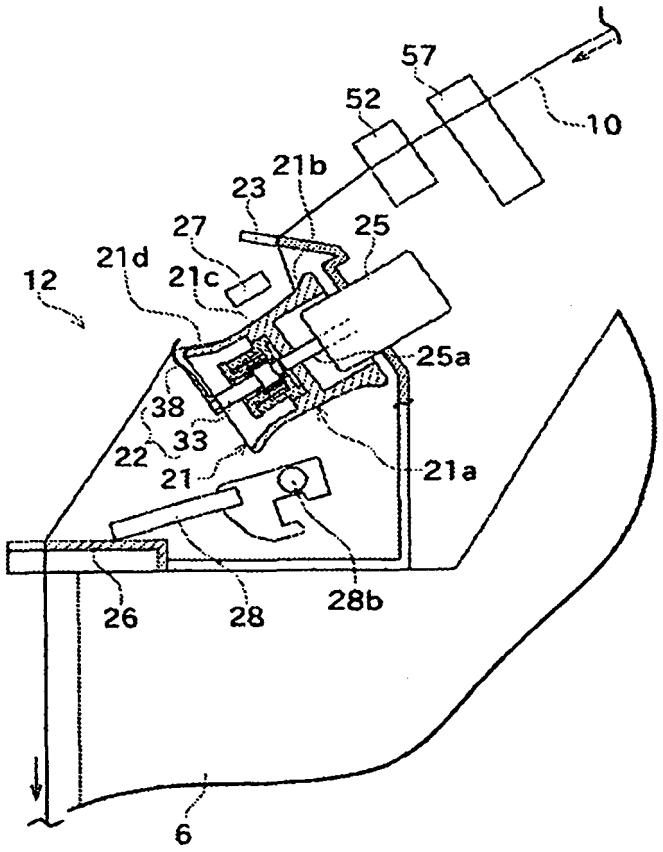

FIG. 4

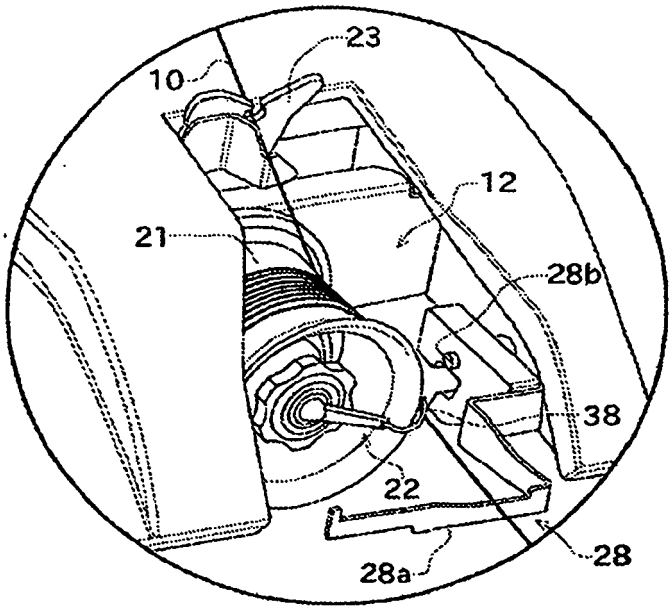

FIG. 5

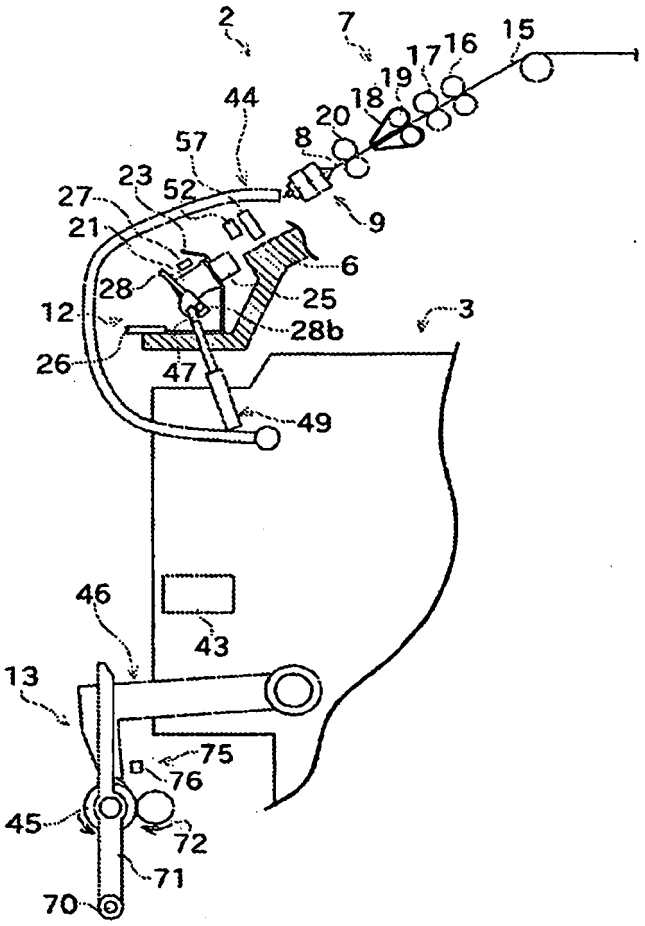
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FIG. 6

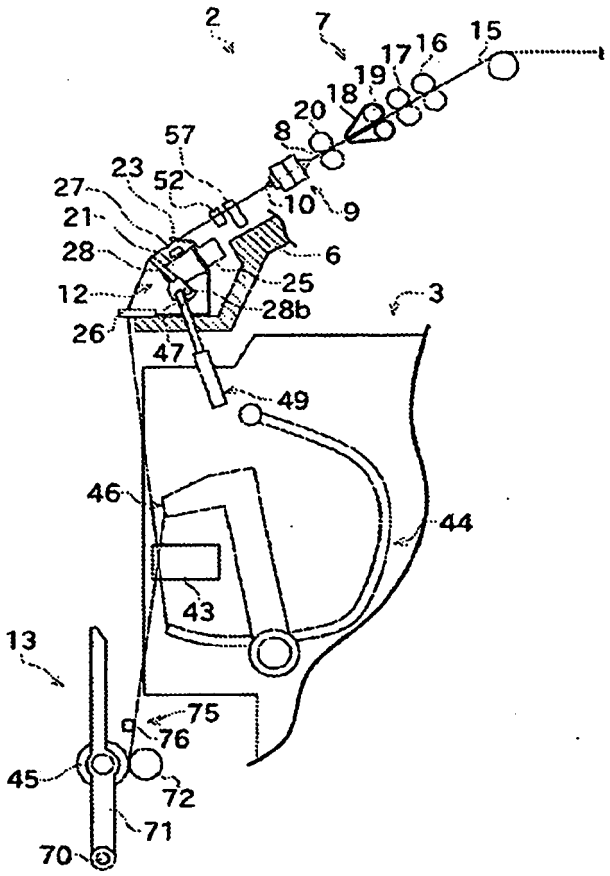
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FIG. 7

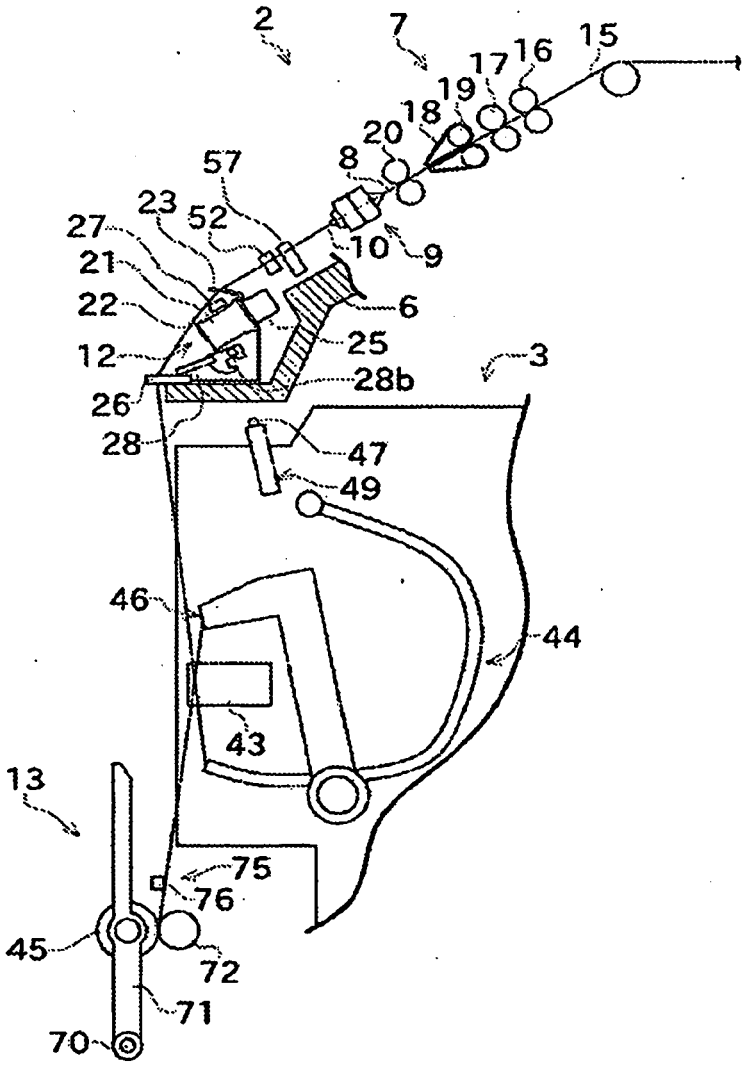
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FIG. 8

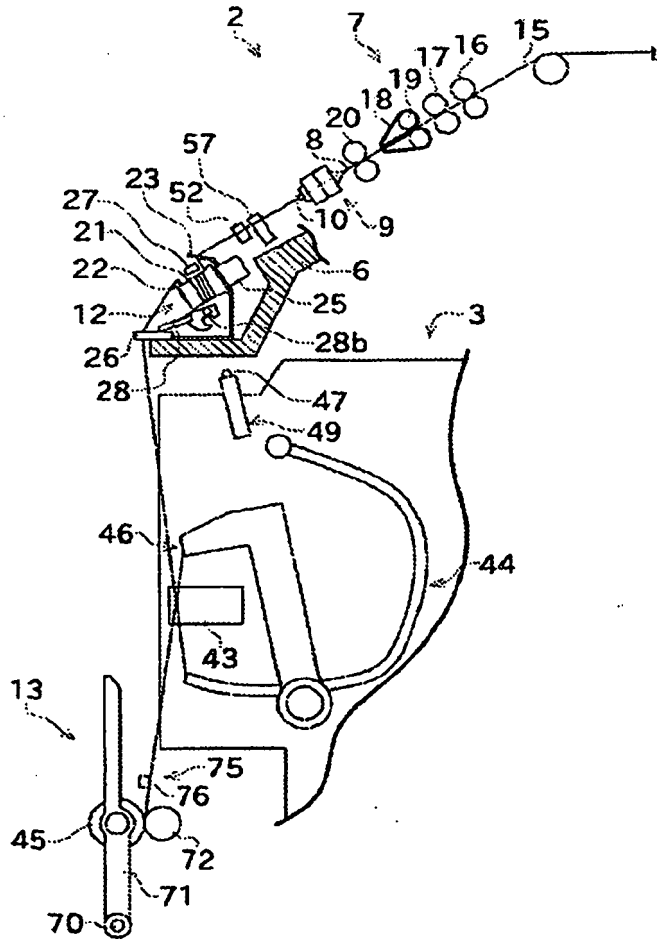
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FIG. 9

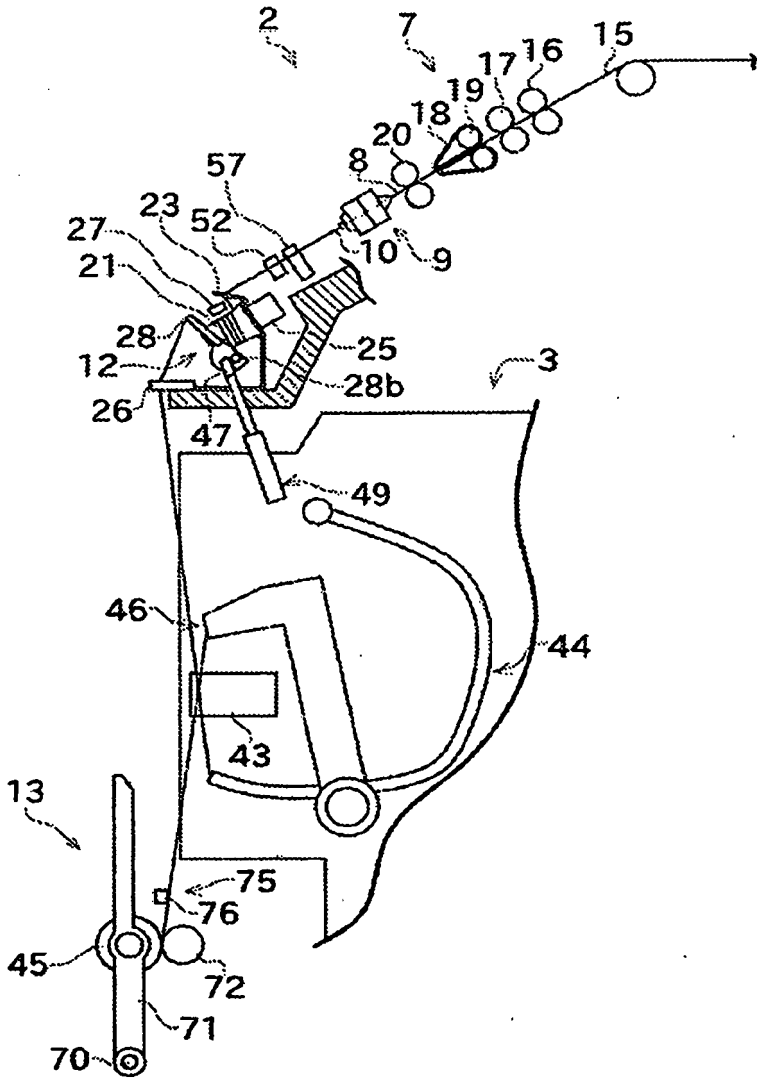
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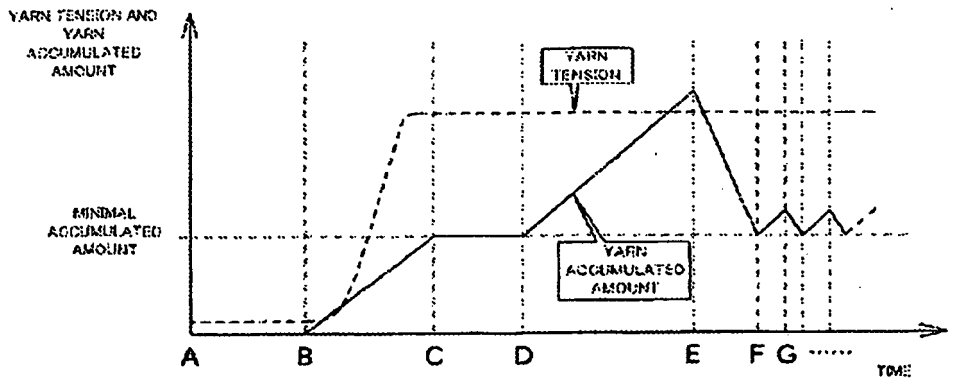
FIG. 10


YARN TENSION AND YARN ACCUMULATED AMOUNT
MINIMAL ACCUMULATED AMOUNT
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YARN ACCUMULATED AMOUNT
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REFERENCES CITED IN THE DESCRIPTION

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