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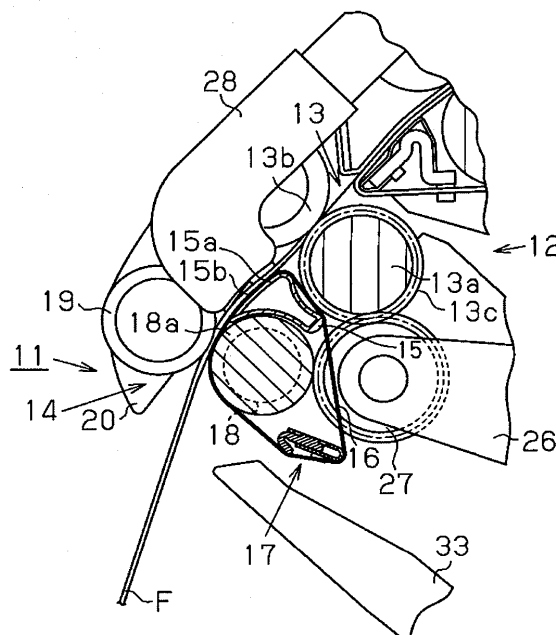
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(54) **Fiber bundle collecting device for a spinning machine**

(57) A fiber bundle collecting device (11) for a spinning machine collects a fiber bundle (F) drafted by a draft part (12) of the spinning machine. The fiber bundle collecting device (11) includes a delivery portion (14), a suction pipe (15), an apron guide (17) and an air-permeable apron (16). The apron guide (17) is adapted to guide the

apron (16) so that the apron travels along a path spaced away from a nip roller (18a) of the delivery portion on the side of the nip roller (18a) opposite to part of the nip roller (18a) which guides the fiber bundle. The apron guide (17) is also adapted to guide the apron (16) along a plane on the side of the apron guide (17) where the apron (16) is wound.

FIG. 1A



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a fiber bundle collecting device for a spinning machine and, more particularly, to a device arranged downstream of a drafting device (or drafting part) of a fine spinning machine for collecting fiber bundle drafted by the drafting device.

[0002] There are proposed various types of fiber bundle collecting devices for collecting drafted fiber bundle before twisting for the purpose of improvement of yarn quality by reducing fluff in the fiber bundle. For collecting and transporting the fiber bundle, an endless perforated belt (or air-permeable apron) is used (for example, Japanese Patent Application Publication No. 2004-100094 or No. 2001-279539). Referring to Fig. 6 showing the arrangement disclosed by the first reference, or Publication No. 2004-100094, the fiber bundle collecting device is arranged downstream of final roller pairs 61 which form part of a drafting device, including nip roller pairs 62, suction pipes 63 and air-permeable aprons 64. The top nip roller 62b of the nip roller pair 62 is pressed against its counterpart bottom nip roller 62a through the apron 64. The suction pipe 63 is arranged upstream of the nip point of the nip roller pairs 62 as seen in the direction of movement of the fiber bundle F, and has a guide surface with suction holes 63a. Downstream of the nip point of the nip roller pair 62 is arranged an apron guide 65 having an arcuate cross section as viewed in the direction of movement of the fiber bundle F.

[0003] Referring to Fig. 7 showing the fiber bundle collecting device disclosed by the second reference, or Publication No. 2001-279539 and designated by reference numeral 72, sliver collecting zone 73 is located downstream of the front roller pairs (final roller pair) 71 of a drafting device as viewed in the direction of movement of the fiber bundle F and the fiber bundle collecting device 72 is provided in the zone 73. The fiber bundle collecting device 72 includes a suction shoe 74, turning rollers 75, 76, and a perforated apron 77 which is wound around the suction shoe 74 and the turning rollers 75, 76. The sliver collecting zone 73 is defined by and between two nip positions K1, K2. The first nip position K1 is a position where the fiber bundle F is nipped by the top roller 71a and the bottom roller 71 b of the front roller pair 71. The second nip position K2 is a position where the perforated apron 77 is pressed against the top roller 71a by the turning roller 75.

[0004] Referring back to Fig. 6, the fiber bundle collecting device is made such that the apron 64 moves in contact with the bottom nip roller 62a not only at the side thereof where the fiber bundle F is guided, but also at the radially opposite side of the bottom nip roller 62a, with the result that the space S formed by the apron 64, the bottom nip roller 62a and the suction pipe 63 is narrow. Since the bottom nip roller 62a and the suction pipe 63 are provided as one unit, e.g., for each four spindles

of the spinning machine, the space S for the spindles located at the opposite ends of each unit is formed as a dead-end space having no way for cotton fly to escape therefrom. Therefore, the fly tends to be accumulated easily in the space S and the accumulated fly presses the apron 64 in operation. This will result in extra energy required for driving the apron 64 and shortened serviceable life of the apron 64.

[0005] Referring back to Fig. 7, the fiber bundle collecting device 72 uses the turning roller 76 whose diameter is smaller than that of the other turning roller 75 which defines the second nip position K2 with the top roller 71a and the turning roller 76 around which the apron 77 turns or changes its moving direction is located farther away from the turning roller 75 than in the case of the collecting device of the first reference of Fig. 6. In this structure, the apron 77 moves in contact with the turning roller 75 in the region where the apron 77 is wound around the turning roller 75 and the apron 77 in the other region travels remote from the turning roller 75. Therefore, fly tends to be less accumulated in the fiber bundle collecting device 72 of the second reference than in the fiber bundle collecting device of the first reference.

[0006] Since the fiber bundle collecting device 72 uses the turning roller 76 whose diameter is small, however, the path along which the apron 77 travels from the turning roller 75 to the turning roller 76 is spaced away from the original yarn path which is indicated by chain double-dashed line in Fig. 7. Part of fibers of the fiber bundle F is attached to the apron 77 when the fiber bundle F passes through the sliver collecting zone 73, and the attached fibers are released from the apron 77 in the region where the apron 77 just moves away from the turning roller 75, so that the fiber bundle F is removed from the apron 77. Therefore, the fiber bundle F is actually drawn out from the fiber bundle collecting device 72 through a path which is indicated by the chain line of Fig. 7. As the spaced distance ΔL between the original yarn path and the position P where the fiber bundle F just moves away from the apron 77 increases, the actual path of the fiber bundle F is bent to a large extent, which makes it easier for the yarn to be broken. In order to avoid such yarn breakage, the turning roller 76 should be arranged close to the original yarn path. In this case, however, it becomes hard to ensure provision of a sufficient space below the turning roller 75.

[0007] The present invention is directed to a fiber bundle collecting device which permits the provision of a space necessary for installing the fiber bundle collecting device and lengthens the cleaning interval and the serviceable period of life of the apron.

SUMMARY OF THE INVENTION

[0008] The present invention provides a fiber bundle collecting device for a spinning machine for collecting a fiber bundle drafted by a draft part of the spinning machine. The fiber bundle collecting device includes a de-

livery portion, a suction pipe, an apron guide and an air-permeable apron. The delivery portion is located downstream of a final delivery roller pair of the draft part as viewed in a direction of movement of the fiber bundle and has nip rollers. The suction pipe is located upstream of a nip point of the delivery portion as viewed in the direction of movement of the fiber bundle and has a guide surface with a suction hole. The apron guide is located downstream of the nip point of the delivery portion as viewed in the direction of movement of the fiber bundle. The air-permeable apron is wound around the suction pipe, one of the nip rollers and the apron guide so as to be rotated thereround. The apron guide is adapted to guide the apron so that the apron travels along a path spaced away from the nip roller on the side of the nip roller opposite to part of the nip roller which guides the fiber bundle. The apron guide is also adapted to guide the apron along a plane on the side of the apron guide where the apron is wound.

[0009] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The features of the present invention that are believed to be novel are set forth with particularity in the appended claims. The invention together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1A is a schematic side view showing part of a fiber bundle collecting device according to one embodiment of the present invention;

Fig. 1B is a partially enlarged view of Fig. 1A;

Fig. 2A is a partial schematic view of the fiber bundle collecting device as seen from downstream of a nip point of a delivery portion with respect to direction of movement of a fiber bundle;

Fig. 2B is a front view of a rotary shaft of the fiber bundle collecting device;

Fig. 3A is a perspective view showing the relation between an air-permeable apron and an apron guide of the fiber bundle collecting device;

Fig. 3B is a schematic perspective view showing a spring member of the fiber bundle collecting device;

Fig. 4A is a schematically exploded plan view showing tensioning means of the fiber bundle collecting device;

Fig. 4B is a schematic plan view showing the tensioning means in its assembled state;

Fig. 5 is a schematic sectional side view showing part of a fiber bundle collecting device according to another embodiment of the present invention;

Fig. 6 is a schematic side view showing part of a fiber bundle collecting device according to background art; and

Fig. 7 is a schematic sectional side view showing part of another fiber bundle collecting device according to background art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The following will describe a fiber bundle collecting device for a spinning machine as embodied in a fine spinning machine with reference to Figs. 1A through 4B. The fiber bundle collecting device of the present embodiment has substantially the same structure as that of Japanese Patent Application Publication No. 2004-100094 which has been previously filed by the present applicant, except the apron guide thereof. Referring to Fig. 1A, the fiber bundle collecting device 11 is located downstream of final delivery roller pairs 13 of the drafting device 12 as viewed in the direction of movement of the fiber bundle F. The drafting device 12 serves as a drafting part of the spinning machine.

[0012] The fiber bundle collecting device 11 includes delivery portions 14, suction pipes 15, air-permeable aprons 16 and apron guides 17. Each delivery portion 14 has a bottom nip roller 18a that serves as a nip roller and a top nip roller 19. The bottom nip roller 18a is formed as a part of a rotary shaft 18 which is arranged parallel to the front bottom roller 13a of the final delivery roller pair 13. The top nip roller 19 is pressed against the bottom nip roller 18a through the apron 16. Like the front top rollers 13b of the drafting device 12, the two top nip rollers 19 are supported by a weighting arm (not shown) through a support member 20 for each two spindles of the spinning machine. The support member 20 is formed integrally with a support member for the two front top rollers 13b. The suction pipe 15 is located upstream of the nip points of the delivery portions 14 as viewed in the direction of movement of the fiber bundle F and has a guide surface 15b with suction holes 15a.

[0013] Referring to Fig. 2A, bottom components of the fiber bundle collecting device 11 are provided by half of the spindles arranged between roller stands 21 of the drafting device 12 as one unit, or four spindles in this embodiment. At an intermediate position between any two adjacent roller stands 21 arranged at a predetermined interval in the longitudinal direction of the spinning machine is disposed a support arm 22 which is supported at the proximal end thereof by a support beam (not

shown) extending in the longitudinal direction of the spinning machine, with the rotary shaft 18 supported between the roller stand 21 and the support arm 22.

[0014] Referring to Fig. 2B, the rotary shaft 18 is formed in a predetermined length corresponding to a plurality of spindles (or four spindles in this embodiment), and bearings 23 fixed to opposite ends of the rotary shaft 18 are fitted in end plugs 24. The end plugs 24 are supported at the fitting portions 24a thereof by support portions 21a, 22a which are provided in the roller stands 21 and the support arm 22, respectively, whereby each of the rotary shafts 18 is rotatably supported by the roller stand 21 and the support arm 22. Each of the support portions 21a, 22a is formed so as to be capable of supporting two end plugs 24, thus making it possible to support the end plugs 24 mounted to any two adjacent ends of two different rotary shafts 18. A gear 25 is fixedly mounted at an intermediate position on the rotary shaft 18 for rotation therewith.

[0015] As shown in Fig. 1A, the front bottom roller 13a is formed with a gear 13c at a position facing the gear 25 (not shown in Fig. 1A). There is provided a support arm 26 which is fixed at the proximal end thereof to the support beam (not shown) in the same manner as the support arm 22 and an intermediate gear 27 is rotatably supported by the support arm 26 for engagement with the gear 13c and the gear 25. In such an arrangement, torque of the front bottom roller 13a is transmitted to the rotary shaft 18 through the gear 13c, the intermediate gear 27 and the gear 25.

[0016] A suction duct (not shown) is arranged in the fine spinning machine extending in the longitudinal direction thereof (or the direction perpendicular to the plane of Fig. 1A). The suction pipe 15 extends parallel to the suction duct and connected thereto through a connection tube 28. The suction pipe 15 is supported by a pair of the end plugs 24 in the same manner as the rotary shaft 18 is supported by being fitted in the paired end plugs 24.

[0017] The apron guide 17 will now be described. The apron guide 17 is located downstream of the nip point of the delivery portion 14 as viewed in the direction of movement of the fiber bundle F. The apron guide 17 is adapted for guiding the apron 16 in such a way that the apron 16 travels along a path spaced away from the circumferential surface of the bottom nip roller 18a when moving in the region remote and opposite to the part of the bottom nip roller 18a where the fiber bundle F is guided, as shown in Fig. 1B. In addition, the apron guide 17 is formed so as to guide the apron 16 along a plane on the side of the apron guide 17 where the apron 16 is wound. The apron guide 17 has tensioning means 29 (shown in Fig. 4B) for providing tension to the apron 16. The apron guide 17 has a plate-like bar 30 which extends in the axial direction of the bottom nip roller 18a and is supported by a pair of end plugs 24 in which the opposite ends of the bar 30 are fitted. The bar 30 has a bent portion 30a which is formed at one side of the width direction (in a direction perpendicular to the axial direction of the bottom nip roller

18a) of the bar 30 and extends over the entire length of the bar 30.

[0018] Referring to Fig. 4A, the tensioning means 29 has a pressing member 31 which is formed with a bent portion 31a and supported by the bar 30 so as to be movable in the width direction of the bar 30 and a spring member 32 which urges the pressing member 31 in the direction which causes the bent portion 31a of the pressing member 31 to move away from the bar 30. The pressing member 31 is bent so that its cross section has a U-shape, as shown in Fig. 3A. The bar 30 has four projections 30b on the side thereof adjacent to the bottom nip roller 18a at positions corresponding to the mounting position of the pressing members 31 and extending in the width direction of the bar 30.

[0019] The pressing member 31 is formed with substantially the same width as the apron 16. A pair of projections 31b is formed for each pressing member 31 on the side thereof facing the apron 16 for regulating the movement of the apron 16 in width direction. An elongated hole 31c which is longer than the projection 30b is formed in the pressing member 31 at a position corresponding to the projection 30b in an assembled state of the tensioning means 29, as shown in Fig. 4B. The pressing member 31 is mounted on the bar 30 with the projection 30b received loosely in the elongated hole 31c.

[0020] Referring to Figs. 4A and 3B, the spring member 32 includes two coil portions 32a, a connecting portion 32b connecting the two coil portions 32a at one ends thereof and two pressing portions 32c extending from the other ends of the two coil portions 32a at an angle to the connecting portion 32b and in an intersecting relation to each other. As shown in Fig. 4A, the bar 30 is formed with a pair of recesses 30c for each pressing member 31 for engagement with the coil portions 32a.

[0021] In mounting the tensioning means 29 and the apron 16 in place, firstly the coil portions 32a of the spring member 32 are engaged with the paired recesses 30c of the bar 30 with the apron 16 moved away from its mounting position, as shown in Fig. 4B. Then, the pressing member 31 is mounted on the bar 30 so as to hold the spring member 32 and the bar 30. In this state, the pressing member 31 is pushed against the urging force of the spring member 32 and then the apron 16 is moved to a position where the apron 16 is wound around the bar 30 and the pressing member 31. Accordingly, the apron 16 is mounted in place.

[0022] The apron 16 is wound around the suction pipe 15, the apron guide 17 and the bottom nip roller 18a in contact therewith. The apron 16 is rotated by the bottom nip roller 18a while having sliding contact with the guide surface 15b and the pressing member 31. In the present embodiment, the apron 16 is formed by woven fabric which has an appropriate air permeability.

[0023] As shown in Figs. 1A and 2A, there is provided a suction nozzle 33 of a single type pneumatic device whose nozzle end is located below the apron guide 17 for each spindle. The suction nozzle 33 is adapted to

draw in the fiber bundle F delivered from the drafting device 12 in the event of yarn breakage. The proximal end of the suction nozzle 33 is connected to a pneumatic duct (not shown) which is common to all spindles of the spinning machine.

[0024] The following will describe the operation of the fiber bundle collecting device 11 as constructed above. In operation of the fine spinning machine, the fiber bundle F drafted by the drafting device 12 is guided from the final delivery roller pair 13 to the fiber bundle collecting device 11. The bottom nip roller 18a and the top nip roller 19 are rotated at substantially the same surface speed as the final delivery roller pair 13, and the fiber bundle F passes through the nip point of the bottom and top rollers 18a, 19 under an appropriate tension before moving downstream while being turned and twisted.

[0025] The suction of the duct is exerted to the suction pipe 15 through the connection tube 28, and the suction of the suction holes 15a formed on the guide surface 15b is exerted to the fiber bundle F through the apron 16. The fiber bundle F is subjected to sucking and collecting at positions corresponding to the suction holes 15a. Thus, as compared with a spinning machine provided with no fiber bundle collecting device 11, generation of fluff and fly is restricted and, therefore, the yarn quality is improved.

[0026] In the background art, the apron is arranged to move in contact with the bottom nip roller on the side thereof that is opposite the part of the bottom nip roller which guides the fiber bundle, as indicated by double dashed-chain line in Fig. 1 B, and, therefore, a narrow wedge-shaped space is formed between the suction pipe and the bottom nip roller as indicated by S in Fig. 1B. Therefore, fly generated during the operation of the fine spinning machine is accumulated easily in a space between the bottom nip roller 18a and the curved surface of the suction pipe 15 which follows the circumferential surface of the bottom nip roller 18a. Once fly has been thus accumulated in the space, the fly accumulation is increased to extend out of the wedge-shaped space S. Depending on the condition of the spinning operation, the fly accumulation is increased in about a week to such an extent that affects the spinning results.

[0027] In the present embodiment, however, the apron 16 travels along a path that is spaced away from the bottom nip roller 18a on the side of the bottom nip roller 18a that is opposite to the part thereof which guides the fiber bundle F, as shown by solid line in Fig. 1 B, therefore, the wedge-shaped space S formed between the suction pipe 15 and the bottom nip roller 18a is open to a larger space. Therefore, fly tends to be less accumulated in the space between the suction pipe 15 and the bottom nip roller 18a. Additionally, it takes a longer time before the fly accumulation is increased to an extent that presses the apron 16 thereby to affect the traveling of the apron 16. Thus, the cleaning interval of the fiber bundle collecting device 11 of the present embodiment can be extended in comparison with that of devices of the background

art. The cleaning interval can be extended about two to three times longer as compared with the background devices.

[0028] When a guide member whose cross section has an arcuate shape as disclosed by Japanese Patent Application Publication No. 2004-100094 or a guide roller whose diameter is large is provided in place of the apron guide 17 of the above-described embodiment according to the present invention, the path of the apron 16 projects downstream with respect to the direction of movement of the fiber bundle F, which makes it hard to ensure the space for the fiber bundle collecting device 11. In particular, when a pneumatic device of a single nozzle type is used, it is easy for the apron 16 to interfere with the suction nozzle 33. Since the apron guide 17 of the present embodiment is adapted to guide the apron 16 along a plane on the side of the apron guide 17 where the apron 16 is wound, the above problem is resolved.

[0029] In the region between the bent portion 31a of the pressing member 31 and the bent portion 30a of the bar 30 on the side of the apron guide 17 where the apron 16 is wound, the apron 16 moves along a plane. That is, the apron guide 17 guides the apron 16 along a plane on the side of the apron guide 17 where the apron 16 is wound. Therefore, if the bent portion 31a of the pressing member 31 is spaced away from the path of the fiber bundle F and the bent portion 30a of the bar 30 is arranged near the path of the fiber bundle F, it is easy to ensure the space necessary for installing the fiber bundle collecting device 11.

[0030] This embodiment provides the following effects.

(1) The fiber bundle collecting device 11 is located downstream of the final delivery roller pair 13 of the drafting device 12 as viewed in the direction of movement of the fiber bundle F and has the suction pipe 15 which is located upstream of the nip point of the delivery portion 14 and the apron 16 which is wound around the suction pipe 15, the bottom nip roller 18a and the apron guide 17 which is located downstream of the nip point of the delivery portion 14. The apron 16 is rotated round the suction pipe 15, the bottom nip roller 18a and the apron guide 17. The apron guide 17 guides the apron 16 so that the apron 16 travels along a path that is spaced away from the bottom nip roller 18a on the side of the bottom nip roller 18a that is opposite to the part thereof which guides the fiber bundle F. Therefore, fly tends to be less accumulated in the space between the suction pipe 15 and the bottom nip roller 18a. It takes a longer time before the fly accumulation is increased to such an extent that presses the apron 16 thereby to affect the movement of the apron 16. Thus, the cleaning interval of the fiber bundle collecting device 11 of the present embodiment can be extended in comparison with that of devices of the background art and the cleaning interval of the device 11 and the serviceable period of life of the apron 16 can be extended, ac-

cordingly. In addition, a sufficient distance is ensured between the apron 16 and the bottom nip roller 18a on the side of the bottom nip roller 18a that is opposite to the part thereof which guides the fiber bundle F, and winding range R of the apron 16 from the nip point of the delivery portion 14 to the position where the apron 16 moves away from the bottom nip roller 18a is kept optimally to prevent generation of yarn breakage.

(2) The apron guide 17 is adapted to guide the apron 16 along a plane on the side of the apron guide 17 where the apron 16 is wound in contact therewith. Therefore, compared to a case, for example, where the apron is guided along a path which ensure the sufficient distance between the apron 16 and the bottom nip roller 18a and the optimal winding range R of the apron 16 from the nip point of the delivery portion 14 to the position where the apron 16 moves away from the bottom nip roller 18a by a guide roller having circular section, a space that is necessary for installation of the fiber bundle collecting device 11 is ensured easily. That is, the apron 16 is guided properly without interference of the suction nozzle 33 with the apron guide 17 which is located immediately below the fiber bundle collecting device 11.

(3) The apron guide 17 has tensioning means 29 for providing tension to the apron 16, which makes it easy to mount the apron 16 on the apron guide 17 so that the apron 16 travels or moves under an appropriate tension. In addition, compared to a case where the tensioning means 29 is provided in any other part of the device, a space for the fiber bundle collecting device 11 is easily ensured and the structure of the device 11 is simplified.

(4) The apron guide 17 has a plate-like bar 30 extending in the axial direction of the bottom nip roller 18a. Therefore, compared to a case where two rollers or two round bars are used in place of the plate-like bar 30, the number of parts for use in the device is reduced and the assembling procedure of the device is facilitated, accordingly.

(5) The plate-like bar 30 is bent at one side of its width. Therefore, as compared to a case where a simple flat bar is used, the plate-like bar 30 offers sufficient strength even with a reduced thickness.

(6) Since the tensioning means 29 is provided so that the pressing member 31 for providing tension to the apron 16 is movable in the width direction of the plate-like bar 30, the moving path of the apron 16 will hardly affect the arrangement of the suction nozzle 33 if the width of the plate-like bar 30 is increased.

(7) The spring member 32 of the tensioning means 29 includes two coil portions 32a, a connecting portion 32b connecting the two coil portions 32a at one ends thereof and two pressing portions 32c extending from the other ends of the coil portions 32a at an angle to the connecting portion 32b and in an intersecting relation to each other. In the present embodiment, a torsion spring is used for the spring member 32. The spring member 32 is mounted to the bar 30 with the coil portions 32a engaged with the recesses 30c formed in the bar 30. Therefore, the pressing member 31 is smoothly urged by the spring member 32.

[0031] The present invention is not limited to the above-described embodiment but may be implemented as follows.

[0032] The bar 30 does not necessarily have to have a bent portion 30a which extends over the entire length of the bar 30 at one side of the width thereof. However, the bar 30 having the bent portion 30a may be made thinner without affecting the strength of the bar 30.

[0033] The apron guide 17 has only to be adapted to guide the apron 16 so that the apron 16 travels along a path spaced away from the bottom nip roller 18a on the side of the bottom nip roller 18a opposite to the part of the bottom nip roller 18a which guides the fiber bundle F and to guide the apron 16 along a plane on the side of the apron guide 17 where the apron 16 is wound. The apron guide 17 does not necessarily have to have the bar 30. As shown in Fig. 5, two round bars 34 or two rollers may be arranged so as to extend parallel to the bottom nip roller 18a. In such a case, tensioning means may be provided in such a way that the opposite ends of one of the round bars 34 are urged by any suitable springs.

[0034] The tensioning means 29 is not limited to the structure as shown in Figs. 4A and 4B wherein the pressing member 31 and the spring member 32 which are separate from the bar 30 are mounted on the bar 30, but the spring member may be fixed to the bar 30 and the pressing member 31. The spring member does not necessarily have to have a coil portion.

[0035] The tensioning means may be arranged in other places than the apron guide 17. However, providing the tensioning means to the apron guide 17 is advantageous in that installation space is secured and also the device can be made simple.

[0036] The present invention may dispense with the tensioning means.

[0037] Instead of forming the apron 16 of woven fabric, it is possible to use knitted fabric for the apron 16. In this case, as in the woven fabric, appropriate air permeability is obtained without the trouble of making small holes through the belt which forms the apron 16 and, therefore, the apron of such knitted fabric can be manufactured with less cost. In addition, the apron made of knitted fabric can be rotated under an appropriate tension without the

use of a tension device by virtue of stretchability of the knitted fabric.

[0038] Instead of forming the apron 16 of woven fabric or knitted fabric, it is also possible to form the apron 16 by making multiple holes through a rubber belt, or resin belt having elasticity.

[0039] The rotary shaft 18 and the suction pipe 15 may be provided not only for four spindles as one unit, but for spindles arranged between the roller stands 21 (for example, eight spindles) as one unit. Additionally, each unit does not necessarily have the same number of spindles. Two different kinds of units may be employed by arranging the spindles between the roller stands 21 into two different numbers of spindles (for example, six spindles and two spindles).

[0040] The rotary shaft 18 having the bottom nip roller 18a may be provided as a shaft which is common to all of the spindles. In this case, the rotary shaft 18 may be driven by a motor through a gear train provided on the gear end of the spinning machine substantially in the same manner as the front bottom roller 13a of the drafting device 12.

[0041] Instead of a pneumatic device of a single nozzle type, a pneumatic device of a flute type may be employed.

[0042] Therefore, the present examples and embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein but may be modified within the scope of the appended claims.

[0043] A fiber bundle collecting device for a spinning machine collects a fiber bundle drafted by a draft part of the spinning machine. The fiber bundle collecting device includes a delivery portion, a suction pipe, an apron guide and an air-permeable apron. The apron guide is adapted to guide the apron so that the apron travels along a path spaced away from a nip roller of the delivery portion on the side of the nip roller opposite to part of the nip roller which guides the fiber bundle. The apron guide is also adapted to guide the apron along a plane on the side of the apron guide where the apron is wound.

Claims

1. A fiber bundle collecting device (11) for a spinning machine for collecting a fiber bundle (F) drafted by a draft part (12) of the spinning machine, comprising:

a delivery portion (14) located downstream of a final delivery roller pair (13) of the draft part (12) as viewed in a direction of movement of the fiber bundle (F) and having nip rollers (18a, 19);

a suction pipe (15) located upstream of a nip point of the delivery portion (14) as viewed in the direction of movement of the fiber bundle (F) and having a guide surface (15b) with a suction hole (15a);

an apron guide (17) located downstream of the

nip point of the delivery portion (14) as viewed in the direction of movement of the fiber bundle (F); and

an air-permeable apron (16) wound around the suction pipe (15), one of the nip rollers (18a) and the apron guide (17) so as to be rotated therearound;

characterized in that

the apron guide (17) is adapted to guide the apron (16) so that the apron (16) travels along a path spaced away from the nip roller (18a) on the side of the nip roller (18a) opposite to part of the nip roller (18a) which guides the fiber bundle (F), wherein the apron guide (17) is also adapted to guide the apron (16) along a plane on the side of the apron guide (17) where the apron (16) is wound.

2. The fiber bundle collecting device (11) according to claim 1, wherein the apron guide (17) has tensioning means (29) for providing tension to the apron (16).
3. The fiber bundle collecting device (11) according to claim 1 or 2, wherein the apron guide (17) has a plate-like bar (30) which extends in an axial direction of the nip roller (18a).
4. The fiber bundle collecting device (11) according to claim 3, wherein the bar (30) has a bent portion (30a) which is formed at one side of the bar (30) in a direction perpendicular to the axial direction of the nip roller (18a).
5. The fiber bundle collecting device (11) according to claim 3 or 4, wherein the apron guide (17) has tensioning means (29) for providing tension to the apron (16), wherein the tensioning means (29) has a pressing member (31) and a spring member (32), wherein the pressing member (31) is arranged so as to be movable in the width direction of the plate-like bar (30) and hold the bar (30), wherein the pressing member (31) is bent so that its cross section has a U-shape, and wherein the spring member (32) urges the pressing member (31) in a direction which causes a bent portion (31 a) of the pressing member (31) to move away from the bar (30).
6. The fiber bundle collecting device (11) according to claim 5, wherein the pressing member (31) is mounted on the bar (30) with a projection (30b) received loosely in an elongated hole (31 c) of the pressing member (31).
7. The fiber bundle collecting device (11) according to claim 5 or 6, wherein the spring member (32) includes two coil portions (32a), a connecting portion (32b) connecting the two coil portions (32a) at one ends thereof and two pressing portions (32c) extend-

ing from the other ends of the two coil portions (32a) at an angle to the connecting portion (32b) and in an intersecting relation to each other.

8. The fiber bundle collecting device (11) according to any one of claims 1 through 7, wherein the apron guide (17) has two round bars (34) which extend parallel to the nip roller (18a). 5
9. The fiber bundle collecting device (11) according to claim 8, wherein the opposite ends of one of the round bars (34) are urged by springs. 10

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FIG. 1A

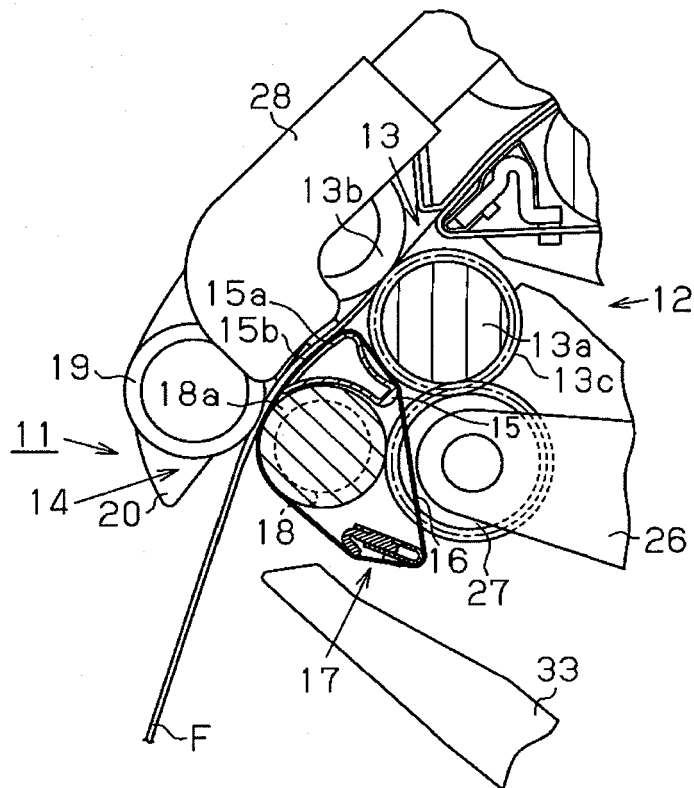


FIG. 1B

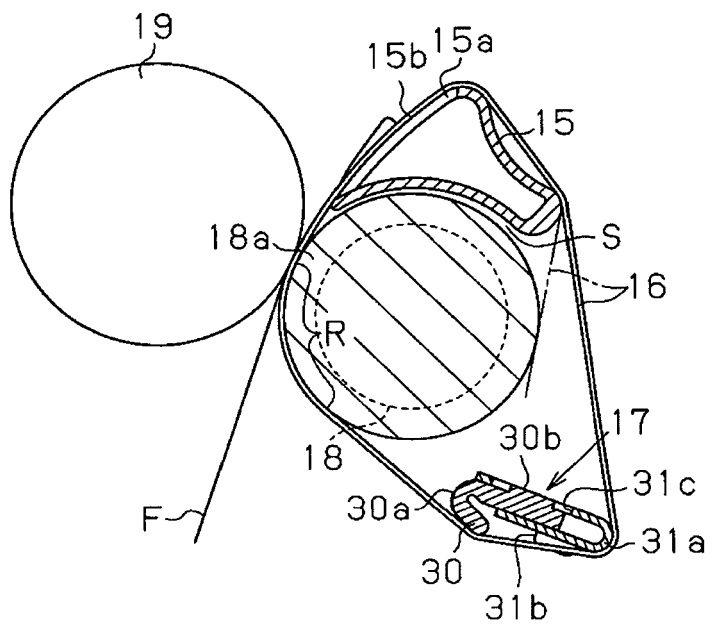


FIG. 2A

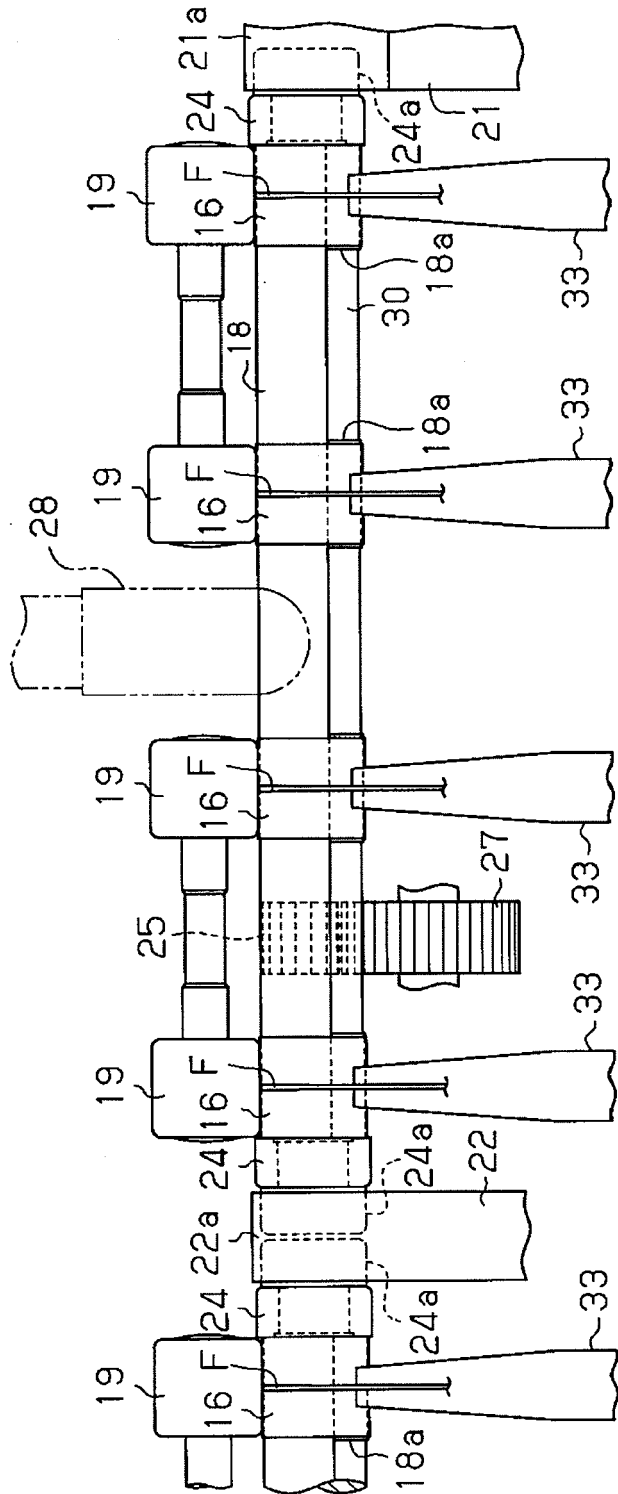


FIG. 2B

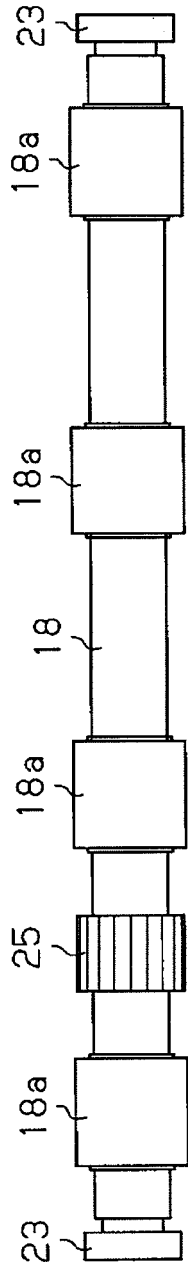


FIG. 3A

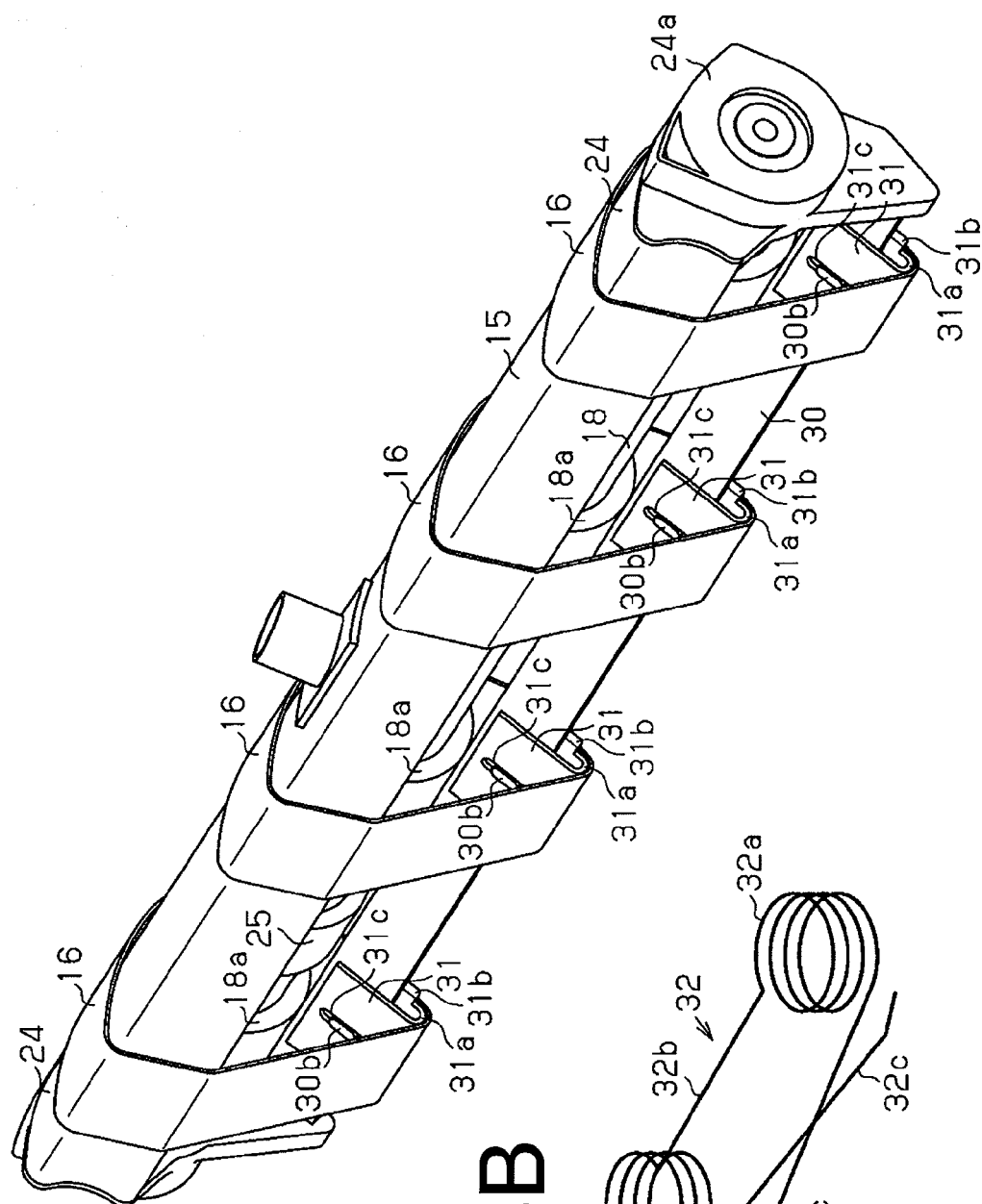


FIG. 3B

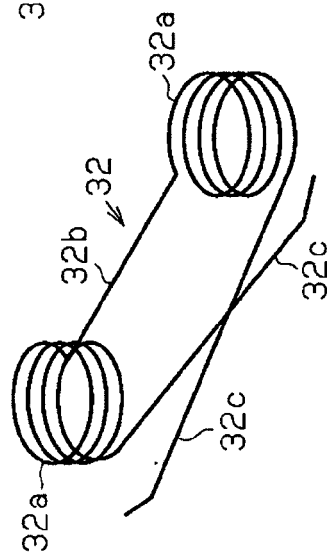


FIG. 4A

FIG. 4B

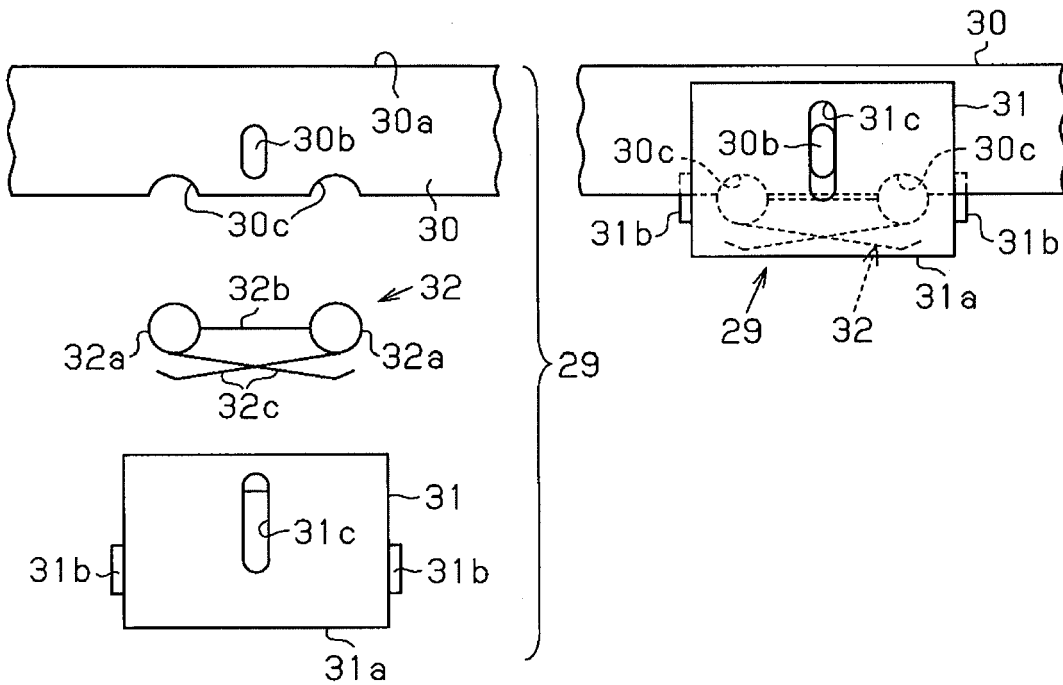


FIG. 5

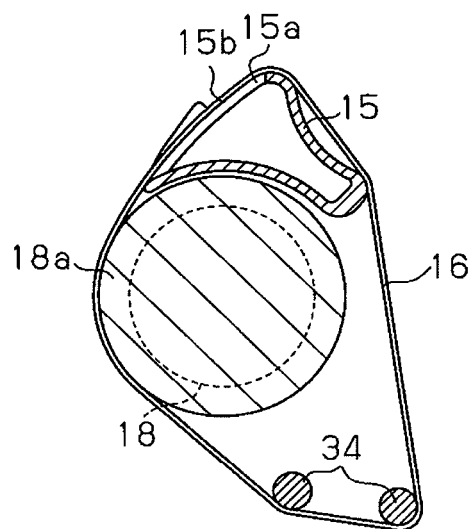


FIG. 6 (Background Art)

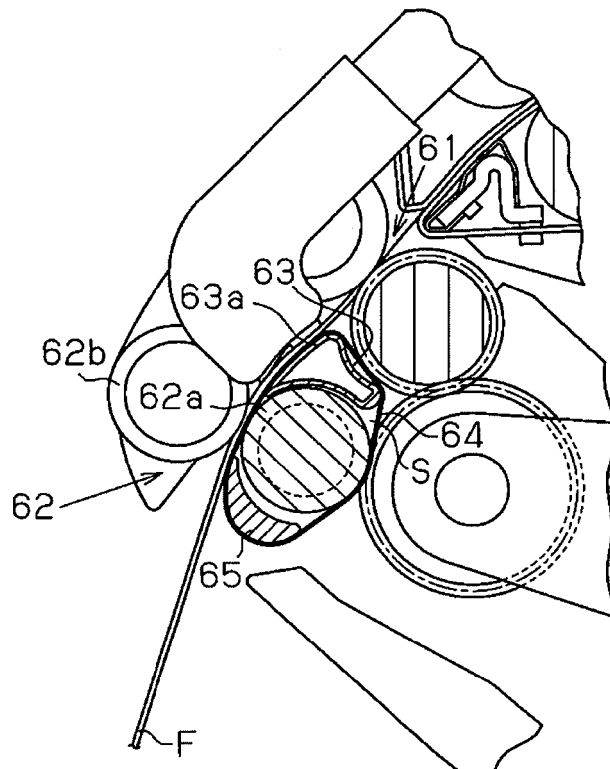
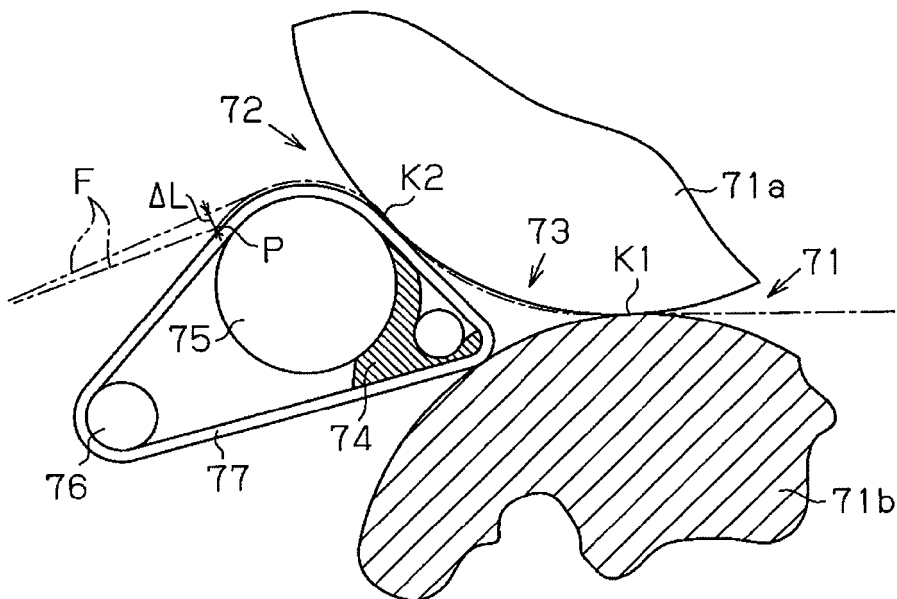


FIG. 7 (Background Art)



REFERENCES CITED IN THE DESCRIPTION

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