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

Vorrichtung zum Sammeln von Faserbündeln für eine Spinnmaschine

Dispositif de collecte de faisceaux de fibres pour machine à filer

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a fiber bundle collecting device for a spinning machine according to the preamble of claim 1 and, more particularly, to a device arranged downstream of a draft device (draft part) of a spinning machine for collecting fiber bundle drafted by the draft device.

[0002] There are proposed various types of fiber bundle collecting devices for collecting a drafted fiber bundle (sliver) before twisting for the purpose of improvement of yarn quality by reducing fluff in the fiber bundle. A typical fiber bundle collecting device has a suction pipe having a guide surface with a suction slit and a perforated conveyor belt moving along the guide surface for collecting and transporting the fiber bundle (for example, refer to JP-A-2002-61036).

[0003] The fiber bundle collecting device disclosed in JP-A-2002-61036 and shown in Figs. 6 and 7A through 7C has a front roller pair (final delivery roller pair) 62, a suction pipe 63, a guide roller 64 and a perforated conveyor belt 65. Referring to Fig. 6, the suction pipe 63 and the perforated conveyor belt 65 are located downstream of the front roller pair 62 of the draft device 61 as viewed in the transporting direction of the fiber bundle, and the perforated conveyor belt 65 is wound around the suction pipe 63 and the guide roller 64. A suction slit 66 is formed in the suction pipe 63 at the sliding surface thereof. A nip roller 67 is disposed adjacent to the downstream end of the suction slit 66 as viewed in the transporting direction of the fiber bundle F for pressing the perforated conveyor belt 65 and the fiber bundle F against the suction pipe 63 while allowing the perforated conveyor belt 65 to move.

[0004] Referring to Fig. 7A, the suction slit 66 is formed oblique with respect to the transporting direction (arrow direction) of the fiber bundle F moved by the perforated conveyor belt 65. More particularly, the suction slit 66 is formed with a substantially constant width except the part adjacent to the upstream end thereof as viewed in the transporting direction of the fiber bundle F which is formed so to be widened gradually toward the upstream end. As shown in Figs. 7A and 7B wherein the top of the respective drawings correspond to the upstream side of the transportation of the fiber bundle F, the left edge of the suction slit 66 as seen in the drawings (as seen in the longitudinal direction of the suction pipe 63) is formed substantially linearly, while the right edge of the suction slit 66 is curved on the upstream side thereof to have upstream and downstream portions and the inclination angle of the upstream portion relative to the traveling direction of the fiber bundle F is relatively larger than that of the downstream portion. Thus, a widened region 68 is formed in the suction slit 66 at the upstream end thereof. As indicated in Figs. 7A and 7B, the curved right edge of the suction slit 66 serves as the guide edge 69 for the

fiber bundle F. In the spinning machine, in order to reduce the abrasion of the part of the draft device that is subjected to contact with the fiber bundle F, the fiber bundle F travels while traversing in the width direction of the perforated conveyor belt 65. According to the fiber bundle collecting device disclosed in the above Publication, the fiber bundle F traverses in the range of the width W of the region 68, and the width of the traversing motion of the fiber bundle F is in the range of about 5 to 6 millimeters.

[0005] According to the fiber bundle collecting device disclosed in the above Publication, the fiber bundle F is traversed within the width of the region 68 formed at the upstream end of the suction slit 66, and guided toward the guide edge 69 from an downstream edge 68A of the region 68 extending continuously to the guide edge 69 of the suction slit 66. Thus, the distance of the guide edge 69 over which the fiber bundle F moves from the region 68 is substantially constant regardless of the point of the region 68 through which the fiber bundle F being traversed enters into the region 68. If the whole length of the downstream edge 68A of the region 68 is set to correspond to the range of the traversing motion of the fiber bundle F, the angle between the downstream edge 68A of the region 68 and the transporting direction of the fiber bundle F on the perforated conveyor belt 65 needs to be increased. Thus, the fiber bundle F fails to move along the downstream edge 68A of the region 68 and be guided toward the guide edge 69 smoothly, so that the resulting yarn quality is varied.

[0006] Referring to Fig. 7C, the angle made between the downstream edge 68A of the region 68 and the fiber bundle transporting direction of the perforated conveyor belt 65 may not be set so large. The range S of the traversing motion of the fiber bundle F needs to be set to correspond to both of the downstream edge 68A of the region 68 and the guide edge 69 of the suction slit 66. Thus, the traveling path of the fiber bundle F relative to the suction slit 66 is changed by the traversing motion of the fiber bundle F, so that the distance of the movement of the fiber bundle F along the guide edge 69 of the suction slit 66 is also changed. Specifically, the fiber bundle F traveling on the left side of the suction slit 66 moves a shorter distance as compared to the fiber bundle F traveling on the right side.

[0007] If the angle made between the suction slit 66 and the transporting direction of the fiber bundle F is increased for solving the above problem, it becomes difficult for the fiber bundle F to move along the guide edge 69 of the suction slit 66. Also, it is difficult to reduce variations of the moving distance of the fiber bundle F along the guide edge 69 by increasing the overall length of the suction slit 66 because of the arrangement of the spinning machine. If the angle of only the side edge opposite to the guide edge 69 of the suction slit 66 is increased, the width of the suction slit 66 is undesirably decreased at some points.

SUMMARY OF THE INVENTION

[0008] The present invention, which has been made in view of the above problems, has the object to provide a fiber bundle collecting device for a spinning machine which reduces the variation of the spun yarn quality.

[0009] This object is achieved by a fiber bundle collecting device having the features of claim 1.

[0010] Advantageous further developments are set out in the dependent claims.

[0011] The DE-A1-10 2007 003 525 discloses a fiber bundle collecting device which comprises an apron guide, a suction pipe having a guide surface with a suction slit and a perforated conveyer belt wound around the suction pipe and the apron guide. For delivering the fiber bundle, the perforated conveyer belt is rotated. The suction slit is formed oblique with respect to the traveling direction of which the fiber bundle travels in the regions upstream and downstream of the suction slit. Furthermore, the suction slit has a first side edge and a second side edge in the width direction of the suction slit. The first side edge serves as a guide edge for collecting the fiber bundle and has an upstream portion and a downstream portion. The obliqueness of the upstream portion with respect to the traveling direction of the fiber bundle is greater than the obliqueness of the downstream portion with respect to the traveling direction of the fiber bundle. The second side edge has a downstream portion, a downstream end, an upstream portion and an upstream end. The downstream portion of the second side edge extends along the first side edge from the downstream end of the second side edge. The upstream end of the second side edge is located at a side of the first side edge from a first imaginary line extending from the downstream portion of the second side edge and the upstream end of the second side edge is located at a side of the first side edge from an intersecting point located between the first imaginary line and a second imaginary line extending from the upstream end in perpendicular direction to the traveling direction of the fiber bundle.

[0012] Furthermore, the DE-A1-37 14 212 discloses a further fiber bundle collecting device.

[0013] The fiber bundle collecting device includes an apron guide, a suction pipe having a guide surface with a suction slit and a perforated conveyer belt wound around the suction pipe and the apron guide and rotated to deliver fiber bundle. The suction slit is formed oblique with respect to the traveling direction of which the fiber bundle travels in the regions upstream and downstream of the suction slit. The suction slit has a first side edge and a second side edge in the width direction of the suction slit. The first side edge serves as a guide edge for collecting the fiber bundle. The first side edge has an upstream portion and a downstream portion, and the obliqueness of the upstream portion with respect to the traveling direction of the fiber bundle is greater than the obliqueness of the downstream portion with respect to the traveling direction of the fiber bundle. The second

side edge has a downstream portion, a downstream end and an upstream end. The downstream portion of the second side edge extends along the first side edge from the downstream end of the second side edge. The upstream end of the second side edge is located at a side of the first side edge from a first imaginary line extending from the downstream portion of the second side edge. The upstream end of the second side edge is located at a side of the first side edge from an intersecting point located between the first imaginary line and a second imaginary line extending from the upstream end in perpendicular direction to the traveling direction of the fiber bundle.

[0014] 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

[0015] 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. 1 is a partially cutaway schematic side view showing part of a fiber bundle collecting device according to one embodiment of the present invention;

Fig. 2A is a schematic view showing the relation between a suction pipe and a perforated conveyer belt in the fiber bundle collecting device of Fig. 1;

Fig. 2B is an enlarged schematic view showing the relation between a suction slit and a fiber bundle in the fiber bundle collecting device of Fig. 1;

Fig. 3A is a graph showing a relation between the traveling path and the hairlines of the fiber bundle;

Fig. 3B is a graph showing a relation between the traveling path of the fiber bundle and the yarn tenacity;

Figs. 4A and 4B are a schematic views showing the suction slit according to different embodiments of the present invention, respectively;

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

Fig. 6 is a partially cutaway schematic side view showing part of the fiber bundle collecting device ac-

cording to background art;

Fig. 7A is a fragmentary schematic view showing the relation between the suction pipe and the perforated conveyer belt in the fiber bundle collecting device of Fig. 6;

Fig. 7B is a schematic view showing the relation between the suction slit and the fiber bundle in the fiber bundle collecting device of Fig. 6; and

Fig. 7C is a schematic view showing the relation between the suction slit and the fiber bundle in the case when the range of the traversing motion of the fiber bundle is changed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] The following will describe a fiber bundle collecting device for a spinning machine with reference to Figs. 1 through 3. Referring to Fig. 1, a fiber bundle collecting device 11 is arranged downstream of a final delivery roller pair 13 of a draft device 12. The fiber bundle collecting device 11 includes a delivery part 14, a suction pipe 15, a perforated conveyer belt 16 and an apron guide 17. The delivery part 14 includes a bottom nip roller 18A and a top nip roller 19. The bottom nip roller 18A is formed as a part of a rotary shaft 18 which is arranged in parallel relation 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 perforated conveyer belt 16. 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 as in the case of the front top roller 13B of the draft device 12, and 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 point of the delivery part 14 as viewed in the traveling direction of the fiber bundle F.

[0017] Meanwhile, the bottom components of the fiber bundle collecting device 11 are provided by half of the spindles arranged between roller stands 21 of the draft device 12 as one unit, or four spindles in this embodiment. A support arm (not shown) is disposed at an intermediate position between any two adjacent roller stands 21 arranged at a predetermined interval in the longitudinal direction of the spinning machine. The support arm is supported at the proximal end thereof by a support beam (not shown) extending in the longitudinal direction of the spinning machine, and the rotary shaft 18 is supported between the roller stand 21 and the support arm. A gear 22 is fixedly mounted on the rotary shaft 18 for rotation therewith at a longitudinal intermediate position thereof.

[0018] The front bottom roller 13A is formed with a gear 13C in facing relation to the gear 22. An intermediate gear 25 is rotatably supported for engagement with the

gear 13C and the gear 22 by the support arm 24 fixed at the proximal end thereof to the support beam. In such an arrangement, the torque of the front bottom roller 13A is transmitted to the rotary shaft 18 through the gear 13C, the intermediate gear 25 and the gear 22.

[0019] A suction duct (not shown) is arranged extending in the frame of the spinning machine in the longitudinal direction thereof or in the direction perpendicular to the plane of Fig. 1. The suction pipe 15 extends parallel to the suction duct and is connected to the suction duct through a connection tube 26. The suction pipe 15 has a guide surface 28 with a suction slit 27. The perforated conveyer belt 16 is wound around the suction pipe 15, the apron guide 17 and the bottom nip roller 18A in contact therewith. In such arrangement, the perforated conveyer belt 16 is rotated, thereby delivering the fiber bundle F. The perforated conveyer belt 16 is made of woven fabric having an appropriate air permeability.

[0020] Referring to Figs. 2A and 2B, the suction slit 27 is formed oblique with respect to the traveling direction in the vertical direction as seen in Figs. 2A and 2B or of which the fiber bundle F travels in the regions upstream and downstream of the suction slit 27. As shown in Fig. 2A and 2B wherein the top of the respective drawings correspond to the upstream side of the transportation of the fiber bundle, the suction slit 27 is formed oblique rightward in this preferred embodiment of the present invention. One of the side edges of the suction slit 27 in the width direction thereof (longitudinal direction of the suction pipe 15) located on the outer side of the oblique direction of the suction slit 27 (the edge on the right side of Figs. 2A and 2B) serves as a guide edge 29 for collecting the fiber bundle F. The guide edge 29 as a first side edge is formed such that the linear downstream portion 29B extends continuously from the linear upstream portion 29A and also that the obliqueness of the upstream portion 29A is larger than that of the downstream portion 29B. The upstream portion 29A and the downstream portion 29B are connected with a smooth curved shape of the guide edge 29.

[0021] The suction slit 27 has a side edge 30 as a second side edge which is formed opposite to the guide edge 29 and has a downstream portion 30A and an upstream portion 30B. The side edge 30 is formed such that its downstream portion 30A extends along the downstream portion 29B of the guide edge 29 from the downstream end of the side edge 30. In this preferred embodiment, the downstream portion 30A is formed in parallel relation to the downstream portion 29B of the guide edge 29. As shown in Fig. 2B, the side edge 30 of the suction slit 27 is formed such that the upstream end 30UP of the side edge 30 is located at a side of the guide edge 29 as viewed from the intersection point P1 located between the imaginary line L1 as an extension from the downstream portion 30A of the side edge 30 and the imaginary line L2 extending along the upstream end edge 32 of the suction slit 27. The imaginary line L1 serves as a first imaginary line and the imaginary line L2 serves as a sec-

ond imaginary line. The upstream end edge 32 of the suction slit 27 extends from the upstream end (30UP) in perpendicular direction to the traveling direction of the fiber bundle F. The distance from the nip point of the final delivery roller pair 13 to the suction slit 27 is kept constant irrespective of the position of the fiber bundle F being traversed.

[0022] The upstream portion 30B of the side edge 30 has a linear portion 31 extending along the draw-in direction of the fiber bundle F from the upstream end 30UP. The intermediate portion 30C connecting the downstream portion 30A and the linear portion 31 of the side edge 30 is formed in a linear shape whose obliqueness is greater than that of the downstream portion 30A. The linear portion 31 is formed such that an imaginary extension line extending from the linear portion 31 intersects with the upstream portion 29A of the guide edge 29. That is, the upstream end 30UP of the side edge 30 is located at such a position that an imaginary extension line extending along the traveling direction of the fiber bundle F and passing through the upstream end 30UP intersects with the upstream portion 29A of the guide edge 29. The linear intermediate portion 30C has substantially the same obliqueness as the upstream portion 29A of the guide edge 29, and is connected to the downstream portion 30A with a smooth curved shape.

[0023] The ratios of the lengths of the upstream and downstream portions 29A, 29B of the guide edge 29, the lengths of the downstream and upstream portions 30A, 30B of the side edge 30 and the lengths of the linear portion 31 and the whole side edge 30 may be determined in accordance with the obliqueness of the guide edge 29, the quality of yarn to be spun, and the like.

[0024] The range of the traversing motion of the fiber bundle F is set to include an imaginary line (not shown) extending through the upstream end 30UP of the side edge 30 and in the traveling direction of the fiber bundle F. The following will describe the operation of the device as constructed above.

[0025] In operation of the fine spinning machine, the fiber bundle F is drafted by the draft device 12 and 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 that of the final delivery roller pair 13 and, therefore, the fiber bundle F passes through the nip point of the bottom and top nip rollers 18A, 19 under an appropriate tension and then moves downstream while being turned and twisted. The fiber bundle F travels while being traversed by a traverse device (not shown). The speed of the traversing motion of the fiber bundle F is set to be sufficiently smaller than the traveling speed of the fiber bundle F.

[0026] The suction of the suction duct is conducted to the suction pipe 15 through the connection tube 26, and the suction at the suction slit 27 formed at the guide surface 28 is exerted to the fiber bundle F through the perforated conveyor belt 16. Thus, the fiber bundle F travels

while being subjected to sucking and collecting at the position corresponding to the suction slit 27. Therefore, as compared to a spinning machine provided with no fiber bundle collecting device, production of fluff and fly is restricted and, therefore, the yarn quality is improved.

[0027] The fiber bundle F being fed out from the final delivery roller pair 13 is urged in the direction perpendicular to the transporting direction of the perforated conveyor belt 16 (in width direction of the suction slit 27) due to the traversing motion. The fiber bundle F is pressed against the surface of the perforated conveyor belt 16 at the suction slit 27 by the suction, which makes it hard for the fiber bundle F to move in the width direction of the suction slit 27.

[0028] According to this preferred embodiment, however, the side edge 30 of the suction slit 27 has a non-linear shape. As shown in Fig. 2B, the side edge 30 of the suction slit 27 is formed such that the upstream end 30UP of the side edge 30 is located toward the guide edge 29 as viewed from the intersection point P1 made between the imaginary line L1 as an extension from the downstream portion 30A of the side edge 30 and the imaginary line L2 extending along the upstream end edge 32 of the suction slit 27 which in turn extends in perpendicular direction to the traveling direction of the fiber bundle F. Thus, the fiber bundle F traveling on the left side in Fig. 2B relative to the upstream end 30UP of the side edge 30 may be subjected to collecting with a sufficiently length thereof at the downstream portion 29B of the guide edge 29.

[0029] The region of the fiber bundle collecting device 11 where the fiber bundle F is collected while traveling along the guide edge 29 ranges from the bottom end of the guide edge 29 to the upstream of the downstream portion 29B irrespective the position of the traversing motion. Therefore, the region of the fiber bundle collecting device 11 where the fiber bundle F is pressed against the guide edge 29 for collecting is not significantly changed depending on the position of the traversing motion of the fiber bundle F, thereby preventing the variation of the spun yarn quality.

[0030] The fiber bundle F was spun without traversing using the fiber bundle collecting device of the embodiment having the suction pipe 15 with the suction slit 27 having a shape shown in Fig. 2B on one hand and the fiber bundle collecting device of the background art having the suction pipe 63 with the suction slit 66 having a shape shown in Fig. 7C on the other. The hairiness and the tenacity of the spun yarn were measured for different traveling paths of the fiber bundle F. The results of the measurements are shown in Figs. 3A and 3B. Tests were conducted using a spun yarn made of 100% cotton and having count 50. The hairiness is a measure of yarn fluff and it may be defined as the total length of fibers protruding from the structure of the yarn with a length approximately 1 centimeter. Fig. 3A is a graph showing the relation between the hairiness and the traveling path of the fiber bundle F according to the tests. Fig. 3B is a

graph showing the relation between the yarn tenacity and the traveling path of the fiber bundle F according to the tests. In Figs. 3A and 3B, the abscissa axis indicates the traveling path of the fiber bundle F, and the value "0" on the abscissa axis indicates that the point where traveling path of the fiber bundle F intersects with the upper end edge of the suction slit 27 is located at the same horizontal position as the downstream end 29DP of the guide edge 29. Similarly, the value "2" indicates that the point where path of the fiber bundle F intersects with the upper end edge of the suction slit 27 is shifted rightward by 2 millimeters from the point indicated by the value "0", and the value "-2" indicates that the point of intersection is shifted leftward by 2 millimeters from the point indicated by the value "0". In the graph of Fig. 3A, the hairiness is improved with a decrease of the value thereof or toward the abscissa axis, and in the graph of Fig. 3B, the yarn tenacity is improved with an increase of the value thereof or away from the abscissa axis. As is obvious from the graph of Fig. 3A, the variation of hairiness caused by the difference of the traveling path of the fiber bundles in the preferred embodiment of the present invention is less than that in a comparative example of the conventional art, and evaluation of the hairiness is improved. Referring to Fig. 3B, the variation of yarn tenacity caused by the difference of the traveling path of the fiber bundles according to the preferred embodiment of the present invention is also less than that according to the comparative example of the conventional art, and evaluation of the yarn tenacity is also improved.

[0031] The preferred embodiment according to the present invention offers the following advantageous effects.

(1) The fiber bundle collecting device 11 includes the suction pipe 15 and the perforated conveyer belt 16. The suction pipe 15 having the guide surface 28 with the suction slit 27 is arranged downstream of the final delivery roller pairs 13 of the draft device 12, and the perforated conveyer belt 16 wound around the suction pipe 15 and the apron guides 17 is rotated to deliver the fiber bundle F. The suction slit 27 is formed oblique with respect to the traveling direction of which the fiber bundle F travels in the upstream and downstream regions of the suction slit 27. One of the side edges of the suction slit 27 in the width direction thereof located on the outer side of the oblique direction of the suction slit 27 serves as the guide edge 29 for collecting the fiber bundle F. The guide edge 29 is formed such that the obliqueness of the upstream portion 29A is greater than that of the downstream portion 29B. The side edge 30 located opposite to the guide edge 29 is formed in such a manner that the downstream portion 30A extends along the guide edge 29 from the downstream end and the upstream end 30UP is shifted to the side of the guide edge 29 as viewed from the point P1 where the imaginary line L1 linearly extending from the

downstream portion 30A intersects with the imaginary line L2 extending along the upstream end edge 32 perpendicular to the traveling direction of the fiber bundle F. Thus, if the fiber bundle F travels along the traveling path far from the guide edge 29, the range of the movement of the fiber bundle F along the guide edge 29 of the suction slit 27 is sufficiently ensured. Therefore, the difference of the moving distance of the fiber bundle F along the guide edge 29 due to the varying traveling path of the fiber bundle F caused by the traversing motion of the fiber bundle F is decreased, so that the variation of the spun yarn quality is prevented.

(2) The upstream portion 30B of the side edge 30 has a linear portion 31 extending along the draw-in direction of the fiber bundle F from the upstream end 30UP, and the intermediate portion 30C connecting the downstream portion 30A and the linear portion 31 of the side edge 30 is formed in a linear shape whose obliqueness is greater than that of the downstream portion 30A. Thus, when the fiber bundle F is guided to the suction slit 27 from the side of the upstream end 30UP opposite to the guide edge 29, the traveling path of the fiber bundle F is shifted opposite to the upstream end 30UP relative to the guide edge 29 due to the suction of the suction slit 27 located downstream of the upstream end 30UP. Therefore, decreasing of the moving distance of the fiber bundle F along the guide edge 29 may be prevented with a result that the variation of the spun yarn quality may be prevented.

(3) The linear portion 31 of the suction slit 27 is located such that an imaginary line extending from the linear portion 31 intersects with the upstream portion 29A of the guide edge 29. Thus, the range over which the fiber bundle F is pressed against the guide edge 29 for collecting is increased, thereby improving the spun yarn quality.

[0032] The present invention is not limited to the preferred embodiment described above-described preferred embodiment, but it may be modified in various ways as exemplified below. The suction slit 27 is not limited to the structure of Fig. 2B wherein the upstream portion 30B of the side edge 30 located opposite to the guide edge 29 has the linear portion 31 extending from the upstream end 30UP and along the direction in which the fiber bundle F travels, and the downstream portion 30A of the side edge 30 and the linear portion 31 are connected by the intermediate portion 30C. For example, as shown in Fig. 4A, the suction slit 27 may dispense with the liner portion extending along the direction in which the fiber bundle F travels such as the linear portion 31, but the upstream portion 30B of the side edge 30 extending continuously to the downstream portion 30A of the side edge 30 is formed such that the obliqueness of the

upstream portion 30B of the side edge 30 with respect to the direction in which the fiber bundle F travels is greater than the obliqueness of the downstream portion 30A with respect to the direction in which the fiber bundle F travels. In this case, the shape of the side edge 30 located opposite to the guide edge 29 of the suction slit 27 become simple in comparison to the shape of the side edge 30 having the intermediate portion 30C.

[0033] The suction slit 27 is not limited to the structure in which the whole suction slit 27 is oblique rightward as viewed with the upstream side of the movement of the fiber bundle F set at the top of the drawing, but, for example, the suction slit 27 may be oblique leftward, as shown in Fig. 4B. In this structure, the left side edge of the suction slit 27 serves as the guide edge 29. The moving distance of the fiber bundles F along the guide edge 29 is kept substantially the same irrespective of the traveling path of the fiber bundle F, thereby reducing the variation of the spun yarn quality.

[0034] The suction slit 27 is not limited to a shape in which the downstream portion 30A linearly extends exactly parallel to the guide edge 29. For example, the shape of the suction slit 27 may be formed in such a manner that the distance between the downstream portion 30A and the guide edge 29 is increased toward the upstream side thereof, or neither of the downstream portion 30A and the downstream portion 29B have a linear shape, but they are curved continuously from the bottom end thereof.

[0035] The suction slit 27 may be formed in such a manner that both of the upstream portion 29A and the downstream portion 29B of the guide edge 29 have curved shapes, respectively. Referring to Fig. 5, the guide member 33 with a guide surface 33A having a circular arc shape may be arranged downstream of the bottom nip roller 18A for rotating the perforated conveyer belt 16 for delivering the fiber bundle F. The connecting tube 26 connecting the suction pipe 15 to the suction duct for applying vacuum to the suction pipe 15 may be arranged at a position where the connecting tube 26 is connected to the suction pipe 15 from the front of the bottom nip roller 18A.

[0036] The conveyer belt may be made of perforated and elastic rubber or resin instead of the woven fabric or knitted fabric.

[0037] A fiber bundle collecting device for a spinning machine includes an apron guide, a suction pipe having a guide surface with a suction slit and a perforated conveyer belt. The suction slit is formed oblique with respect to the traveling direction of which the fiber bundle travels in the regions upstream and downstream of the suction slit to have first and second side edges. The second side edge has a downstream end, a downstream portion extending along the first side edge from the downstream end and an upstream end located at a side of the first side edge from a first imaginary line extending from the downstream portion and at a side of the first side edge from an intersecting point located between the first im-

aginary line and a second imaginary line extending from the upstream end in perpendicular direction to the traveling direction of the fiber bundle.

Claims

1. A fiber bundle collecting device (11) for a spinning machine, which is provided on the downstream of a final delivery roller pair (13) of a draft device (12) comprising:

an apron guide (17);
a suction pipe (15) having a guide surface (28) with a suction slit (27); and
a perforated conveyer belt (16) wound around the suction pipe (15) and the apron guide (17), the perforated conveyer belt (16) rotated to deliver fiber bundle (F),

wherein the suction slit (27) is formed oblique with respect to the traveling direction of which the fiber bundle (F) travels in the regions upstream and downstream of the suction slit (27), and the suction slit (27) has a first side edge (29) and a second side edge (30) in the width direction of the suction slit (27),

wherein the first side edge (29) serves as a guide edge for collecting the fiber bundle (F), the first side edge (29) has an upstream portion (29A) and a downstream portion (29B), and the obliqueness of the upstream portion (29A) with respect to the traveling direction of the fiber bundle (F) is greater than the obliqueness of the downstream portion (29B) with respect to the traveling direction of the fiber bundle (F),

wherein the second side edge (30) has a downstream portion (30A), a downstream end, an upstream portion (30B) and an upstream end (30UP), the downstream portion (30A) of the second side edge (30) extends along the first side edge (29) from the downstream end of the second side edge (30), wherein the upstream end (30UP) of the second side edge (30) is located at a side of the first side edge (29) from a first imaginary line (L1) extending from the downstream portion (30A) of the second side edge (30), and the upstream end (30UP) of the second side edge (30) is located at a side of the first side edge (29) from an intersecting point (P1) located between the first imaginary line (L1) and a second imaginary line (L2) extending from the upstream end (30UP) in perpendicular direction to the traveling direction of the fiber bundle (F),

characterized in that

the upstream portion (30B) of the second side edge (30) has a linear portion (31) extending along the traveling direction of the fiber bundle

(F) from the upstream end (30UP).

2. The fiber bundle collecting device (11) according to claim 1, **characterized in that** the linear portion (31) and the downstream portion (30A) of the second side edge (30) are connected with a smooth curved shape of the second side edge (30). 5
3. The fiber bundle collecting device (11) according to claim 1, **characterized in that** the linear portion (31) and the downstream portion (30A) of the second side edge (30) are connected with a linear shape of the second side edge (30). 10
4. The fiber bundle collecting device (11) according to claim 1, **characterized in that** the upstream portion (30B) of the second side edge (30) has a linear shape and extends continuously to the downstream portion (30A) of the second side edge (30). 15
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5. The fiber bundle collecting device (11) according to claim 1, **characterized in that** the upstream portion (30B) of the second side edge (30) has a curved shape and extends continuously to the downstream portion (30A) of the second side edge (30). 25
6. The fiber bundle collecting device (11) according to claim 4 or 5, **characterized in that** the obliqueness of the upstream portion (30B) of the second side edge (30) with respect to the traveling direction of the fiber bundle (F) is larger than the obliqueness of the downstream portion (30A) of the second side edge (30) with respect to the traveling direction of the fiber bundle (F). 30
35
7. The fiber bundle collecting device (11) according to any one of claims 1 through 6, **characterized in that** the downstream portion (30A) of the second side edge (30) has a curved shape extending continuously from the downstream end of the downstream portion (30A) of the second side edge (30). 40
8. The fiber bundle collecting device (11) according to any one of claims 1 through 7, **characterized in that** the upstream portion (29A) and the downstream portion (29B) of the first side edge (29) have curved shapes, respectively. 45

Patentansprüche 50

1. Vorrichtung (11) zum Sammeln von Faserbündeln für eine Spinnmaschine, die stromabwärts eines finalen Zustellwalzenpaars (13) einer Ziehvorrichtung (12) vorgesehen ist, mit: 55

einer Gliederbandführungseinrichtung (17);
einem Saugrohr (15), das eine Führungsfläche

(28) mit einem Saugschlitz (27) aufweist; und einem perforierten Fördergürtel (16), der um das Saugrohr (15) und die Gliederbandführungseinrichtung (17) aufgezogen ist, wobei der perforierte Fördergürtel (16) zum Zustellen von Faserbündel (F) gedreht wird, wobei der Saugschlitz (27) bezüglich der Bewegungsrichtung, in der sich das Faserbündel (F) in den Bereichen stromaufwärts und stromabwärts des Saugschlitzes (27) bewegt, schräg ausgebildet ist, und wobei der Saugschlitz (27) einen ersten Seitenrand (29) und einen zweiten Seitenrand (30) in der Breitenrichtung des Saugschlitzes (27) aufweist, wobei der erste Seitenrand (29) als ein Führungsrand zum Sammeln des Faserbündels (F) dient, der erste Seitenrand (29) einen stromaufwärtigen Abschnitt (29A) und einen stromabwärtigen Abschnitt (29B) aufweist und die Schrägheit des stromaufwärtigen Abschnitts (29A) bezüglich der Bewegungsrichtung des Faserbündels (F) größer als die Schrägheit des stromabwärtigen Abschnitts (29B) bezüglich der Bewegungsrichtung des Faserbündels (F) ist,

wobei der zweite Seitenrand (30) einen stromabwärtigen Abschnitt (30a), ein stromabwärtiges Ende, einen stromaufwärtigen Abschnitt (30B) und ein stromaufwärtiges Ende (30UP) aufweist, wobei sich der stromabwärtige Abschnitt (30A) und der zweite Seitenrand (30) von dem stromabwärtigen Ende des zweiten Seitenrands (30) ausgehend entlang des ersten Seitenrands (30) erstrecken, wobei sich das stromaufwärtige Ende (30UP) des zweiten Seitenrands (30) an einer Seite des ersten Seitenrands (29) ausgehend von einer ersten gedachten Linie (L1) befindet, die sich von dem stromabwärtigen Abschnitt (30A) des zweiten Seitenrands (30) aus erstreckt, und wobei sich das stromaufwärtige Ende (30UP) des zweiten Seitenrands (30) an einer Seite des ersten Seitenrands (29) ausgehend von einem Schnittpunkt (P1) befindet, der sich zwischen der ersten gedachten Linie (L1) und einer zweiten gedachten Linie (L2) befindet, die sich von dem stromaufwärtigen Ende (30UP) in senkrechter Richtung zu der Bewegungsrichtung des Faserbündels (F) erstreckt,

gekennzeichnet dadurch, dass

der stromaufwärtige Abschnitt (30B) des zweiten Seitenrands (30) einen linearen Abschnitt (31) aufweist, der sich von dem stromaufwärtigen Ende (30UP) ausgehend entlang der Bewegungsrichtung des Faserbündels (F) erstreckt.

2. Vorrichtung (11) zum Sammeln von Faserbündeln

nach Anspruch 1, **gekennzeichnet dadurch, dass** der lineare Abschnitt (31) und der stromabwärtige Abschnitt (30A) des zweiten Seitenrands (30) durch eine gleichmäßig gekrümmte Form des zweiten Seitenrands (30) verbunden sind.

3. Vorrichtung (11) zum Sammeln von Faserbündeln nach Anspruch 1, **gekennzeichnet dadurch, dass** der lineare Abschnitt (31) und der stromabwärtige Abschnitt (30A) des zweiten Seitenrands (30) durch eine lineare Form des zweiten Seitenrands (30) verbunden sind. 10
4. Vorrichtung (11) zum Sammeln von Faserbündeln nach Anspruch 1, **gekennzeichnet dadurch, dass** der stromaufwärtige Abschnitt (30B) des zweiten Seitenrands (30) eine lineare Form aufweist und sich kontinuierlich zu dem stromabwärtigen Abschnitt (30A) des zweiten Seitenrands (30) hin erstreckt. 15
5. Vorrichtung (11) zum Sammeln von Faserbündeln nach Anspruch 1, **gekennzeichnet dadurch, dass** der stromaufwärtige Abschnitt (30B) des zweiten Seitenrands (30) eine gekrümmte Form aufweist und sich kontinuierlich zu dem stromabwärtigen Abschnitt (30A) des zweiten Seitenrands (30) hin erstreckt. 20
6. Vorrichtung (11) zum Sammeln von Faserbündeln nach Anspruch 4 oder 5, **gekennzeichnet dadurch, dass** die Schrägheit des stromaufwärtigen Abschnitts (30B) des zweiten Seitenrands (30) bezüglich der Bewegungsrichtung des Faserbündels (F) größer als die Schrägheit des stromabwärtigen Abschnitts (30A) des zweiten Seitenrands (30) bezüglich der Bewegungsrichtung des Faserbündels (F) ist. 25
7. Vorrichtung (11) zum Sammeln von Faserbündeln nach einem der Ansprüche 1 bis 6, **gekennzeichnet dadurch, dass** der stromabwärtige Abschnitt (30A) des zweiten Seitenrands (30) eine gekrümmte Form aufweist, die sich von dem stromabwärtigen Ende des stromabwärtigen Abschnitts (30A) des zweiten Seitenrands (30) ausgehend kontinuierlich erstreckt. 30
8. Vorrichtung (11) zum Sammeln von Faserbündeln nach einem der Ansprüche 1 bis 7, **gekennzeichnet dadurch, dass** der stromaufwärtige Abschnitt (29A) und der stromabwärtige Abschnitt (29B) des ersten Seitenrands (29) jeweils gekrümmte Formen aufweisen. 35

Revendications

1. Dispositif (11) de collecte de faisceaux de fibres con-

çu pour une machine à filer, qui est prévu en aval d'une paire de rouleaux (13) de distribution finale d'un dispositif d'étirage (12) comprenant :

un guide de tablier (17);
 un tuyau d'aspiration (15) comportant une surface de guidage (28) avec une fente d'aspiration (27); et
 une courroie transporteuse perforée (16) enroulée autour du tuyau d'aspiration (15) et du guide de tablier (17), la courroie transporteuse perforée (16) tournant pour distribuer le faisceau de fibres (F),
 dans lequel la fente d'aspiration (27) est formée en biais par rapport à la direction de déplacement dans laquelle le faisceau de fibres (F) se déplace dans les régions en amont et en aval de la fente d'aspiration (27), et la fente d'aspiration (27) a un premier bord latéral (29) et un deuxième bord latéral (30) dans la direction de largeur de la fente d'aspiration (27),
 dans lequel le premier bord latéral (29) fait office de bord de guidage pour collecter le faisceau de fibres (F), le premier bord latéral (29) a une partie amont (29A) et une partie aval (29B), et l'obliquité de la partie amont (29A) par rapport à la direction de déplacement du faisceau de fibres (F) est plus importante que l'obliquité de la partie aval (29B) par rapport à la direction de déplacement du faisceau de fibres (F),
 dans lequel le deuxième bord latéral (30) a une partie aval (30A), une extrémité aval, une partie amont (30B) et une extrémité amont (30UP), la partie aval (30A) du deuxième bord latéral (30) s'étend le long du premier bord latéral (29) à partir de l'extrémité aval du deuxième bord latéral (30), dans lequel l'extrémité amont (30UP) du deuxième bord latéral (30) est située à un côté du premier bord latéral (29) par rapport à une première ligne imaginaire (L1) s'étendant de la partie aval (30A) du deuxième bord latéral (30), et l'extrémité amont (30UP) du deuxième bord latéral (30) est située à un côté du premier bord latéral (29) par rapport à un point d'intersection (P1) situé entre la première ligne imaginaire (L1) et une deuxième ligne imaginaire (L2) s'étendant de l'extrémité amont (30UP) dans une direction perpendiculaire à la direction de déplacement du faisceau de fibres (F),
caractérisé en ce que
 la partie amont (30B) du deuxième bord latéral (30) a une partie linéaire (31) s'étendant le long de la direction de déplacement du faisceau de fibres (F) à partir de l'extrémité amont (30UP).

2. Dispositif (11) de collecte de faisceaux de fibres selon la revendication 1, **caractérisé en ce que** la par-

tie linéaire (31) et la partie aval (30A) du deuxième bord latéral (30) sont reliées par une forme incurvée régulière du deuxième bord latéral (30).

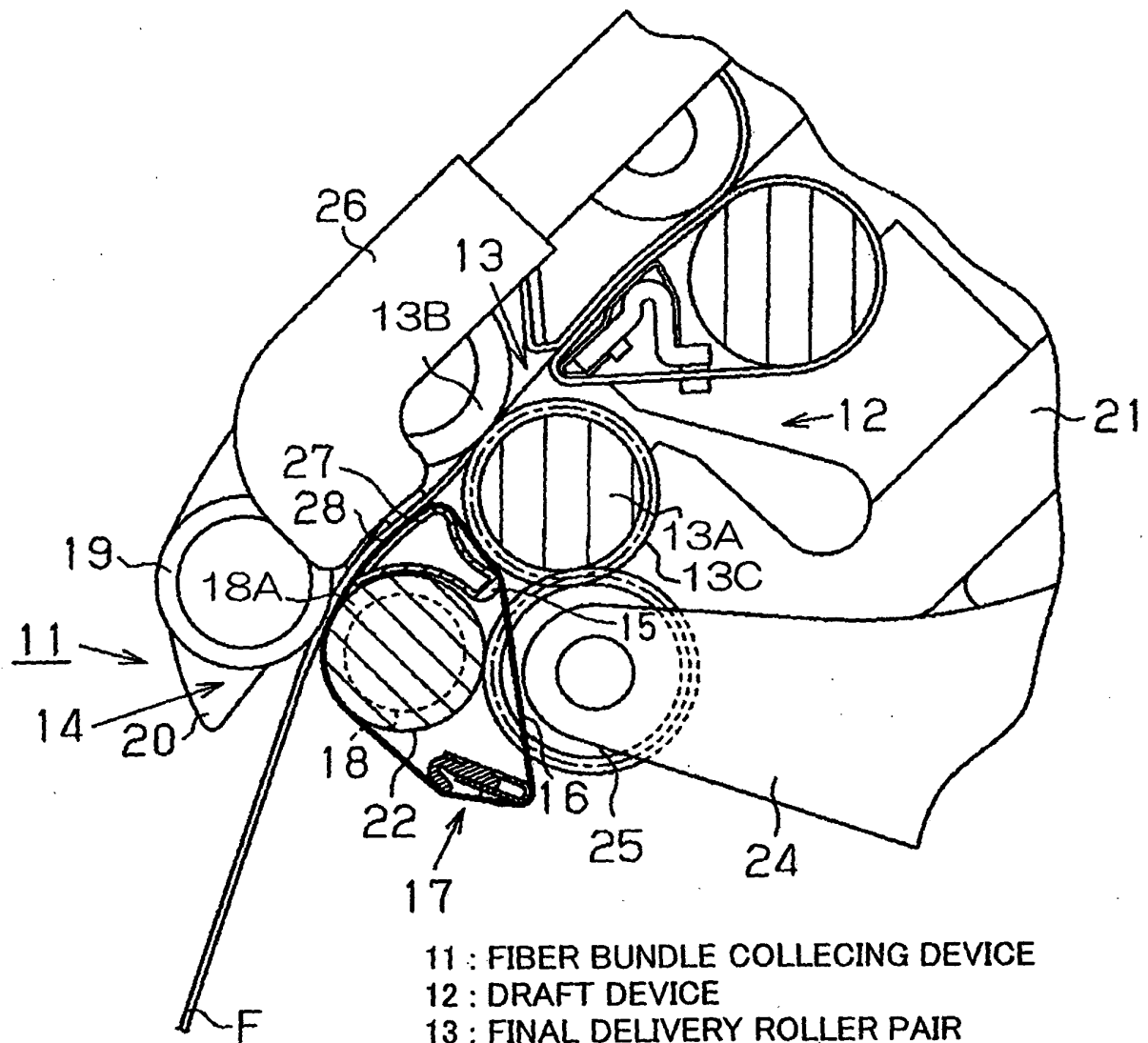
3. Dispositif (11) de collecte de faisceaux de fibres selon la revendication 1, **caractérisé en ce que** la partie linéaire (31) et la partie aval (30A) du deuxième bord latéral (30) sont reliées par une forme linéaire du deuxième bord latéral (30). 5
4. Dispositif (11) de collecte de faisceaux de fibres selon la revendication 1, **caractérisé en ce que** la partie amont (30B) du deuxième bord latéral (30) a une forme linéaire et s'étend en continu jusqu'à la partie aval (30A) du deuxième bord latéral (30). 10 15
5. Dispositif (11) de collecte de faisceaux de fibres selon la revendication 1, **caractérisé en ce que** la partie amont (30B) du deuxième bord latéral (30) a une forme incurvée et s'étend en continu jusqu'à la partie aval (30A) du deuxième bord latéral (30). 20
6. Dispositif (11) de collecte de faisceaux de fibres selon la revendication 4 ou 5, **caractérisé en ce que** l'oblicité de la partie amont (30B) du deuxième bord latéral (30) par rapport à la direction de déplacement du faisceau de fibres (F) est plus grande que l'oblicité de la partie aval (30A) du deuxième bord latéral (30) par rapport à la direction de déplacement du faisceau de fibres (F). 25 30
7. Dispositif (11) de collecte de faisceaux de fibres selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** la partie aval (30A) du deuxième bord latéral (30) a une forme incurvée s'étendant en continu de l'extrémité aval de la partie aval (30A) du deuxième bord latéral (30). 35
8. Dispositif (11) de collecte de faisceaux de fibres selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** la partie n amont (29A) et la partie aval (29B) du premier bord latéral (29) ont respectivement des formes incurvées. 40

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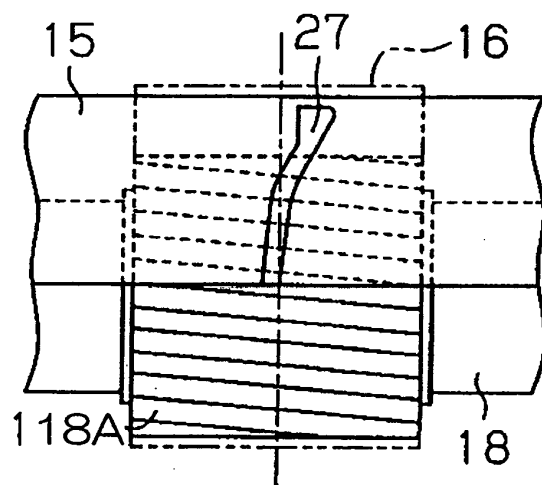
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FIG. 1



- 11 : FIBER BUNDLE COLLECING DEVICE
- 12 : DRAFT DEVICE
- 13 : FINAL DELIVERY ROLLER PAIR
- 15 : SUCTION PIPE
- 16 : PERFORATED CONVEYER BELT
- 17 : APRON GUIDE
- 27 : SUCTION SLIT
- 28 : GUIDE SURFACE

FIG. 2A



L1, L2 : IMAGINARY LINE
P1 : INTERSECTION POINT
W1, W2 : WIDTH
29 : GUIDE EDGE
29A, 30B : UPSTREAM PORTION
29B, 30A : DOWNSTREAM PORTION
29DP : DOWNSTREAM END
30 : SIDE EDGE
30UP : UPSTREAM END
31 : LINEAR PORTION
32 : UPSTREAM END EDGE

FIG. 2B

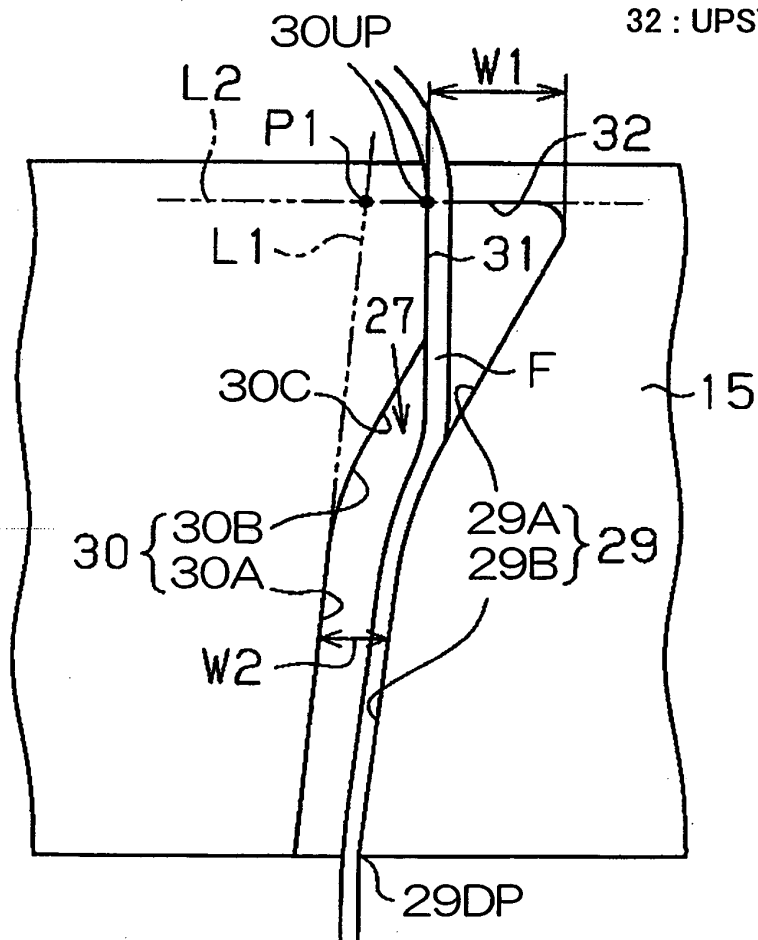


FIG. 3A

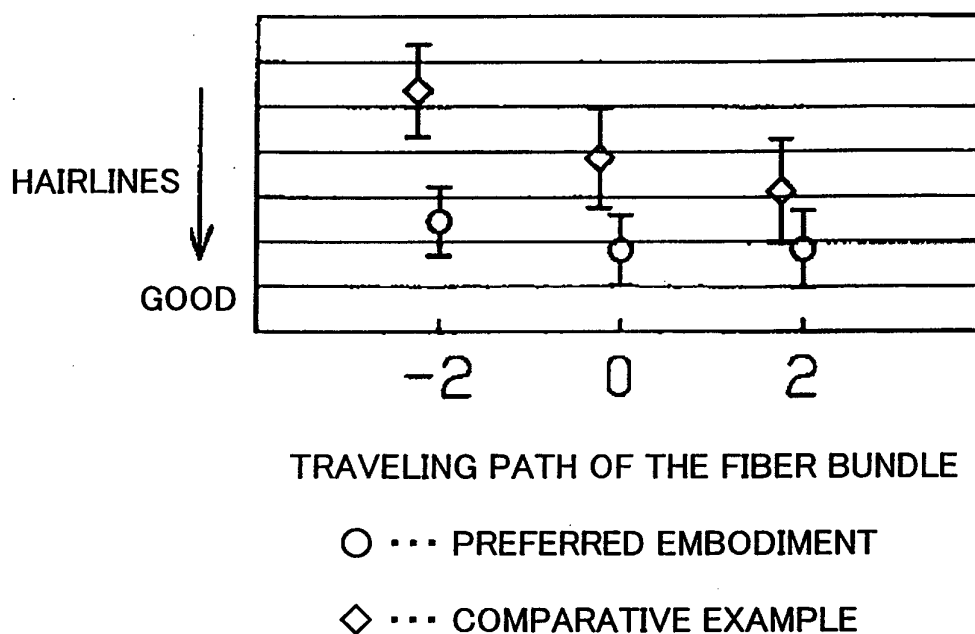


FIG. 3B

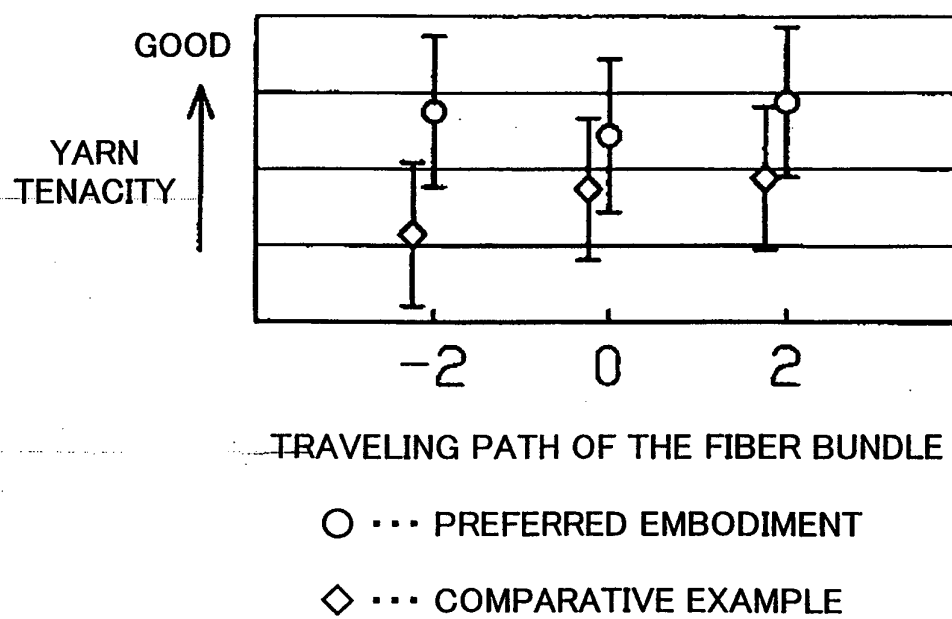


FIG. 4A

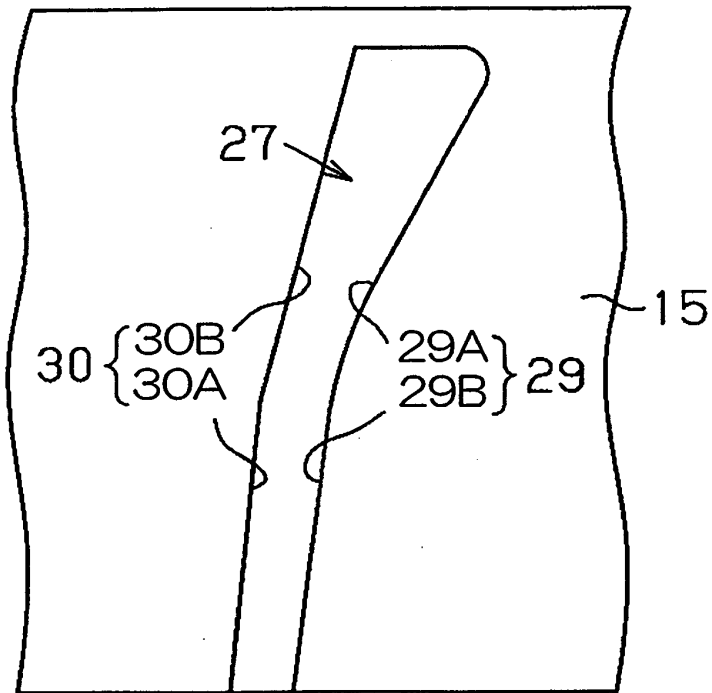


FIG. 4B

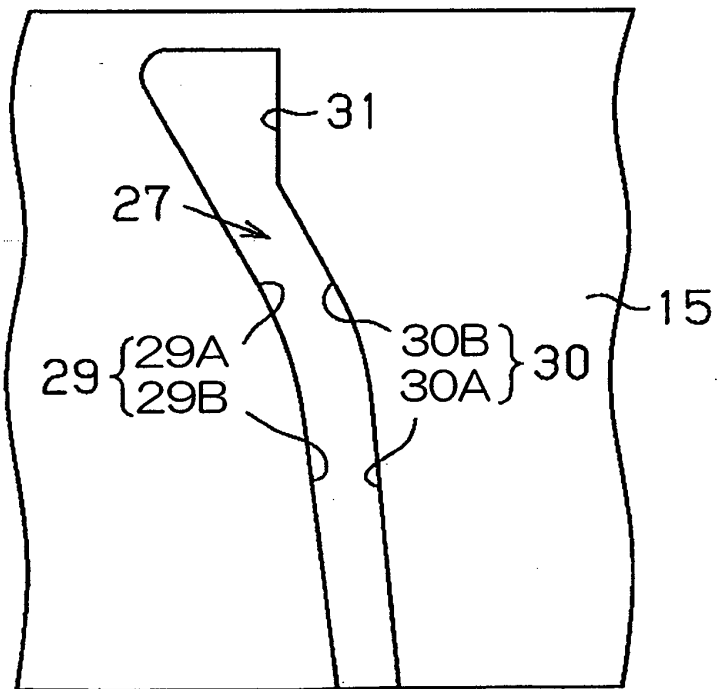


FIG. 5

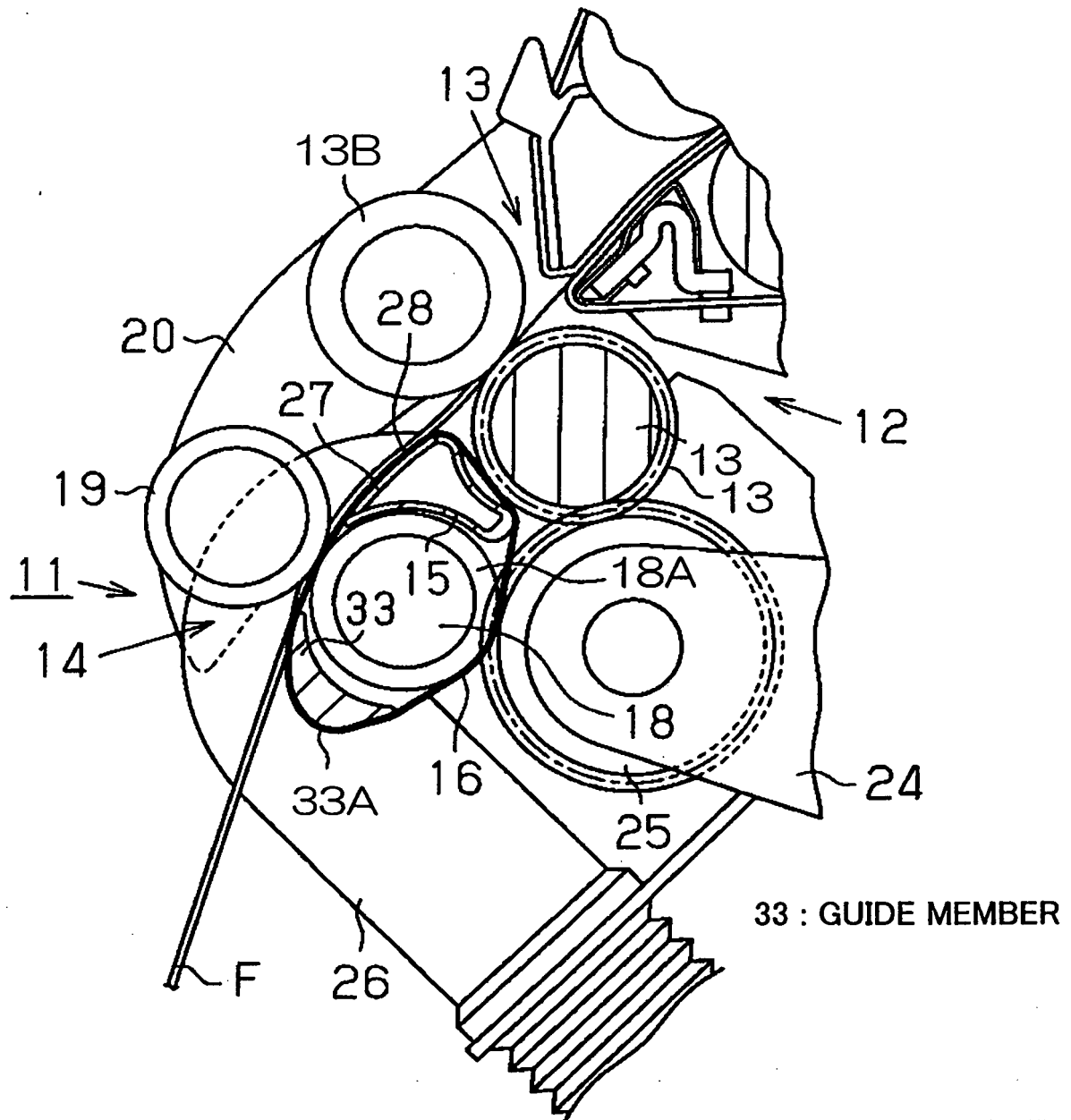


FIG. 6

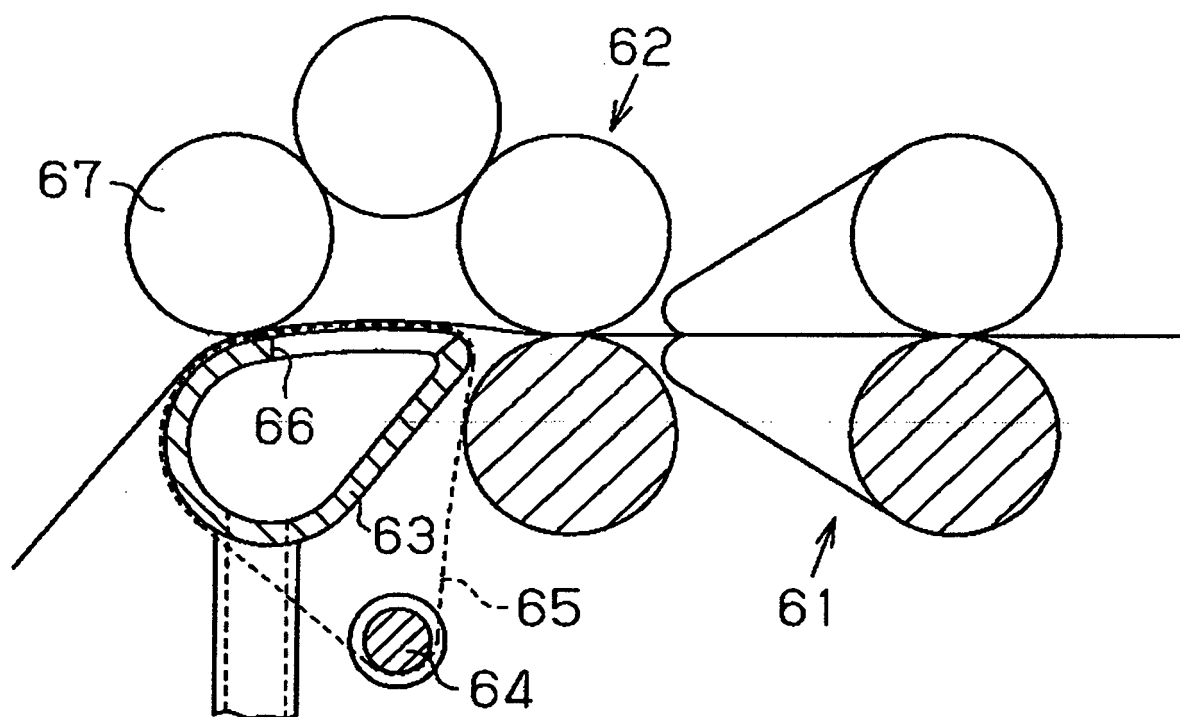


FIG. 7A

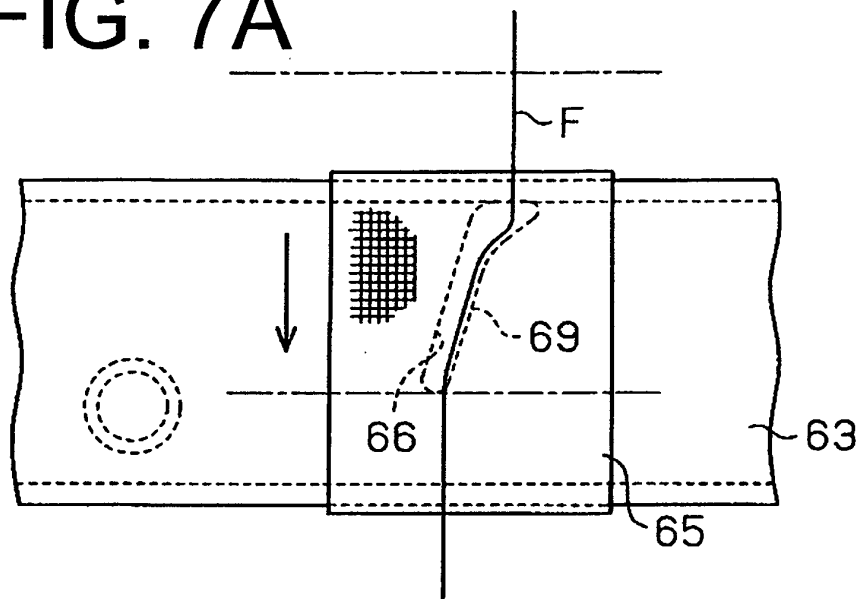


FIG. 7B

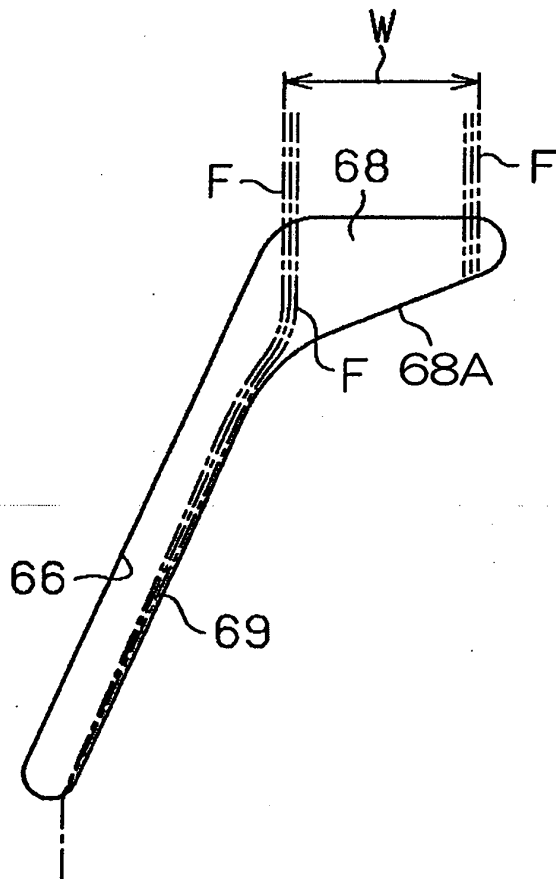
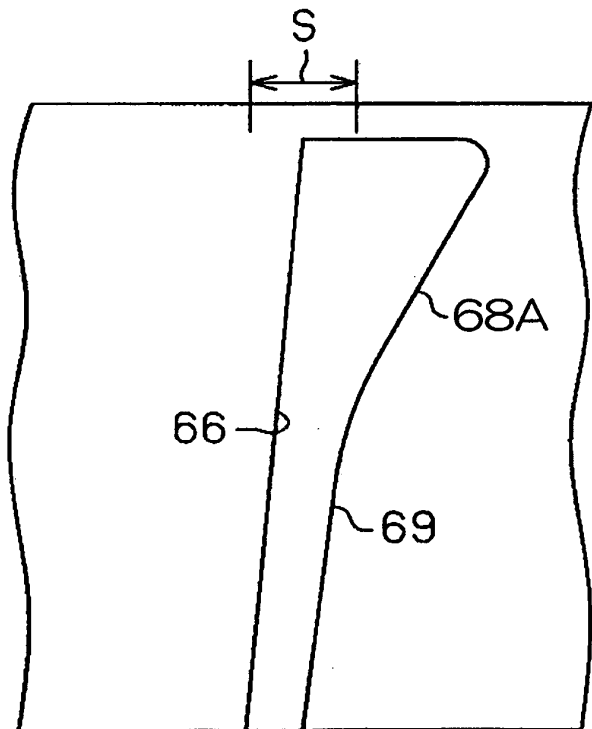


FIG. 7C



REFERENCES CITED IN THE DESCRIPTION

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