(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 518 949 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.03.2005 Bulletin 2005/13

(51) Int Cl.[7]: **D01H 4/02**, D01H 1/115

(21) Application number: **04021723.4**

(22) Date of filing: **13.09.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **29.09.2003 JP 2003337381**

(71) Applicant: **MURATA KIKAI KABUSHIKI KAISHA**
Minami-ku Kyoto-shi Kyoto 601 (JP)

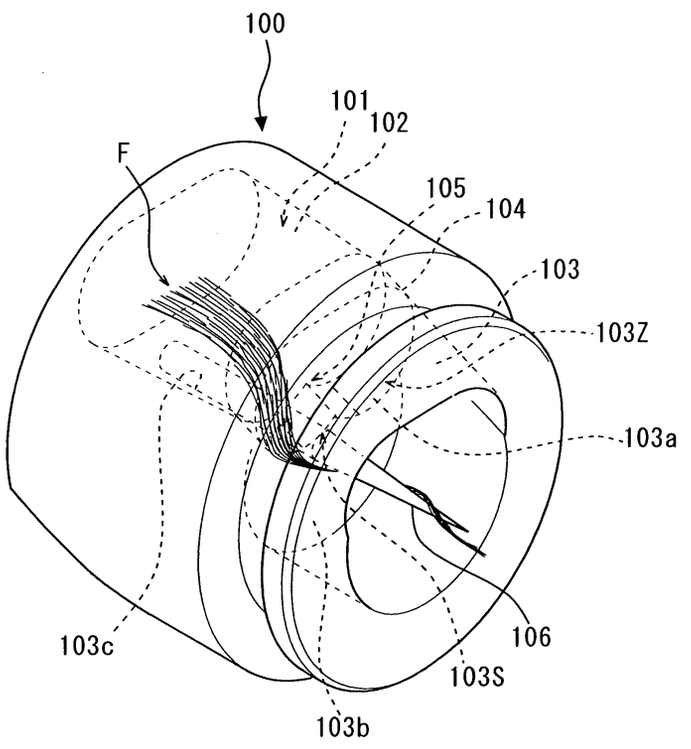
(72) Inventor: **Matsumoto, Tatsumori**
Otsu-shi, Shiga (JP)

(74) Representative: **Liedl, Christine et al**
c/o Hansmann & Vogeser,
Albert-Rosshaupter-Strasse 65
81369 München (DE)

(54) Air vortex spinning machine with special fibre introductions passages

(57) A spinning machine in which a spinning member is disposed, the spinning member having a nozzle block 11 in which air injection holes are drilled, a hollow guide shaft 17, a fiber introduction hole 101 opened at a tip side of the hollow guide shaft 17, and a fiber guide member 106 that guides fibers to the tip of the hollow guide shaft 17, wherein, first, a separating projecting portion 105 is formed in a fiber contact surface of the fiber introduction hole 101 to define a plurality of passages 103S, 103Z having different fiber introduction directions with respect to said fiber guide member 106 (Fig 2).

FIG.1



EP 1 518 949 A2

Description

Field of the Invention

[0001] The present invention relates to a spinning machine that manufactures spun yarns utilizing whirling air currents.

Background of the Invention

[0002] First, the general configuration of a conventional spinning machine will be described with reference to Figure 7.

[0003] F is a bundle of fibers as an aggregate of short fibers such as slivers which are accommodated in a can 1. D is a 4-line type draft device composed of a back roller 2, a third roller 3, a second roller 4 around which an apron belt 4a is extended, and a front roller 5, the draft device D being shown as an example. S is a spinning member, described later, and 6 is a yarn feeding member composed of a nip roller 6a and a delivery roller 6b. P is a winding package formed around a bobbin 7 supported in a bobbin holder (not shown in the drawings). A rotatively driven friction roller 8 abuts against a surface of the winding package P, which is thus rotated. 9 is a traverse guide of a traverse device (not shown in the drawings).

[0004] The bundle of fibers F drawn out of the can 1 is drafted by the draft device D and then enters the spinning member S. The bundle of fibers F is thus formed into a yarn Y. The formed yarn Y is then fed toward the winding package P while being sandwiched between the nip roller 6a and the delivery roller 6b, which constitute the yarn feeding member 6. While being traversed by the traverse guide 9, the yarn Y is then wound into the winding package P, which is rotating while abutting against the friction roller 8.

[0005] A large number of spinning units each composed of, for example, the draft device D, the spinning member S, the yarn feeding member 6, and the winding package P, such as those described above, are arranged in line along a frame (not shown in the drawings) to constitute a spinning machine.

[0006] Now, with reference to Figures 8 to 11, a description will be given of the spinning member S, disposed in a conventional spinning machine.

[0007] 10 is a needle holder having a fiber introduction hole 10a into which the bundle of fibers F drafted by the draft device D and then discharged from the front roller 5 is introduced, the needle holder 10 also having a needle 10b disposed along the fiber introduction hole 10a and operating as a fiber guide member. The fiber introduction hole 10a is formed of an introduction passage 10a1 formed substantially like a funnel and extending substantially parallel to a tangent at a nip point X between a top roller 5a and a bottom roller 5b, both constituting the front roller 5, and an inclined passage 10a2 formed substantially like a cylinder and inclined from the tangent at the nip point X between the top roller 5a and the bottom roller 5b, both constituting the front roller 5, the inclined passage 10a2 extending toward the needle 10b. A bent portion 10a3 is formed at the boundary between the introduction passage 10a1 and the inclined passage 10a2. Further, an opening 10a1' in the introduction passage 10a1 substantially parallel to the needle 10b, the opening 10a1' being located at the front roller 5 side, is formed like a horizontally elongate elliptical slot so as to facilitate introduction of the bundle of fibers F. The introduction passage 10a1 is tapered from the opening 10a1', formed like a horizontally elongate elliptical slot, toward the inclined passage 10a2, formed like a cylindrical space portion having a substantially circular cross section.

[0008] 11 is a nozzle block in which a plurality of air injection holes 11a are formed. The needle holder 10 and the nozzle block 11 are arranged so that their opposite surfaces abut against each other. The needle holder 10 is fitted into a mounting hole 12a drilled in the nozzle housing 12 and located at the front roller 5 side. Further, the nozzle block 11 is fitted into a mounting hole 12b lying opposite the front roller 5 and into a mounting hole 13a drilled in a main housing 13. 14 is a plate-like member sandwiched between the nozzle housing 12 and the main housing 13. The nozzle block 11 is fitted into a through-hole 14a drilled in the plate member 14. An annular air reservoir 15 and a communication hole 16 are formed in the nozzle housing 12, and the communication hole 16 is in communication with an annular air reservoir 15. The communication hole 16 is connected to a source of compressed air via a pipe (not shown in the drawings). Accordingly, compressed air supplied by the source of compressed air enters the air reservoir 15 through the communication hole 16, and the air is subsequently injected from the air injection holes 11a, drilled in the nozzle block 11.

[0009] The air injection holes 11a, formed in the nozzle block 11, is drilled in a tangential direction with respect to an inner peripheral surface 11b of the nozzle block 11. If the compressed air injected from the air injection holes 11a is whirled counterclockwise (in the direction of an arrow A1 shown in Figure 9) as viewed from the draft device D side, a spun yarn with an S twist is generated. On the other hand, if the compressed air injected from the air injection holes 11a is whirled clockwise as viewed from the draft device D side, a spun yarn with a Z twist is generated. Consequently, the nozzle block 11 is replaced depending on the direction of the twist (S or Z twist) in the desired spun yarn.

[0010] 17 is a rotative or non-rotative hollow guide shaft. The hollow guide shaft 17 is fitted into a mounting hole 18a drilled in a shaft supporting block 18 installed in an opening 13b in the main housing 13. 19 is an air chamber formed between the main housing 13 and the shaft supporting block 18. The air chamber 19 is connected to an air suction source (not shown in the drawings) via a pipe 13d connected to a suction hole 13c

formed in the main housing 13, the air suction source sucking air at a low suction pressure. During spinning, the air chamber 19 functions as a space into which air injected from the air injection holes 11a, drilled in the nozzle block 11, escapes. The air chamber 19 also functions to suck and remove, for example, floating fibers generated during spinning.

[0011] Now, with reference mainly to Figures 8 and 9, a description will be given of a process of generating a yarn using the above described spinning machine.

[0012] The bundle of drafted fibers F fed out of the front roller 5 of the draft device D enters the fiber introduction hole 10a in the needle holder 10. Subsequently, the bundle F enters a spinning chamber s1 formed between the nozzle block 11 and a tip 17a of the hollow guide shaft 17. In the spinning chamber s1, a whirling air current flowing in a predetermined direction is formed by air injected from the air injection holes 11a, drilled in the nozzle block 11 (in the present embodiment, a whirling air current flowing counterclockwise as viewed from the front roller 5 is formed as shown by an arrow A1 in Figure 9). The whirling air current flows downward while whirling along an outer peripheral surface of the hollow guide shaft 17, and the whirling air then enters the air chamber 19 and is subsequently discharged from the suction hole 13c via the pipe 13d. Air injected from the air injection holes 11a, drilled in the nozzle block 11, acts to generate a sucking air current near the opening 10a1' inlet in the fiber introduction hole 10a in the needle holder 10, which opening is located at the front roller 5 side. Accordingly, the bundle of drafted fibers F fed out of the front roller 5 is sucked into the fiber introduction hole 10a.

[0013] The bundle of fibers F exiting the fiber introduction hole 10a of the needle holder 10 is introduced into a hollow passage 17b in the hollow guide shaft 17 while being wound around the needle 10b, the tip of which is placed close to the inlet of the hollow passage 17b in the hollow guide shaft 17. Then, the fibers f constituting the bundle of fibers F exiting the fiber introduction hole 10a in the needle holder 10 have their leading ends entangled with a spun yarn Y' being generated in the hollow passage 17b in the hollow guide shaft 17 and are thus introduced into the hollow passage 17b in the hollow guide shaft 17. Further, the whirling air current being generated in the spinning chamber s1 causes the trailing ends f1 of the fibers f to be bent along an outer peripheral surface of the tip 17a of the hollow guide shaft 17 while running around the tip 17a of the hollow guide shaft 17 (fibers having their leading ends inserted into the hollow passage 17b of the hollow guide shaft 17 and having their trailing ends f1 arranged and bent along the outer peripheral surface of the tip 17a of the hollow guide shaft 17 will hereinafter be referred to as reversed fibers).

[0014] Moreover, when the trailing ends f1 of the reversed fibers f near the inlet of the hollow passage 17b of the hollow guide shaft 17 as the spun yarn Y' being generated moves, the trailing ends f1 of the reversed fibers f are whirled around the spun yarn Y' being generated and located in the hollow passage 17b of the hollow guide shaft 17. At the same time, the trailing ends f1 are wound around the outer periphery of the spun yarn Y' to generate a spun yarn Y. In this manner, an actually twisted spun yarn Y is generated which consists of core fibers composed of the fibers f substantially straightly introduced into the hollow passage 17b of the hollow guide shaft 17 and the reversed fibers f wound around the core fibers. The bundle of fibers F is wound around the needle 10b. Accordingly, even if part of the twist applied by the whirling air current attempts to propagate toward the front roller 5, the propagation is hindered by the needle 10b to prevent the bundle of fibers F fed out of the front roller 5 from being twisted.

[0015] The position of the needle 10b-side exhaust port of the inclined passage 10a2, formed in the needle holder 10, depends on the whirling direction of the whirling air current generated by air injected against the needle 10b from the air injection holes 11a, drilled in the nozzle block 13.

[0016] For example, if the whirling air current formed flows counterclockwise as viewed from the front roller 5 as shown by the arrow A1 in Figure 9 or an arrow A3 in Figure 11, the needle 10b is attached to a position at about 45 degrees from a bottom point T1 of a substantially circular exhaust port 10a2' of the inclined passage 10a2, forming the fiber introduction hole 10a, in a counterclockwise direction along the exhaust port 10a2', in other words, in the whirling direction of the whirling air current. Attaching the needle 10b to such a position prevents the fibers f constituting the bundle of fibers F, transferred along the inclined passage 10a2, from being separated into two directions along the needle 10b. When separated into the two directions along the needle 10b, the fibers f constituting the bundle of fibers F may be wound around the needle 10b to preclude the generation of a spun yarn.

[0017] Further, if the whirling current formed flows clockwise as viewed from the front roller 5, as shown by an arrow A2 in Figure 10, the needle 10b is attached to a position at about 45 degrees from the bottom point T1 of the substantially circular exhaust port 10a2' of the inclined passage 10a2, forming the fiber introductin hole 10a, in a clockwise direction along the exhaust port 10a2', in other words, in the whirling direction of the whirling air current. Attaching the needle 10b to such a position prevents the fibers f constituting the bundle of fibers F, transferred along the inclined passage 10a2, from being separated into the two directions along the needle 10b, as described above.

[0018] As described above, the whirling direction of the whirling air current is appropriately switched by applying an S twist or a Z twist to the spun yarn generated. To achieve this, both needle holder 10 and nozzle block 11 must be replaced.

[0019] The conventional spinning machine described

above is disclosed in the Unexamined Japanese Patent Application Publication (Tokkai) No. 2000-345438

[0020] As described above, if a spun yarn undergoing the desired twist (S or Z twist) is to be generated, both needle holder 10 and nozzle block 11 must be replaced. Accordingly, the operation of switching the twist in the spun yarn is inefficient and difficult.

[0021] It is an object of the present invention to solve the problems of the conventional spinning machine.

Summary of the Invention

[0022] To accomplish this object, the present invention provides a spinning machine in which a spinning member is disposed, the spinning member having a nozzle block in which air injection holes are drilled, a hollow guide shaft, a fiber introduction hole opened at a tip side of the hollow guide shaft, and a fiber guide member that guides fibers to the tip of the hollow guide shaft, wherein, first, a separation protrusion is formed in a fiber contact surface of the fiber introduction hole to define a plurality of passages having different fiber introduction directions with respect to the fiber guide member, wherein, second, the separation projection is formed so that the plurality of passages are symmetric with respect to an axis of the fiber guide member, wherein, third, the fiber introduction hole is formed of an introduction passage at an opening inlet side and an inclined passage located downstream side of the introduction passage and extending toward the fiber guide member, and a bent portion is formed at a boundary between the introduction passage and the inclined passage, the separation projection being formed downstream side of the bent portion, wherein, fourth, a wall portion of the separation projection and the inclined passage form a common radius of curvature, and wherein, fifth, an edge of an exhaust port of the passage which edge is located at the fiber guide member side is located at a predetermined distance from the axis of the fiber guide member.

[0023] The separation protrusion is formed in the fiber contact surface of the fiber introduction hole to define the plurality of passages having the different fiber introduction directions with respect to the fiber guide member. Consequently, it is unnecessary to replace a needle holder depending on the whirling direction of a whirling air current generated in a spinning chamber. This improves the operability of switching of a twist in a spun yarn.

[0024] The separation projection is formed so that the plurality of passages are symmetric with respect to the axis of the fiber guide member. Consequently, it is possible to prevent a variation in the quality of spun yarns such as their strength or uniformity caused by a variation in the whirling direction of the whirling air current generated in the spinning chamber.

[0025] The fiber introduction hole is formed of the introduction passage at the opening inlet side and the inclined passage located downstream side of the introduction passage and extending toward the fiber guide member. Consequently, a bundle of fibers running through the fiber introduction hole can have its running speed controlled. This ensures that the fibers are wound around the fiber guide member. Further, the separation projection is formed downstream side of the bent portion at the boundary between the introduction passage and the inclined passage. Consequently, the bundle of fibers running biased toward one side of the fiber introduction hole, the bias starting in the vicinity of the bent portion, can be reliably supplied from either direction with respect to the fiber guide member through the corresponding passage without being divided.

[0026] The wall portion of the separation projection and the inclined passage form the common radius of curvature. Consequently, the bundle of fibers whirled by the whirling air current generated in the spinning chamber can run smoothly. This improves the quality of manufactured spun yarns such as their strength and uniformity.

[0027] The edge of the exhaust port of the passage which edge is located at the fiber guide member side is located at the predetermined distance from the axis of the fiber guide member. Consequently, it is possible to more reliably hinder the propagation, toward the front roller, of a twist applied by the whirling air current to the bundle of fibers.

Brief Description of the Drawings

[0028]

Figure 1 is a perspective view of a needle holder schematically showing the behavior of fibers, the needle holder constituting a spinning member of a spinning machine according to the present invention.

Figure 2 is a partial vertical side sectional view of the spinning member constituting the spinning machine according to the present invention.

Figure 3 is a front view of the needle holder as viewed from a front roller side, the needle holder constituting the spinning member of the spinning machine according to the present invention.

Figure 4 is a rear view of the needle holder as viewed from a side opposite to the front roller side, the needle holder constituting the spinning member of the spinning machine according to the present invention.

Figure 5 is a vertical sectional view of the needle holder constituting the spinning member of the spinning machine according to the present invention.

Figure 6 is a vertical sectional view taken along a line I-I in Figure 2.

Figure 7 is a general perspective view of the spinning machine.

Figure 8 is a vertical sectional view of a spinning member constituting a conventional spinning ma-

chine.

Figure 9 is a partial vertical sectional view of the spinning member constituting the conventional spinning machine.

Figure 10 is a vertical sectional view taken along a line I-I in Figure 9.

Figure 11 is also a vertical sectional view taken along the line I-I in Figure 9.

Detailed Description of the Preferred Embodiments

[0029] An embodiment of the present invention will be described below. However, the present invention is not limited to the embodiment. Various changes may be made to the embodiment without departing from the spirit of the present invention.

[0030] The general configuration of the spinning machine according to the present invention is the same as that of the spinning machine described with reference to Figure 7. Accordingly, its detailed description is omitted. Further, the present invention differs from the above described conventional spinning machine only in the configuration, operation, and effects of a needle holder. Consequently, with reference to Figures 1 to 6, the description below will focus on the needle holder of the spinning machine according to the present invention.

[0031] A fiber introduction hole 101 similar to the fiber introduction hole 10a in the needle holder 10, described above, is also formed in a needle holder 100 according to the present invention. The fiber introduction hole 101 is formed of an introduction passage 102 that is substantially parallel to a tangent at a nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5, and an inclined passage 103 inclined with respect to the nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5, and toward a needle 106 similar to the above described needle 10b and which operates as a fiber guide member. A bent portion 104 is formed at the boundary between the introduction passage 102 and the inclined passage 103. Further, a lower wall surface 103b inclined substantially vertically or downward is formed in the middle of a bottom part 103a constituting a fiber contact surface of the inclined passage 103.

[0032] A cross section of the introduction passage 102 which is perpendicular to the running direction (the direction of a tangent at the nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5) of the bundle of fibers F, the introduction passage 102 forming the fiber introduction hole 101, is formed like a slot shaped substantially like an ellipse with its larger diameter side extending in a horizontal direction. A cross section of the inclined passage 103 which is perpendicular to the running direction of the bundle of fibers F, the inclined passage 103 extending from the bent portion 104 to the lower wall surface 103b, is also formed substantially like an ellipse with its larger diameter side extending in the horizontal direction.

[0033] An angular separating projecting portion 105 is projected from a central portion of the bottom part 103a of the inclined passage 103, located to extend from the bent portion 104 to the lower wall surface 103b. In the present embodiment, a cross section of the separating projecting portion 105 which is perpendicular to the running direction of the bundle of fibers F is formed substantially like an isosceles triangle. Opposite side walls 105a of the separating projecting portion 105 and the bottom part 103a of the inclined passage 103 form a common predetermined radius of curvature. The separating projecting portion 105 defines a plurality of (in this case, two) passages 103S, 103Z having different fiber introduction directions.

[0034] Immediately below the separating projecting portion 105, projected from the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, projected from the central portion of the bottom part 103a of the inclined passage 103, a needle 106 which is similar to the needle 10b, disposed in the needle holder 10 of the above described conventional spinning machine, and which operates as a fiber guide member is attached substantially parallel to the tangent at the nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5, in other words, substantially parallel to the introduction passage 102, constituting the fiber introduction hole 101. The needle 106 is attached at a predetermined distance from the edge (in the present embodiment, the edge bounded by the side walls 105a and the bottom part 103a and the exhaust port 103d) of the exhaust port 103d of the inclined passage 103. In the present embodiment, the needle 106 is attached to the needle holder 100 by being fitted into a hole portion 103c drilled in the lower wall surface 103b. When thus disposed, the needle 106 hinders a twist applied to the fibers f constituting the bundle of fibers F from propagating toward the front roller 5. This prevents the twisting of the bundle of fibers F fed out of the front roller 5.

[0035] As described above, the fiber introduction hole 101 is formed of the introduction passage 102 and the downward inclined passage 103 via the bent portion 104. Accordingly, compared to the case in which the fiber introduction hole 101 is straight and is not formed with the inclined passage 103, it is possible to controllably reduce the running speed of the bundle of fibers F running through the fiber introduction hole 101. This ensures that the fibers f constituting the bundle of fibers F can be wound around the needle 106.

[0036] A description will be given below of the generation of a spun yarn Y using a spinning machine having the spinning member S in which the needle holder 100 configured as described above is disposed.

[0037] If a whirling air current flowing clockwise as viewed from the front roller 5 is formed in the spinning member 1 by air injected from the air injection holes 11a, drilled in the nozzle block 11, the fibers f constituting the

bundle of fibers F located near the exhaust port 103d of the inclined passage 103 are biased by a clockwise twist toward one side as shown by an arrow A4 in Figures 3 and 4. Further, the fibers constituting the bundle of fibers F are wound around the needle 106, attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103, via the passage 103S of the inclined passage 103 as shown in Figure 1.

[0038] As described above, the fibers constituting the bundle of fibers F is wound around the needle 106, attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103. However, the separating projecting portion 105 is projected from the central portion of the bottom part 103a of the inclined passage 103. Accordingly, the fibers f constituting the bundle of fibers F running through the inclined passage 103 of the fiber introduction hole 101 are transferred along the side walls 105a of the separating projecting portion 105. This reliably prevents the fibers f from being separated into two directions along the needle 106.

[0039] If a whirling air current flowing counterclockwise as viewed from the front roller 5 is formed in the spinning chamber s1 by air injected from the air injection holes 11a, drilled in the nozzle block 11, the fibers f constituting the bundle of fibers F located near the exhaust port 103d of the inclined passage 103 are biased by a counterclockwise twist toward one side as shown by an arrow A5 in Figures 3 and 4. The fibers f constituting the bundle of fibers F are wound around the needle 106, attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103, via passage 103z of the inclined passage 103.

[0040] As described above, the fibers constituting the bundle of fibers F is wound around the needle 106, attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103. However, the separating projecting portion 105 is projected from the central portion of the bottom part 103a of the inclined passage 103. Accordingly, the fibers f constituting the bundle of fibers F running through the inclined passage 103 of the fiber introduction hole 101 are transferred upward along the side walls 105a of the separating projecting portion 105. This reliably prevents the fibers f from being separated into two directions along the needle 106.

[0041] In particular, the separating projecting portion 105 is preferably provided downstream side of the bent portion 104 of the fiber contact surface (the bottom part 103a of the inclined passage 103). The reason will described below.

[0042] If the separating projecting portion 105 extends beyond and upstream side of the bent portion 104, the bundle of fibers F fed from the draft device D is not affected by twisting enough to run biased toward one side of the fiber introduction hole 101 as shown in Figure 1 while the bundle of fibers F is running upstream side of the bent portion 104. Thus, the bundle of fibers F runs through the center of the fiber introduction hole 101 while being divided into two by the separating projecting portion 105. When the bundle of fibers F behaves in this manner, the two bundles of fibers F obtained by the division are separately supplied to the tip of the hollow guide shaft 17 while being mounted on the needle 106. As a result, the fibers may be caught on the needle 106.

[0043] In contrast, in the present embodiment, the separating projecting portion 105 is provided downstream side of the bent portion 104. Accordingly, as shown in Figure 1, the bundle of fibers F running biased toward one side of the fiber introduction hole 101 can be guided into one of the passages 103S, 103Z. This ensures that the bundle of fibers F can be supplied from one direction with respect to the needle 106.

[0044] As described above, the angular separating projecting portion 105 is projected from the central portion of the bottom part 103 of the inclined passage 103, located to extend from the bent portion 104 to the lower wall surface 103b. The needle 106 is attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103. Accordingly, the inclined passage 103 is formed into the two passages 103S, 103Z, having different fiber introduction direc-

tions. It is thus unnecessary to replace the needle holder 100 depending on the whirling direction of a whirling air current being generated in the spinning chamber s1. This improves the operability of switching of a twist in the spun yarn Y.

[0045] Further, when the separating projecting portion 105 is formed in the center of the bottom part 103a of the inclined passage 103 so that the angle of the bent portion 104 and the like are equal, the passages 103S, 103Z are formed laterally symmetrically with respect to the axis of the needle 106. Consequently, even if the whirling direction of the whirling air current branches to supply the fibers to both passages 103S, 103Z, the quality of the yarn Y such as its strength or uniformity is prevented from varying with only the twisting direction reversed.

[0046] Further, as described above, the side walls 105a of the separating projecting portion 105 and the bottom part 103a of the inclined passage 103 form the common predetermined radius of curvature. Accordingly, the bundle of fibers F being whirled by a clockwise or counterclockwise whirling air current generated in the spinning chamber s1 can run smoothly. This improves the quality of the manufactured spun yarn Y such as its strength or uniformity. The passages 103S, 103Z may be slightly spirally twisted around the needle 106.

[0047] Moreover, the needle 106 is attached to the central portion of the upper end of the lower wall surface 103b, formed in the middle of the bottom part 103a of the inclined passage 103, in other words, attached to the position (at a predetermined distance from the exhaust port 103d of the inclined passage 103) of the lower wall surface 103b which is located immediately below the separating projecting portion 105 in the figures, being projected from the centrol portion of the bottom part 103a of the inclined passage 103. The needle 106 is formed at the predetermined distance from the edge (in the present embodiment, the edge bounded by the side walls 105a and the bottom part 103a and the exhaust port 103d) of the exhaust port 103d of the inclined passage 103. Accordingly, the propagation, toward the front roller 5, of a twist applied by the whirling air current to the bundle of fibers F is hindered not only by the needle 106 but also by the step portion described above. This ensures that the propagation, toward the front roller 5, of a twist applied to the bundle of fibers F is inhibited.

[0048] The above described embodiment shows the example in which the fiber introduction hole 101 is formed of the introduction passage 102 substantially parallel to the tangent at the nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5, and the inclined passage 103, inclined from the tangent at the nip point X between the top roller 5a and the bottom roller 5b, which constitute the front roller 5. However, the whole fiber introduction hole 101 may be formed of the introduction passage 102 without forming the inclined passage 103.

[0049] Further, the above described embodiment shows the example in which the cross section of the introduction passage 102 and inclined passage 103 that is perpendicular to the running direction of the bundle of fibers F, the introduction passage 102 and inclined passage 103 forming the fiber introduction hole 101, is shaped substantially like an ellipse with the larger diameter extending in the horizontal direction. However, the cross section may be formed substantially like a circle. Alternatively, only the introduction passage 102 may be formed substantially like an ellipse with a larger diameter extending in the horizontal direction so that the bundle of fibers F discharged from the front roller 5 is easily introduced into the fiber introduction hole 101.

[0050] Moreover, the above described embodiment shows the example in which the cross section of the separating projecting portion 105 that is perpendicular to the running direction of the bundle of fibers F is formed substantially like an isosceles triangle. However, the present invention is not limited to the cross section shaped substantially like an isosceles triangle but may use various sectional shape such as a semicircle, a square, or an angular shape.

[0051] Moreover, the above described embodiment shows the example in which the separating projecting portion 105 is projected from the central portion of the bottom part 103a of the inclined passage 103, located to extend from the bent portion 104 to the lower wall surface 103b. However, if the precisely homogeneous quality of the spun yarn Y need not be precisely homogeneous regardless of the twisting direction (S or Z twist) of the manufactured spun yarn Y, the separating projecting portion 105 need not necessarily be projected from the central portion of the bottom part 103a of the inclined passage 103, located to extend from the bent portion 104 to the lower wall surface 103b. In this case, the separating projecting portion 105 may be projected from a position offset from the central portion of the bottom part 103a. However, by projecting the separating projecting portion 105 from the central portion of the bottom part 103a of the inclined passage 103, forming the fiber introduction hole 101, it is possible to prevent a variation in the quality of the spun yarn Y such as its strength or uniformity caused by a variation in the whirling direction of a whirling air current generated in the spinning chamber s1. Accordingly, the separating projecting portion 105 is preferably projected from the central portion of the bottom part 103a of the inclined passage 103, forming the fiber introduction hole 101.

Claims

1. A spinning machine in which a spinning member is disposed, the spinning member having a nozzle block in which air injection holes are drilled, a hollow guide shaft, a fiber introduction hole opened at a tip side of the hollow guide shaft, and a fiber guide member that guides fibers to the tip of said hollow

guide shaft, **characterized in that** a separation protrusion is formed in a fiber contact surface of said fiber introduction hole to define a plurality of passages having different fiber introduction directions with respect to said fiber guide member.

2. A spinning machine according to Claim 1, **characterized in that** said separation projection is formed so that said plurality of passages are symmetric with respect to an axis of the fiber guide member.

3. A spinning machine according to Claim 1 or Claim 2, **characterized in that** said fiber introduction hole is formed of an introduction passage at an opening inlet side and an inclined passage located downstream side of the introduction passage and extending toward the fiber guide member, and a bent portion is formed at a boundary between said introduction passage and said inclined passage, said separation projection being formed downstream side of said bent portion.

4. A spinning machine according to Claim 3, **characterized in that** a wall portion of said separation projection and said inclined passage form a common radius of curvature.

5. A spinning machine according to any one of Claims 1 to 4, **characterized in that** an edge of an exhaust port of said passage which edge is located at said fiber guide member side is located at a predetermined distance from the axis of the fiber guide member.

FIG.1

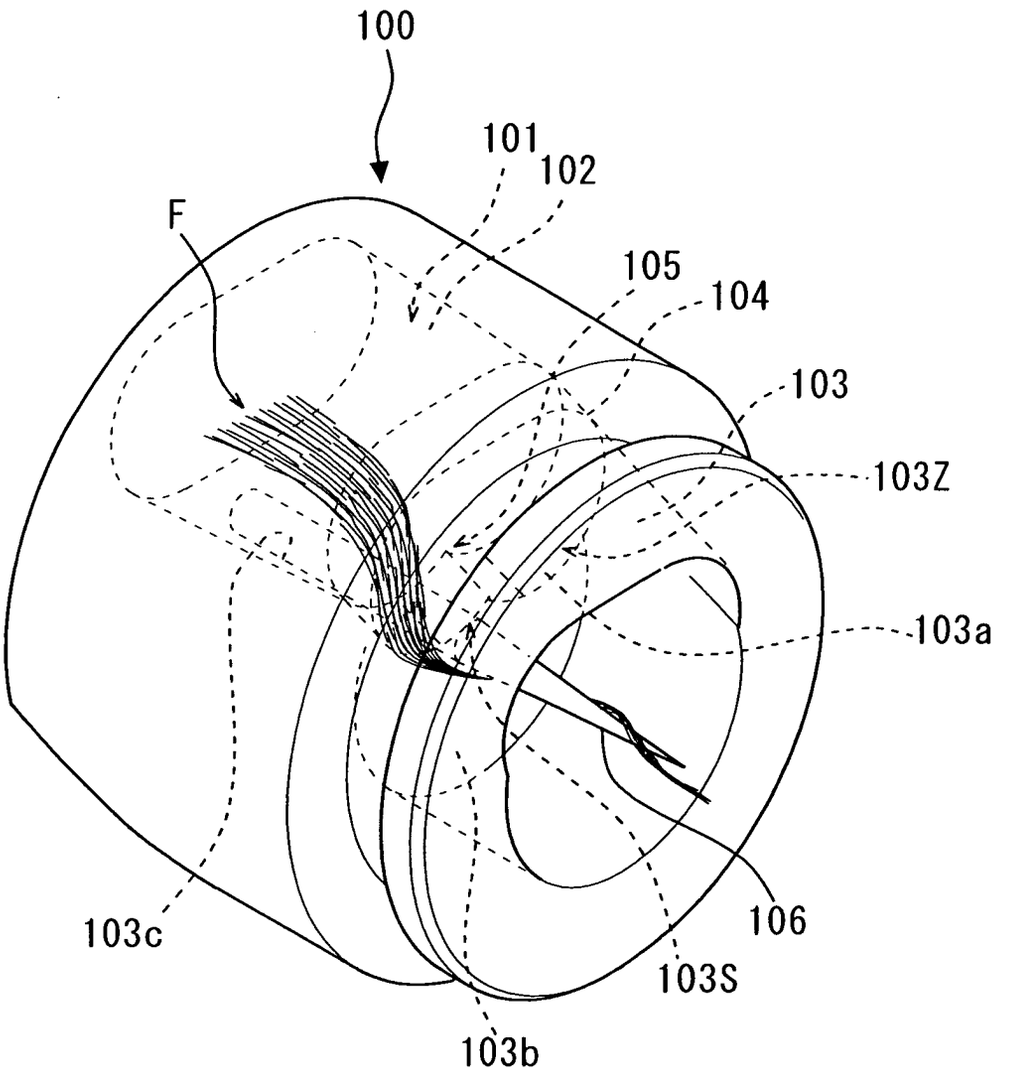


FIG.2

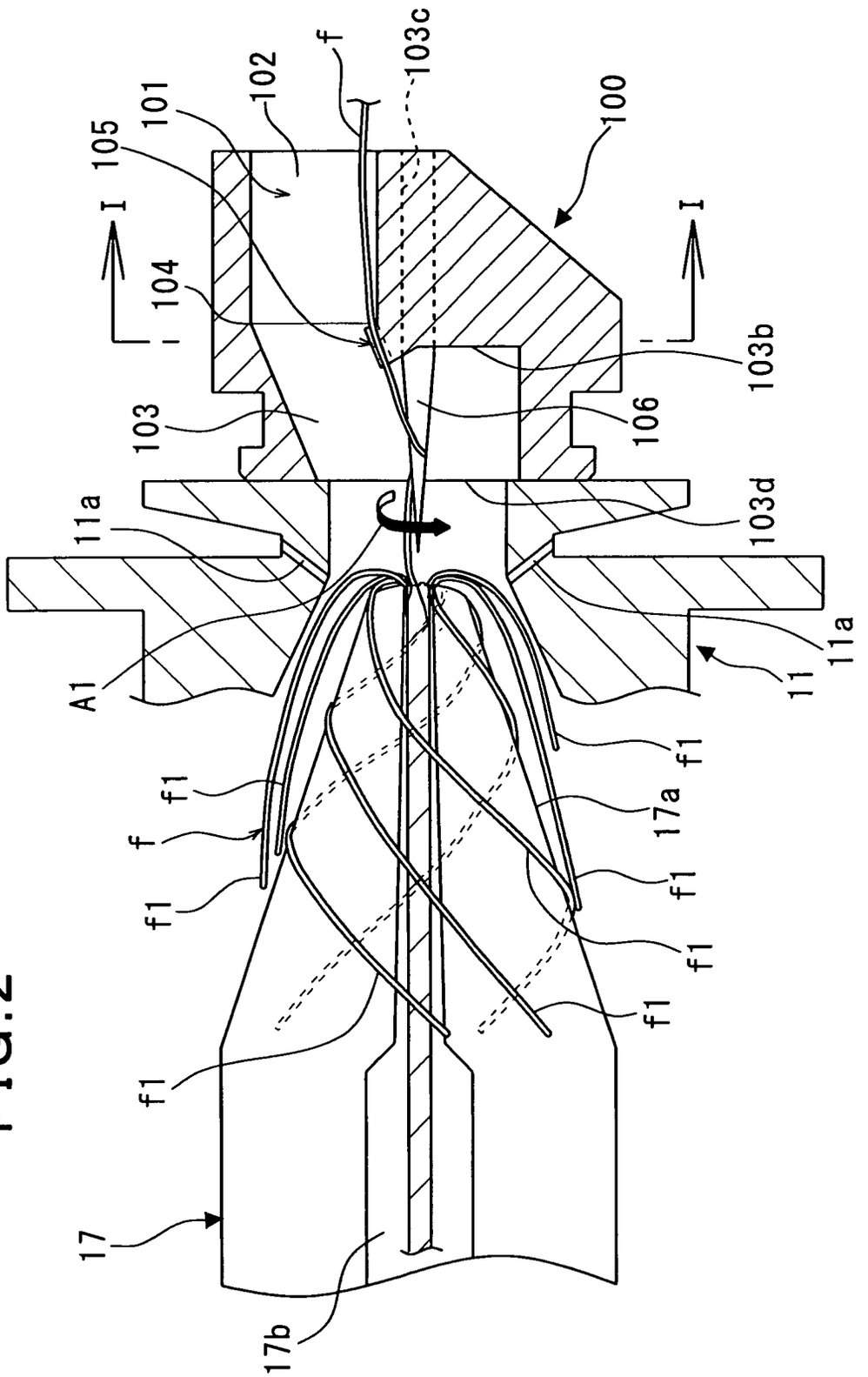

f
103c
102
101
105
100
I
I
104
I
I
103b
103
106
11a
103d
A1
11
11a
f1
f1
f
f1
17a
f1
f1
f1
f1
17
17b

FIG.3

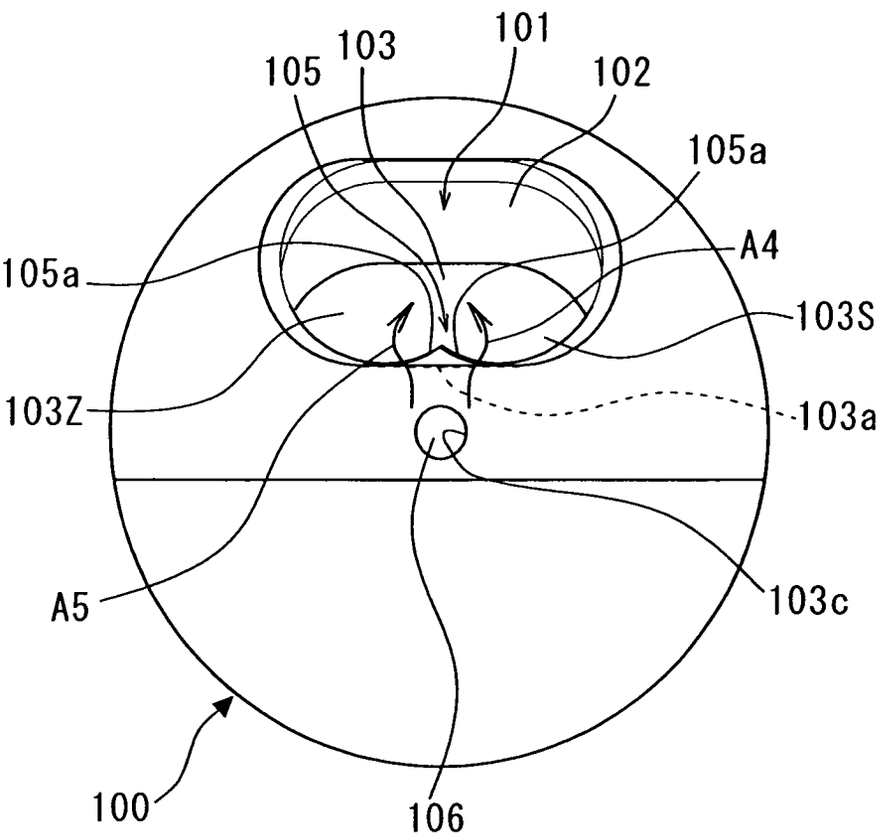


FIG.4

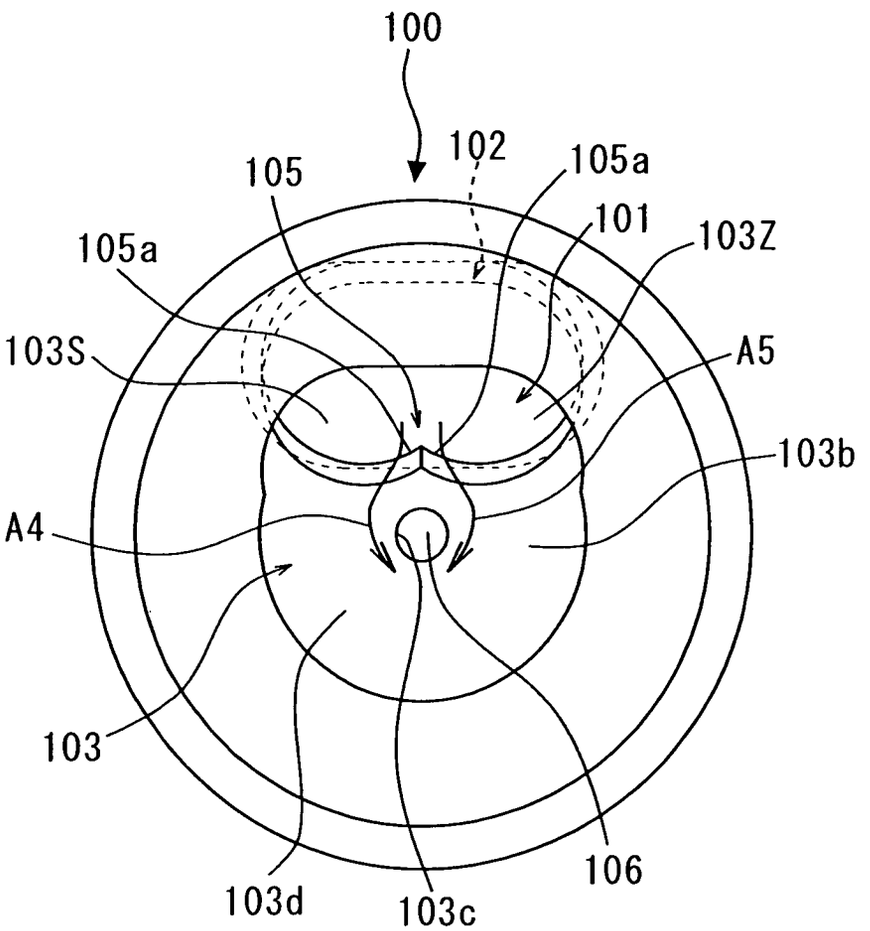

100
102
105
105a
101
103Z
105a
103S
A5
103b
A4
103
103d
103c
106

FIG.5

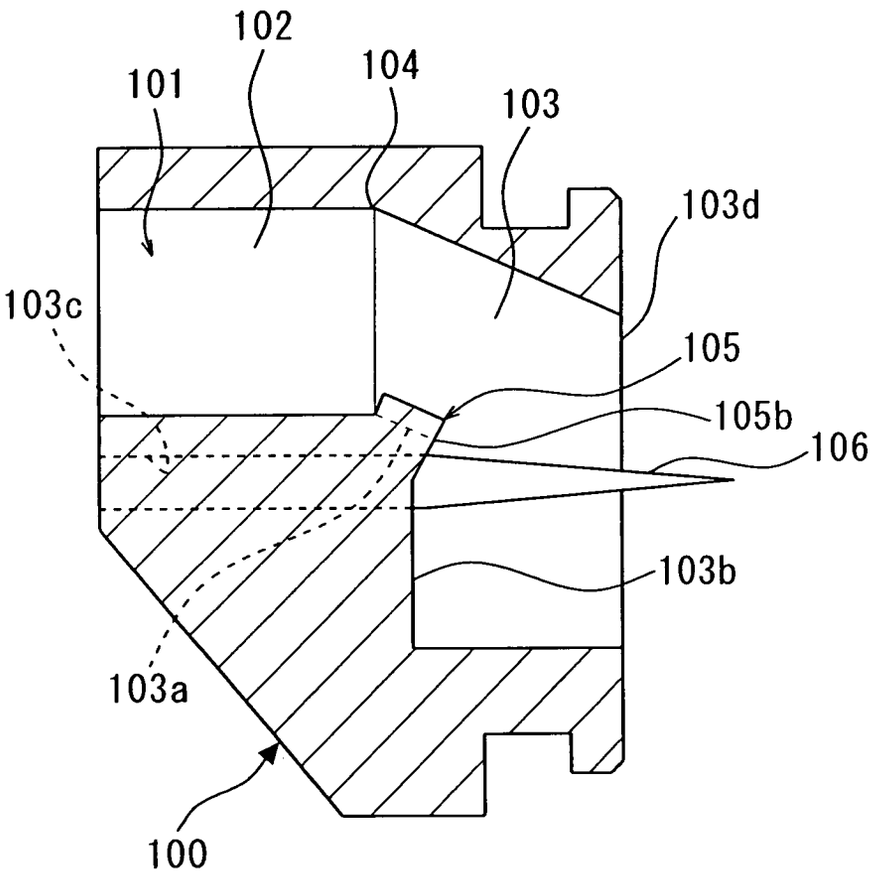


FIG.6

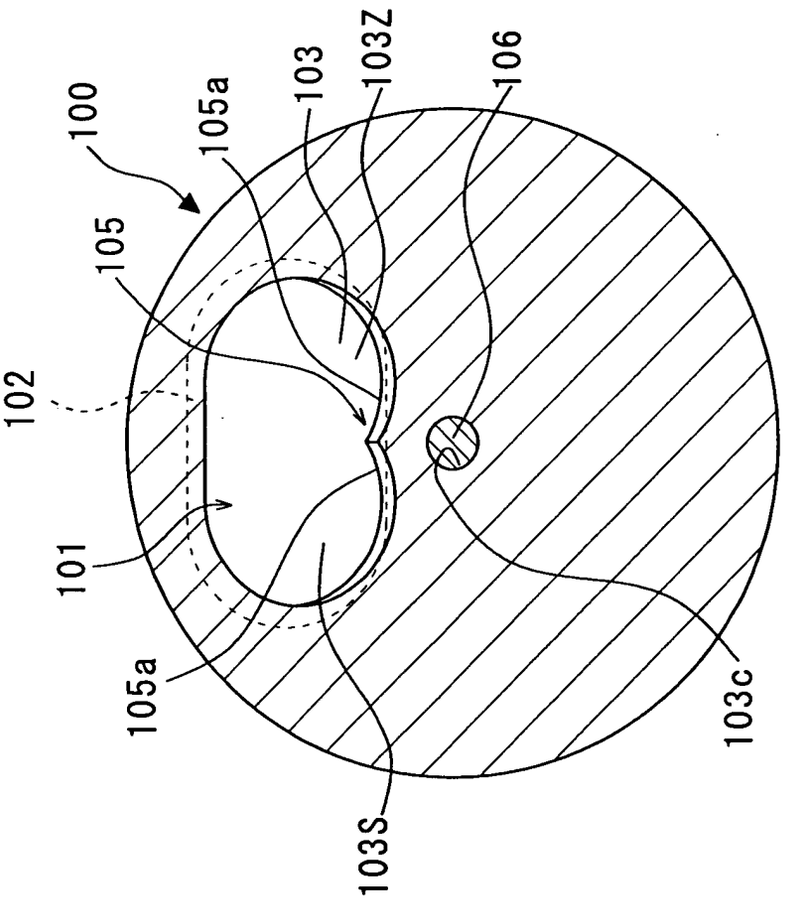


FIG.7

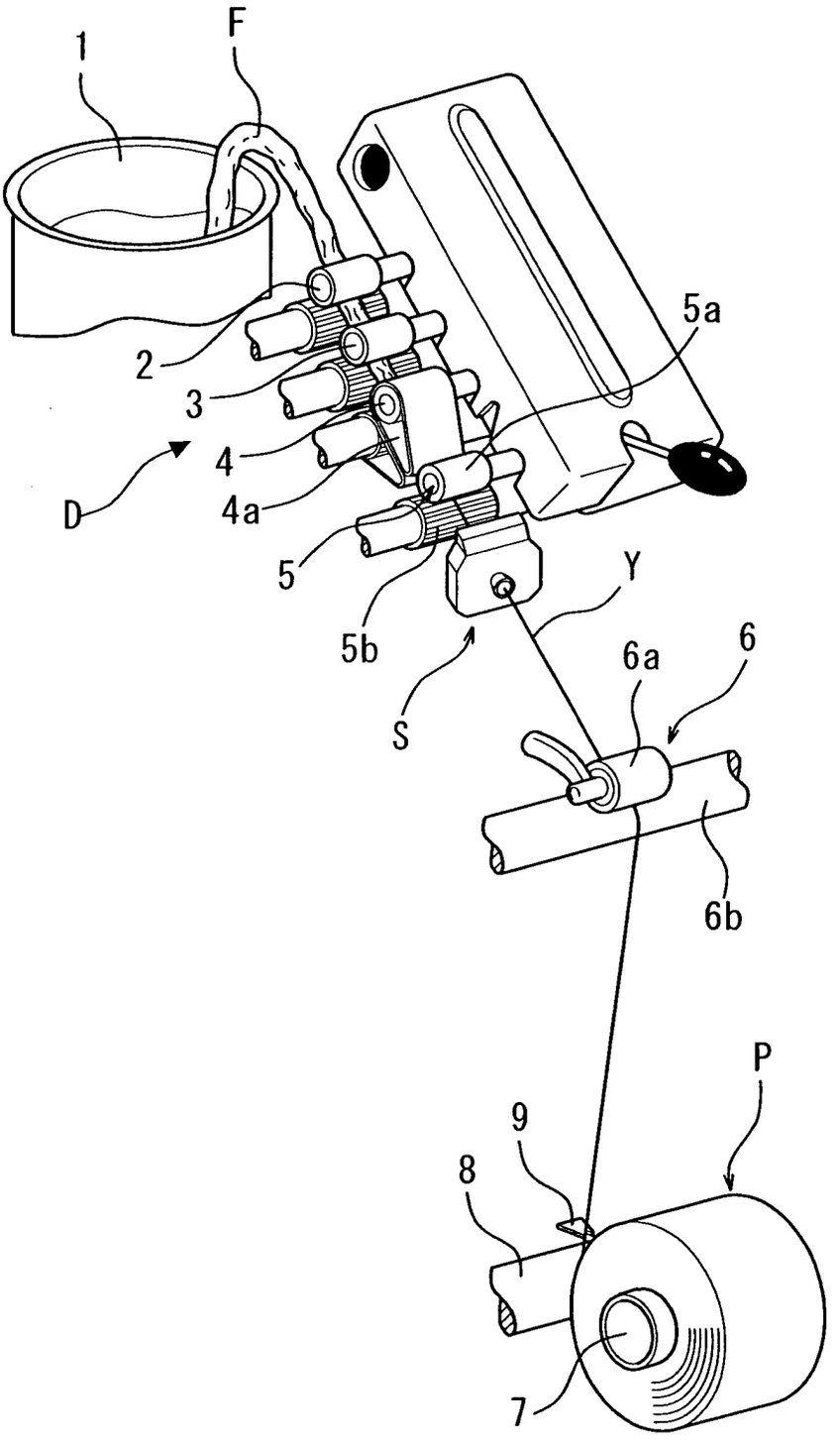


FIG.8

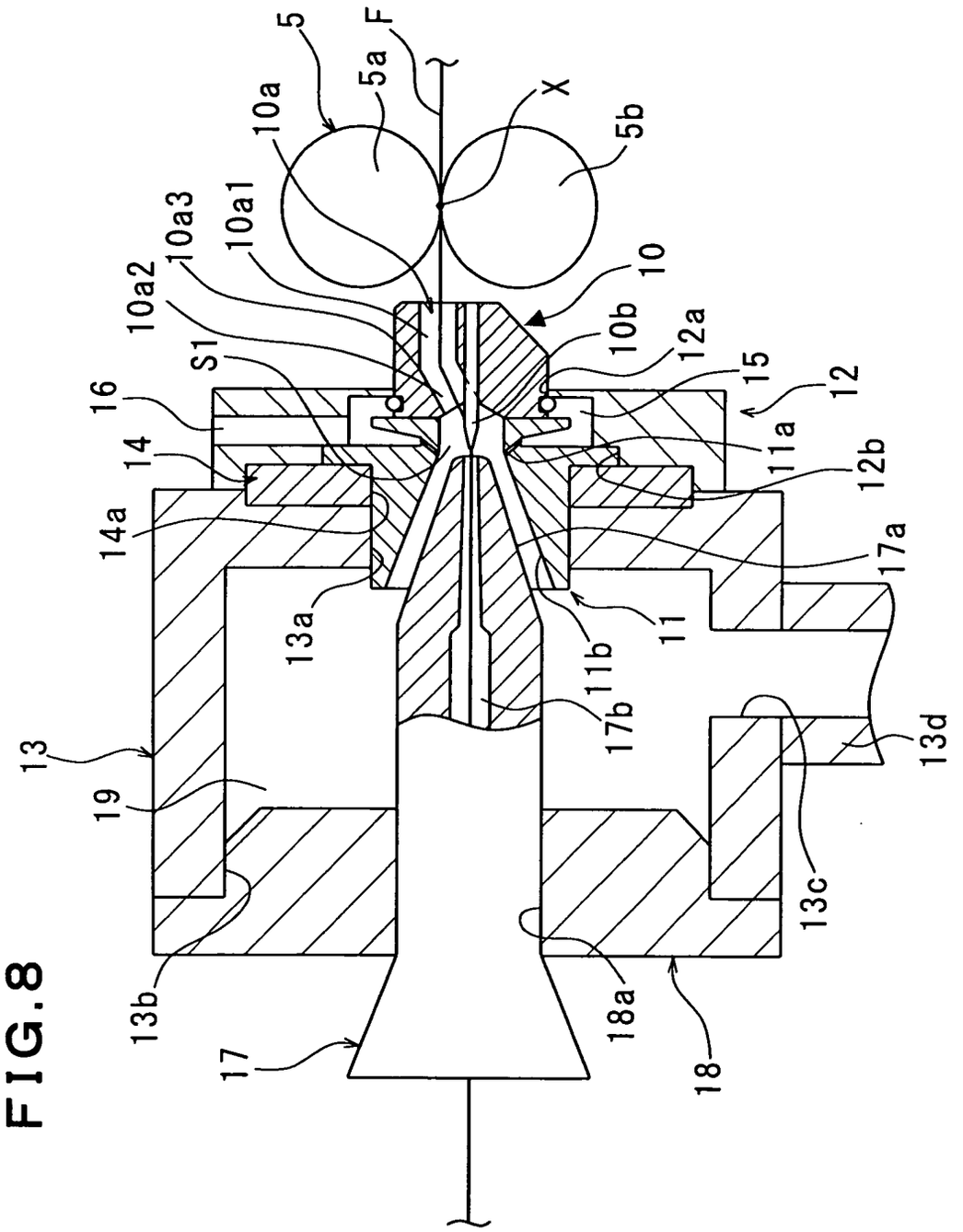

5
5a
F
X
5b
10a
10a3
10a1
10a2
S1
10
10b
12a
15
12
16
14
11a
12b
14a
17a
13a
11
11b
17b
13
19
13d
13c
13b
18a
17
18

FIG.9

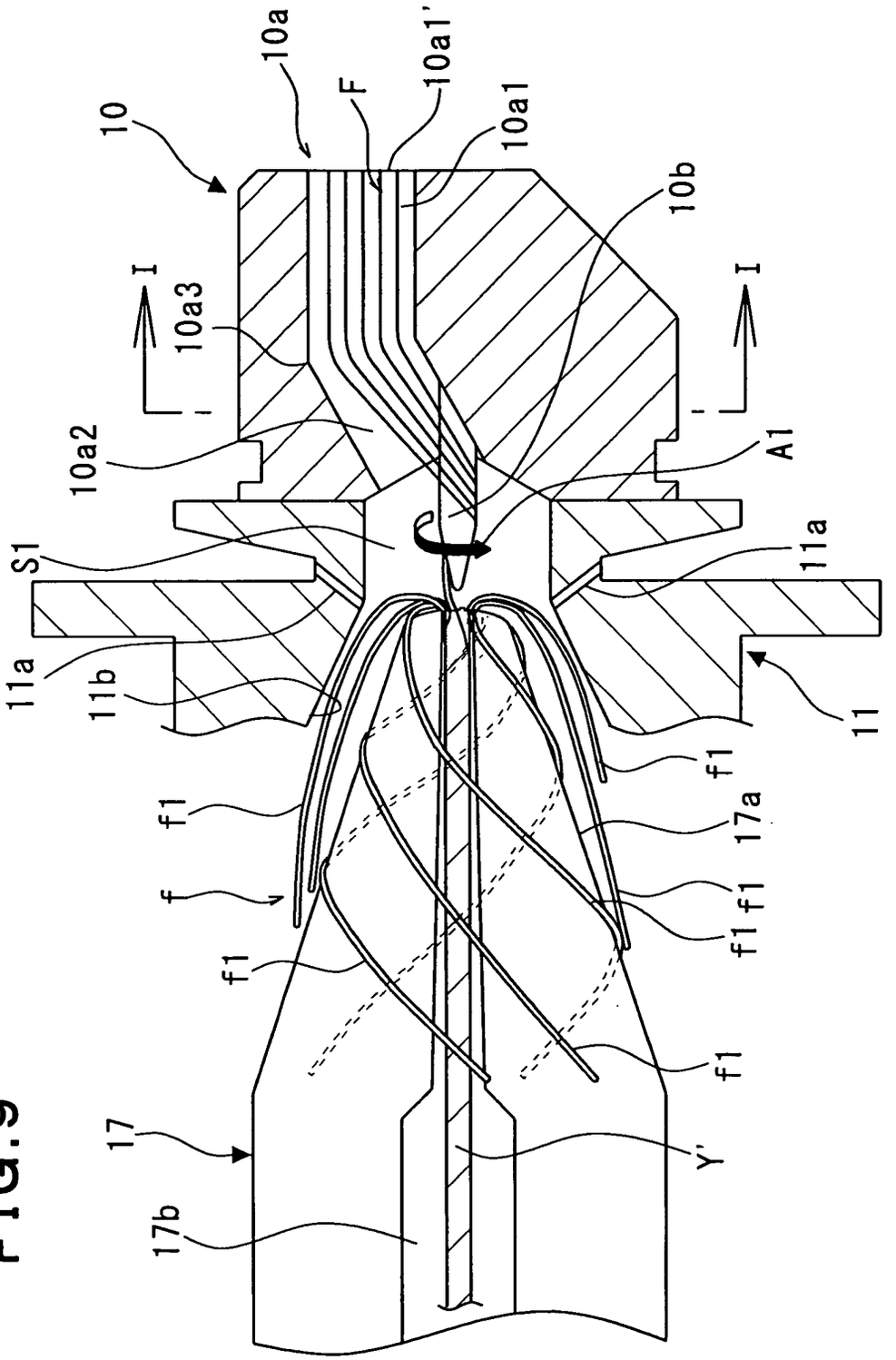

10
10a
F
10a1'
10a1
10b
I
I
10a3
10a2
A1
S1
11a
11a
11b
11
f1
f1
17a
f
f1 f1
f1
f1
17
Y'
17b

FIG.10

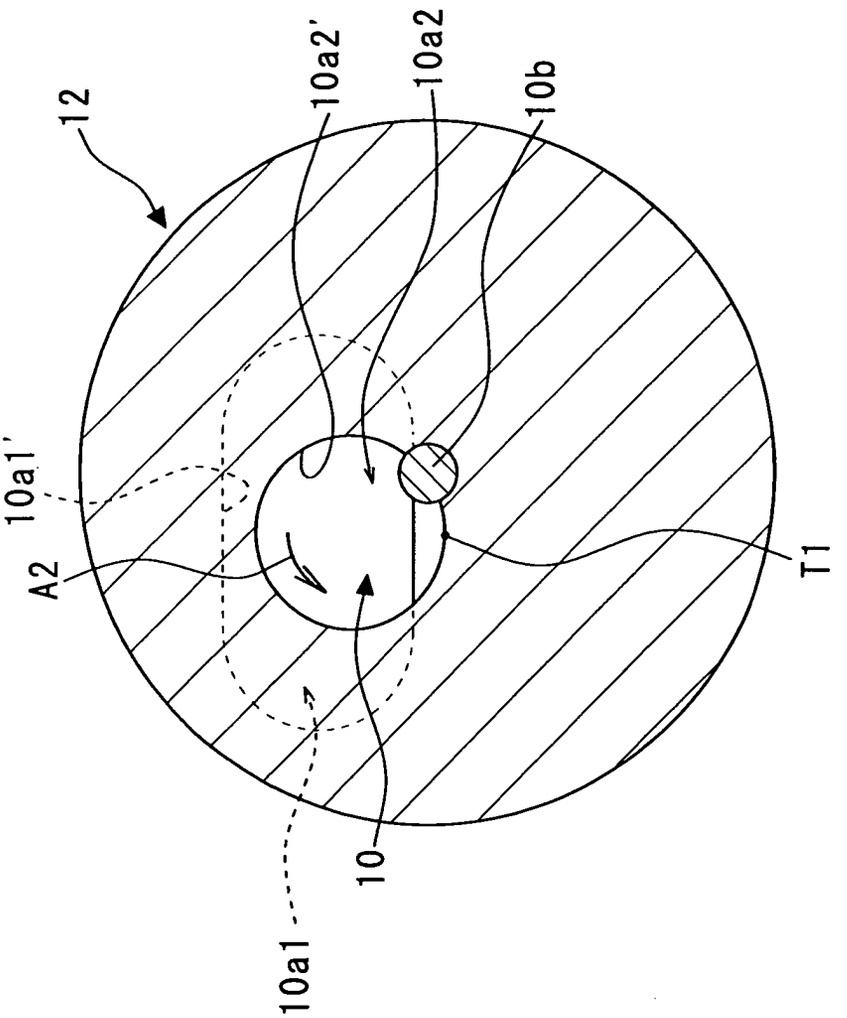


FIG.11