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(54) **Air-jet spinning device and spinning machine**

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(56) References cited:
**EP-A2- 1 072 702 JP-A- 2001 073 236
US-A1- 2007 125 062**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air-jet spinning device and a spinning machine.

2. Description of the Related Art

[0002] Air-jet spinning devices that are equipped with a nozzle block that includes a spinning chamber where fibers are swirled by the action of a swirling air current, and a hollow guide shaft member that includes a passage for guiding the fibers swirled in the spinning chamber to the outside are known in the art (for example, see Japanese Patent Application Laid-open No. H6-287824, Japanese Patent Application Laid-open No. 2001-040532, and Japanese Patent Application Laid-open No. 2001-064831).

[0003] In such an air-jet spinning device, for example, when yarn breakage occurs between the air-jet spinning device and a yarn drawing-out device located downstream of the air-jet spinning device, and filamentous fibers remain in the passage of the hollow guide shaft member, often a troublesome operation needs to be performed for removing the filamentous fibers.

[0004] JP 2001 073236 A discloses a yarn-discharging nozzle for jetting pressurized air into the yarn passage of a guide shaft portion; and a spinning nozzle portion.

[0005] US 2007/125062 A1 discloses an air-jet spinning device.

[0006] EP 1 072 702 A2 discloses a spinning device and method.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide an air-jet spinning device in which the fibers that remain in the passage of the hollow guide shaft member can be removed efficiently and a spinning machine equipped with such an air-jet spinning device.

[0008] In a first aspect of the present invention, there is provided an air-jet spinning device according to Claim 1.

[0009] A spinning machine according to a second aspect of the present invention includes the above air-jet spinning device, a drafting device that drafts fibers and supplies the drafted fibers to the air-jet spinning device, and a winding device that winds a yarn supplied by the air-jet spinning device to form a package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a front view of a spinning machine according

to an embodiment of the present invention;

FIG. 2 is a side view of a spinning unit of the spinning machine shown in FIG. 1;

FIG. 3 is a cross-sectional view of an air-jet spinning device of the spinning unit shown in FIG. 2;

FIG. 4 is a cross-sectional view taken along a line IV-IV shown in FIG. 2;

FIG. 5 is a cross-sectional view taken along a line V-V shown in FIG. 2; and

FIG. 6 is a cross-sectional view of the air-jet spinning device during a cleaning operation.

DETAILED DESCRIPTION

[0011] Exemplary embodiments of the present invention are explained in detail below with reference to the accompanying drawings. In the drawings, parts that are identical or similar are denoted by the same reference numeral and their description is omitted.

[0012] As shown in FIG. 1, a spinning machine 1 includes plural spinning units 2, a yarn joining carrier 3, a blower box 4, and a motor box 5. The spinning units 2 are arranged side by side. Each of the spinning units 2 forms a yarn Y and winds the yarn Y into a package P. The yarn joining carrier 3 performs a yarn joining operation in the spinning unit 2 where breakage of the yarn Y has occurred. The blower box 4 houses an air supply source, etc., that generates a suction flow and a swirling air current and the like in each component part of the spinning units 2. The motor box 5 houses a motor, etc., that supplies power to each component part of the spinning units 2.

[0013] In the following explanation, upstream relative to a running direction of a sliver S, a fiber bundle F, and the yarn Y and downstream relative to the running direction of the sliver S, the fiber bundle F, and the yarn Y shall be referred to simply as "upstream" and "downstream", respectively. The side relative to the yarn joining carrier 3 where a running route of the yarn Y is located and the side opposite to it shall be referred to simply as "front" and "back", respectively.

[0014] As shown in FIGS. 1 and 2, each of the spinning units 2 includes, sequentially from upstream, a drafting device 6, an air-jet spinning device 7, a yarn clearer 8, a tension sensor 9, a yarn pooling device 10, a waxing device 11, and a winding device 12. These devices are directly or indirectly supported by a machine frame 13 in such a manner that the top in a height direction of the spinning machine 1 is upstream (that is, the bottom in the height direction of the spinning machine 1 is downstream).

[0015] The drafting device 6 drafts the sliver S to form the fiber bundle F. The drafting device 6 includes, sequentially from upstream, a back roller pair 61, a third roller pair 62, a middle roller pair 64 with an apron belt 63 stretched thereon, and a front roller pair 65. Each of the roller pairs 61, 62, 64, and 65 drafts the sliver S supplied from a not shown can and conveys the drafted sliver

S from upstream to downstream. The air-jet spinning device 7 imparts twist to the fiber bundle (fibers) F drafted by the drafting device 6 by an action of a swirling air current and forms the yarn (fibers) Y.

[0016] The yarn clearer 8 monitors the running yarn Y at a position between the air-jet spinning device 7 and the yarn pooling device 50. The yarn clearer 8, upon detecting any defect in the yarn Y, transmits a yarn defect detection signal to a unit controller 10. The yarn clearer 8 detects, for example, an abnormality in a thickness of the yarn Y and/or presence of a foreign substance in the yarn Y, etc., as a yarn defect. The tension sensor 9 measures a tension of the running yarn Y at a position between the air-jet spinning device 7 and the yarn pooling device 50, and transmits a tension measurement signal to the unit controller 10. The waxing device 11 applies wax on the running yarn Y at a position between the yarn pooling device 50 and the winding device 12. The unit controller 10 is arranged individually for each of the spinning units 2 and controls the operations of the concerned spinning unit 2.

[0017] The yarn pooling device 50 pools the running yarn Y at a position between the air-jet spinning device 7 and the winding device 12. The yarn pooling device 50 has the functions of stably drawing the yarn Y from the air-jet spinning device 7, pooling the yarn Y conveyed from the air-jet spinning device 7 to prevent slackening of the yarn Y during the yarn joining operation, etc., performed by the yarn joining carrier 3, and adjusting the tension of the yarn Y on the winding device 12 side to prevent any change in the tension of the yarn Y on the winding device 12 side from being transmitted to the air-jet spinning device 7.

[0018] The winding device 12 winds the yarn Y formed by the air-jet spinning device 7 onto a bobbin B to form the package P. The winding device 12 includes a cradle arm 21, a winding drum 22, and a traverse guide 23. The cradle arm 21 is swingably supported by a support shaft 24 and brings a surface of the rotatably supported bobbin B or the package P into contact with a surface of the winding drum 22 at an appropriate pressure. The winding drum 22 is driven by a not shown electric motor that is arranged individually for each of the spinning units 2 to rotate the bobbin B or the package P that is in contact with the winding drum 22. The traverse guide 23 is driven by a support shaft 25 that is common to the plural spinning units 2, and traverses the yarn Y by a predetermined width on the rotating bobbin B or package P.

[0019] The yarn joining carrier 3 moves to the spinning unit 2 where breakage of the yarn Y has occurred, and performs the yarn joining operation at that spinning unit 2. The yarn joining carrier 3 includes a splicer 26, a suction pipe 27, and a suction mouth 28. The suction pipe 27 is swingably supported by a support shaft 31, and catches the end of the yarn Y from the air-jet spinning device 7 by suction, and guides the caught yarn end to the splicer 26. The suction mouth 28 is swingably supported by a support shaft 32, and catches the end of the

yarn Y guided from the winding device 12 by suction, and guides the caught yarn end to the splicer 26. The splicer 26 joins the two yarn ends together.

[0020] The air-jet spinning device 7 is explained next in greater detail. As shown in FIG. 3, the air-jet spinning device 7 includes a nozzle block 70 and a hollow guide shaft member 80. The nozzle block 70 guides the fiber bundle F supplied from the drafting device 6 into the air-jet spinning device 7 and subjects the fiber bundle F to a swirling air current. The hollow guide shaft member 80 guides the yarn Y (twisted fiber bundle F) to the outside.

[0021] The nozzle block 70 includes a fiber guiding member 71 and a swirling air current generating member 72. The fiber guiding member 71 has a guiding hole 71a for guiding the fiber bundle F supplied from the drafting device 6. The swirling air current generating member 72 includes a spinning chamber 73 and first nozzles 74. A tip portion 75a of a needle 75 held by the fiber guiding member 71 is positioned inside the spinning chamber 73.

[0022] The fiber bundle F guided into the spinning chamber 73 via the guiding hole 71a is spun by the swirling air current. Air is injected from the first nozzles 74 into the spinning chamber 73 to generate the swirling air current inside the spinning chamber 73. An opening 72a that is continuous with the spinning chamber 73 is formed in the swirling air current generating member 72. The opening 72a has a truncated conical shape with the tapering end facing upstream.

[0023] As shown in FIG. 4, each of the first nozzles 74 is a narrow hole extending to touch an inner wall surface of the spinning chamber 73 and opens on the inner wall surface. Air is injected from the first nozzles 74 into the spinning chamber 73 so as to generate the swirling air current in the direction indicated by an arrow A1. Each of the first nozzles 74 slants toward downstream as it approaches the inner wall surface of the spinning chamber 73 (see FIG. 3).

[0024] As shown in FIG. 3, an upstream end 80a of the hollow guide shaft member 80 has a truncated conical shape with the tapering end facing upstream, and is arranged inside the opening 72a of the swirling air current generating member 72. There is a gap between the wall of the opening 72a and the wall of the upstream end 80a. A flange-like cap 87 is attached to the hollow guide shaft member 80. The nozzle block 70 is supported by a frame-like holder 76. During a spinning operation of the air-jet spinning device 7, the cap 87 and the holder 76 come into contact with each other and cause the hollow guide shaft member 80 to be positioned relative to the spinning chamber 73 (the position of the hollow guide shaft member 80 in this state is called a "spinning position"). The spinning operation refers to an operation in the above state where the trailing ends of the fibers of the fiber bundle F are swirled around by the air being injected into the spinning chamber 73 from the first nozzles 74 and the fiber bundle F is twisted to form the yarn Y. During the spinning operation, air is injected from the first nozzles 74 but not from later-explained second nozzles 84. The

air injected from the first nozzles 74 during the spinning operation flows into a decompression chamber (collecting member) 77 arranged in the holder 76 via the gap formed between the upstream end 80a and the opening 72a, and the air is collected along with the fibers that are not formed into the yarn Y.

[0025] The hollow guide shaft member 80 includes a passage 81 and the second nozzles 84. The passage 81 guides the yarn Y (fibers swirled around in the spinning chamber 73) to the outside. The second nozzles 84 inject air into the passage 81.

[0026] The passage 81 extends along a center line of the hollow guide shaft member 80, widening toward an outlet 83. The passage 81 includes, sequentially from upstream, a first portion 81a, a second portion 81b, a third portion 81c, and a fourth portion 81d. The first portion 81a extends downstream from an inlet 82 of the upstream end 80a that opens into the spinning chamber 73. The second portion 81b is connected to the first portion 81a. The third portion 81c is connected to the second portion 81b. The fourth portion 81d is connected to the third portion 81c and ends at the outlet 83 in a downstream end 80b of the hollow guide shaft member 80 that opens to the outside.

[0027] As shown in FIG. 5, each of the second nozzles 84 is a narrow hole extending to touch the inner wall surface of the second portion 81b of the passage 81, and opens into the inner wall surface. Air is injected from the second nozzles 84 into the passage 81 so as to produce a swirling air current in the direction of an arrow A2 that is opposite to the direction of the arrow A1 (see FIG. 4). All of the second nozzles 84 fall in one plane that is perpendicular to the center line of the hollow guide shaft member 80 (see FIG. 3).

[0028] As shown in FIG. 3, air is supplied to each of the second nozzles 84 from an air supplying path 86 and an air flow path 85. The air supplying path 86 is connected to the downstream end 80b of the hollow guide shaft member 80. The air flow path 85 is arranged in the hollow guide shaft member 80 so as to surround the passage 81 when viewed from the direction of the center line of the hollow guide shaft member 80.

[0029] The operation of the air-jet spinning device 7 is explained in detail below with reference to FIG. 3. The operation explained below is an operation in which when breakage of the yarn Y occurs in the spinning unit 2, the spinning operation is temporarily stopped accompanying the yarn joining operation by the yarn joining carrier 3 and started thereafter.

[0030] First, upon starting the spinning operation, the unit controller (controller) 10 exerts control such that the air is injected from the first nozzles 74 into the spinning chamber 73 and the air is injected from the second nozzles 84 into the passage 81, in a state where the hollow guide shaft member 80 is positioned at the spinning position.

[0031] With the above action, in the spinning chamber 73, the air flows downstream (that is, toward the gap

formed between the upstream end 80a of the hollow guide shaft member 80 and the opening 72a of the swirling air current generating member 72) while swirling in the direction of the arrow A1 (see FIG. 4). Consequently, the fiber bundle F guided from the drafting device 6 into the spinning chamber 73 via the guiding hole 71a is conveyed to the vicinity of the inlet 82 of the passage 81 while being imparted a loose false twist. In the passage 81, the air flows downstream (that is, toward the outlet 83 of the passage 81) while swirling in the direction of the arrow A2 (see FIG. 5) that is opposite to the direction of the arrow A1. Consequently, the fiber bundle F conveyed to the vicinity of the inlet 82 of the passage 81 is guided through the passage 81 and out from the outlet 83 while being spun into a bundled fiber form.

[0032] Thereafter, the unit controller 10 exerts control so as to cause the suction pipe 27 of the yarn joining carrier 3 to catch the fiber bundle F guided out from the outlet 83 by suction, and stop the injection of air from the second nozzles 84 into the passage 81.

[0033] With the above action, in the passage 81, the fiber bundle F is not spun into a bundled fiber form; instead, the fiber bundle F is imparted a real twist in the spinning chamber 73 by the reversing and swirling action of the swirling air current on the ends of fibers in the fiber bundle F. The yarn Y formed by imparting a real twist to the fiber bundle F is guided through the passage 81 and out from the outlet 83. All the fiber bundles F spun into a bundled fiber form are caught by suction by the suction pipe 27 and the yarn Y is guided to the splicer 26 of the yarn joining carrier 3.

[0034] A cleaning operation of the air-jet spinning device 7 is explained in detail below with reference to FIG. 6. The cleaning operation explained below is performed in the period between a time point at which breakage of the yarn Y occurs in the spinning unit 2 and the spinning operation is temporarily stopped accompanying the yarn joining operation by the yarn joining carrier 3 (spinning operation end time (when no air is injected from the first nozzles 74 and the second nozzles 84)) and a time point at which the spinning operation is started (spinning operation start time). In the cleaning operation, the hollow guide shaft member 80 is advanced into and retreated from the spinning chamber 73 by an actuator, such as an air cylinder. Instead of an air cylinder, a stepping motor, and the like, can be used to improve a positional precision of the hollow guide shaft member 80 relative to the spinning chamber 73.

[0035] In the period between the spinning operation end time and the spinning operation start time, the unit controller 10 causes the hollow guide shaft member 80 to move from the spinning position (the position of the hollow guide shaft member 80 denoted by a broken line in FIG. 6) to a separated position (the position of the hollow guide shaft member 80 denoted by a solid line that is outside the decompression chamber 77 in FIG. 6). The unit controller 10 then exerts control such that air is injected from the second nozzles 84 into the passage

81, in the state where the hollow guide shaft member 80 is positioned at the separated position and the outlet 83 of the passage 81 is open to the outside. The separated position is farther from the spinning chamber 73 than the spinning position at which the hollow guide shaft member 80 is positioned during the spinning operation.

[0036] With the above action, even if there are filamentous fibers remaining in the passage 81 of the hollow guide shaft member 80, they are scrunched and formed into a ball, and gathered near the inlet 82 of the passage 81. This phenomenon occurs because of the outlet 83 of the passage 81 being open to the outside.

[0037] Thereafter, the unit controller 10 exerts control such that the air is injected from the first nozzles 74 into the spinning chamber 73 after the air is injected from the second nozzles 84 into the passage 81. The unit controller 10 then causes the hollow guide shaft member 80 to move from the separated position to a proximity position (the position of the hollow guide shaft member 80 denoted by a double-dotted dashed line that is inside the decompression chamber 77 in FIG. 6), and again causes the hollow guide shaft member 80 to move toward the separated position, in the state where air is being injected from the first nozzles 74 into the spinning chamber 73. The proximity position is closer to the spinning chamber 73 than the separated position but farther from the spinning chamber 73 than the spinning position at which the hollow guide shaft member 80 is positioned during the spinning operation.

[0038] With the above action, the fibers gathered near the inlet 82 of the passage 81 are collected in the decompression chamber 77 along with the air injected from the first nozzles 74 into the spinning chamber 73. The advancing and retreating operation of the hollow guide shaft member 80 relative to the spinning chamber 73 is performed at least once (the operation may be performed plural times (for example, three times), to improve the reliability of collection of the fibers).

[0039] Thereafter, the unit controller 10 causes the hollow guide shaft member 80 to move from the separated position to the spinning position, and in that state, causes the spinning operation to be started.

[0040] As explained above, in the air-jet spinning device 7, in the period between the spinning operation end time and the spinning operation start time, air is injected from the second nozzles 84 into the passage 81, in the state where the hollow guide shaft member 80 is positioned at the separated position that is farther from the spinning chamber 73 than the spinning position and with the outlet 83 of the passage 81 of the hollow guide shaft member 80 being open to the outside. With this action, even when, for example, yarn breakage occurs between the air-jet spinning device 7 and the yarn pooling device 50 causing the filamentous fibers to remain in the passage 81 of the hollow guide shaft member 80, the filamentous fibers can be gathered near the inlet 82 of the passage 81. Hence, in the air-jet spinning device 7, the fibers that remain in the passage 81 of the hollow guide

shaft member 80 can be efficiently removed.

[0041] In the air-jet spinning device 7, in the period between the spinning operation end time and the spinning operation start time, air is injected from the first nozzles 74 into the spinning chamber 73 after the air is injected from the second nozzles 84 into the passage 81. In that state, the hollow guide shaft member 80 is moved from the separated position to the proximity position, and again, moved toward the separated position. With this action, the fibers gathered near the inlet 82 of the passage 81 can be reliably removed from the hollow guide shaft member 80. In the air-jet spinning device 7, the proximity position is farther from the spinning chamber 73 than the spinning position. Hence, because the inlet 82 of the passage 81 is in a retreated state from the spinning chamber 73, the fibers that are removed from the hollow guide shaft member 80 are prevented from remaining in the spinning chamber 73.

[0042] In the air-jet spinning device 7, the fibers gathered at the inlet 82 of the passage 81 are collected in the decompression chamber 77 at a position farther from the spinning chamber 73 than the spinning position. Accordingly, the fibers that are removed are prevented from adhering to the component parts or mixing with the yarn Y being formed.

[0043] In the air-jet spinning device 7, the second nozzles 84 that are arranged for injecting air to smoothly guide the fiber bundle F from the spinning chamber 73 into the passage 81 at the spinning operation start time are also used in the cleaning operation to pass air that is injected into the passage 81 to cause the fibers to gather near the inlet 82 of the passage 81. Hence, a structure of the air-jet spinning device 7 can be simplified by providing the second nozzles 84 with the function of causing the fibers to gather near the inlet 82 of the passage 81 in addition to the function of guiding the fiber bundle F into the passage 81.

[0044] Exemplary embodiments of the present invention are explained above; however, the present invention is not limited to the above embodiments. For example, in the above embodiment, the cleaning operation is performed in the period between the time when breakage of the yarn Y occurs in the spinning unit 2 and the spinning operation is temporarily stopped accompanying the yarn joining operation by the yarn joining carrier 3 (spinning operation end time) and the time when the spinning operation is started (spinning operation start time). However, the cleaning operation can be performed in the period between the time when the operation of the spinning machine 1 or the spinning unit 2 is stopped (spinning operation end time) and the time when the next operation of the spinning machine 1 or the spinning unit 2 is started (spinning operation start time).

[0045] Moreover, in the above embodiment, the separated position is outside the decompression chamber 77. However, as long as the separated position is farther from the spinning chamber 73 than the spinning position, it can be inside the decompression chamber 77. When

the separated position is inside the decompression chamber 77, the fibers gathered near the inlet 82 of the passage 81 can be collected in the decompression chamber 77 even if the hollow guide shaft member 80 is not advanced and retreated relative to the spinning chamber 73.

[0046] In the above embodiment, the second nozzles 84 are provided with the function of causing the fibers to gather near the inlet 82 of the passage 81 in addition to the function of guiding the fiber bundle F into the passage 81. However, the two functions can be performed with separate nozzles. In the above embodiment, all of the second nozzles 84 extend along the same plane that is perpendicular to the center line of the hollow guide shaft member 80. However, the second nozzles 84 can slant toward downstream or upstream as they approach the inner wall surface of the passage 81.

[0047] In the above embodiment, the fibers gathered at the inlet 82 of the passage 81 are collected in the decompression chamber 77. However, a collecting member, such as a suction device can be arranged at a position farther from the spinning chamber 73 than the spinning position (for example, outside the decompression chamber 77, etc.) to collect the fibers gathered at the inlet 82 of the passage 81.

[0048] In the above embodiment, the needle 75 is held by the fiber guiding member 71 to prevent the twist of the fiber bundle F from being conveyed upstream of the air-jet spinning device 7. However, such a structure is not mandatory. For example, the twist of the fiber bundle F can be prevented from being conveyed upstream of the air-jet spinning device 7 by the downstream end of the fiber guiding member 71 instead of the needle 75.

[0049] In the spinning machine 1, the yarn pooling device 50 has the function of drawing out the yarn Y from the air-jet spinning device 7. However, in the spinning machine according to the present invention, the yarn can be drawn out by using a delivery roller and a nip roller.

[0050] In the spinning machine 1, the various devices are arranged in such a manner that the yarn Y supplied from the top in a height direction is wound at the bottom. However, in the spinning machine according to the present invention, the various devices can be arranged in such a manner that the yarn supplied from the bottom in the height direction is wound at the top.

[0051] In the spinning machine 1, a bottom roller of the drafting device 6 and the traverse guide 23 are driven by the power from the motor box 5 (that is, a common motor box 5 is arranged for the spinning units 2). However, in the spinning machine 1 according to the present invention, each component part (for example, the drafting device 6, the air-jet spinning device 7, and/or the winding device 12, etc.) of the spinning unit 2 can be driven independently in each spinning unit 2.

[0052] The tension sensor 9 can be arranged upstream of the yarn clearer 8 in the running direction of the yarn Y. Instead of one unit controller 10 for each spinning unit 2, one unit controller 10 can be arranged for the spinning

units 2. The waxing device 11, the tension sensor 9, and the yarn clearer 8 need not be arranged in the spinning unit 2. The winding device 12 can be driven by a common driving source arranged for the spinning units 2. In this case, to reverse-rotate the package P, the cradle arm 21 is moved by a not shown air cylinder such that the package P is separated from the winding drum 22, and the package P is reverse-rotated by a not shown reverse rotation roller arranged in the yarn joining carrier 3.

[0053] The materials and shapes of each structure of the air-jet spinning device 7 and the spinning machine 1 are not limited to that described above; various materials and shapes can be applied appropriately. For example, the opening 72a can be of a shape other than a truncated cone.

[0054] The air-jet spinning device according to an aspect of the present invention includes a nozzle block, a hollow guide shaft member, and a controller. The nozzle block includes a spinning chamber where fibers are swirled by an action of a swirling air current, and a first nozzle that allows passage of air that is injected into the spinning chamber for generating the swirling air current. The hollow guide shaft member includes a passage through which the fibers that are swirled in the spinning chamber are guided to outside, and a second nozzle that allows passage of air that is injected into the passage. The controller exerts control such that, in a period between a spinning operation end time and a spinning operation start time, the hollow guide shaft member moves from a spinning position that is a position of the hollow guide shaft member during a spinning operation, to a separated position that is farther from the spinning chamber than the spinning position, and air is injected from the second nozzle into the passage, in a state where the hollow guide shaft member is positioned at the separated position and an outlet of the passage is open to the outside.

[0055] With this structure, even when, for example, yarn breakage occurs between the air-jet spinning device and a yarn drawing out device located downstream of the air-jet spinning device causing filamentous fibers to remain in the passage of the hollow guide shaft member, the filamentous fibers can be gathered near an inlet of the passage. Hence, in the air-jet spinning device, the fibers that remain in the passage of the hollow guide shaft member can be removed efficiently.

[0056] In the air-jet spinning device according to another aspect of the present invention, the controller can exert control such that, in the period between the spinning operation end time and the spinning operation start time, the air is injected from the first nozzle into the spinning chamber after the air is injected from the second nozzle into the passage. With this structure, the fibers gathered near the inlet of the passage of the hollow guide shaft member can be reliably removed from the hollow guide shaft member.

[0057] In the air-jet spinning device according to still another aspect of the present invention, the controller

can exert control such that, in the period between the spinning operation end time and the spinning operation start time, the hollow guide shaft member moves from the separated position to a proximity position that is nearer to the spinning chamber than the separated position, and again moves toward the separated position, in a state where the air is injected from the first nozzle into the spinning chamber. With this structure, the fibers gathered near the inlet of the passage of the hollow guide shaft member can be reliably removed from the hollow guide shaft member.

[0058] In the air-jet spinning device according to still another aspect of the present invention, the proximity position can be farther from the spinning chamber than the spinning position. With this structure, because the inlet of the passage of the hollow guide shaft member is in a retreated state from the spinning chamber, the fibers that are removed from the hollow guide shaft member are prevented from remaining in the spinning chamber.

[0059] The air-jet spinning device according to still another aspect of the present invention can further include a collecting member that collects the fibers gathered at the inlet of the passage and that is arranged at a position farther from the spinning chamber than the spinning position. With this structure, the fibers that are removed are prevented from adhering to the component parts or mixing with the yarn being formed.

[0060] In the air-jet spinning device according to still another aspect of the present invention, the controller can exert control such that, at the spinning operation start time, the air is injected from the second nozzle into the passage, in a state where the hollow guide shaft member is positioned at the spinning position. With this structure, the fibers can be smoothly guided from the spinning chamber to the passage of the hollow guide shaft member at the spinning operation start time. Furthermore, by providing the second nozzle with the functions of gathering the fibers and guiding the fibers, the structure of the air-jet spinning device can be simplified.

[0061] A spinning machine according to still another aspect of the present invention includes the above air-jet spinning device, a drafting device that drafts fibers and supplies the drafted fibers to the air-jet spinning device, and a winding device that winds a yarn supplied by the air-jet spinning device to form a package.

[0062] Because the spinning machine includes the above air-jet spinning device, the fibers that remain in the passage of the hollow guide shaft member can be efficiently removed.

Claims

1. An air-jet spinning device (17) comprising:

a nozzle block (70) that includes a spinning chamber (73) where fibers are swirled by an action of a swirling air current and a first nozzle

(74) adapted to allow passage of air that is injected into the spinning chamber (73) for generating therein the swirling air current;

a hollow guide shaft member (80) that includes a passage (81) through which the fibers that are swirled in the spinning chamber (73) are guided to outside and a second nozzle (84) adapted to allow passage of air that is injected into the passage (81); and

a controller (10) adapted to exert control such that, in a period between a spinning operation end time and a spinning operation start time, the hollow guide shaft member (80) moves from a spinning position that is a position of the hollow guide shaft member (80) during a spinning operation, to a separated position that is farther from the spinning chamber (73) than the spinning position, and air is injected from the second nozzle (84) into the passage (81), in a state where the hollow guide shaft member (80) is positioned at the separated position and an outlet (83) of the passage (81) is open to the outside,

characterized in that the controller (10) is adapted to exert control such that, in the period between the spinning operation end time and the spinning operation start time, the hollow guide shaft member (80) is moved from the separated position to a proximity position that is closer to the spinning chamber (73) than the separated position, and again moved toward the separated position, in a state where air is injected into the spinning chamber (73) from the first nozzle (74), and wherein the proximity position is farther from the spinning chamber (73) than the spinning position.

2. The air-jet spinning device (17) as claimed in Claim 1, wherein the controller (10) is adapted to exert control such that, in the period between the spinning operation end time and the spinning operation start time, air is injected from the first nozzle (74) into the spinning chamber (73) after air is injected from the second nozzle (84) into the passage (81).

3. The air-jet spinning device (17) as claimed in any one of Claims 1 to 2, further comprising a collecting member (77) adapted to collect the fibers gathered at an inlet (82) of the passage (81) and that is arranged at a position farther from the spinning chamber (73) than the spinning position.

4. The air-jet spinning device (17) as claimed in any one of Claims 1 to 3, wherein the controller (10) is adapted to exert control such that, at the spinning operation start time, air is injected from the second nozzle (84) into the passage (81), in a state where the hollow guide shaft member (80) is positioned at the spinning position.

5. A spinning machine (1) comprising:

the air-jet spinning device (17) as claimed in any one of Claims 1 to 4;
a drafting device (6) adapted to draft fibers and supply the drafted fibers to the air-jet spinning device (17); and
a winding device (12) adapted to wind a yarn (Y) supplied from the air-jet spinning device (17) to form a package (P).

Patentansprüche

1. Luftstrom-Spinneinrichtung (17), umfassend:

einen Düsenblock (70), der eine Spinnkammer (73) beinhaltet, in welcher Fasern durch eine Wirkung eines sich drehenden Luftstroms gedreht werden, und eine erste Düse (74) beinhaltet, die dazu angepasst ist, einen Durchgang von Luft zu ermöglichen, die in die Spinnkammer (73) eingeblasen wird, um darin den sich drehenden Luftstrom zu generieren;
ein hohles Führungsschaftelement (80), das einen Durchgang (81) beinhaltet, durch welchen die Fasern, die in der Spinnkammer (73) verdreht werden, nach außen geführt werden, und eine zweite Düse (84) beinhaltet, die dazu angepasst ist, einen Durchgang von Luft zu ermöglichen, die in den Durchgang (81) eingeblasen wird; und
eine Steuerung (10), die dazu angepasst ist, eine Steuerung durchzuführen, sodass in einem Intervall zwischen einer Spinnbetätigungszeit und einer Spinnbetätigungsstartzeit das hohle Führungsschaftelement (80) sich von einer Spinnposition, die eine Position des hohlen Führungsschaftelements (80) während einer Spinnbetätigung ist, zu einer getrennten Position bewegt, die weiter von der Spinnkammer (73) als die Spinnposition entfernt ist, und Luft von der zweiten Düse (84) in den Durchgang (81) in einem Zustand eingeblasen wird, in dem das hohle Führungsschaftelement (80) in der getrennten Position positioniert ist und ein Auslass (83) des Durchgangs (81) nach außen geöffnet ist,

dadurch gekennzeichnet, dass die Steuerung (10) dazu angepasst ist, eine Steuerung durchzuführen, sodass in dem Intervall zwischen der Spinnbetätigungszeit und der Spinnbetätigungsstartzeit das hohle Führungsschaftelement von der getrennten Position zu einer nahen Position, die näher an der Spinnkammer (73) als die getrennte Position ist, bewegt wird und danach zu der getrennten Position in einem Zustand bewegt wird, in dem Luft in die Spinn-

kammer (73) von der ersten Düse (74) eingeblasen wird,
und wobei die nahe Position weiter von der Spinnkammer (73) als die Spinnposition entfernt ist.

2. Luftstrom-Spinneinrichtung (17) nach Anspruch 1, wobei die Steuerung (10) dazu angepasst ist eine Steuerung auszuführen, sodass in dem Intervall zwischen der Spinnbetätigungszeit und der Spinnbetätigungsstartzeit Luft von der ersten Düse (74) in die Spinnkammer (73) eingeblasen wird, nachdem Luft von der zweiten Düse (84) in den Durchgang (81) eingeblasen wurde.

3. Luftstrom-Spinneinrichtung (17) nach Anspruch 1 oder 2, ferner umfassend ein Sammelement (77), das dazu angepasst ist, die Fasern, die sich an einem Einlass (82) des Durchgangs (81) angesammelt haben, zu sammeln, und an einer Position weiter von der Spinnkammer (73) entfernt als die Spinnposition angeordnet ist.

4. Luftstrom-Spinneinrichtung (17) nach einem der Ansprüche 1-3, wobei die Steuerung (10) dazu angepasst ist, eine Steuerung durchzuführen, sodass zu einer Spinnbetätigungsstartzeit Luft von der zweiten Düse (84) in den Durchgang (81) in einem Zustand eingeblasen wird, in dem das hohle Führungsschaftelement (80) an der Spinnposition positioniert ist.

5. Spinnvorrichtung (1), umfassend:

Luftstrom-Spinneinrichtung (17) nach einem der Ansprüche 1-4;
Streckeinrichtung (6), die dazu angepasst ist, Fasern zu strecken und die gestreckten Fasern der Luftstrom-Spinneinrichtung (17) zuzuführen; und
eine Wickeleinrichtung (12), die dazu angepasst ist, ein Garn (Y), das von einer Luftstrom-Spinneinrichtung (17) zugeführt wird, zu wickeln, um ein Bündel (P) auszubilden.

Revendications

1. Dispositif de filage à jet d'air (17) comprenant :

un porte-buse (70) qui comporte une chambre de filage (73) où des fibres sont tourbillonnées par une action d'un courant d'air tourbillonnant et une première buse (74) adaptée pour permettre le passage d'air qui est injecté dans la chambre de filage (73) pour y générer le courant d'air tourbillonnant ;
un élément formant arbre de guidage creux (80) qui comporte un passage (81) à travers lequel les fibres, qui sont tourbillonnées dans la cham-

bre de filage (73) sont guidées vers l'extérieur et une seconde buse (84) adaptée pour permettre le passage d'air qui est injecté dans le passage (81) ; et

une unité de commande (10) adaptée pour exercer une commande de sorte que, dans une période entre un instant de fin d'opération de filage et un instant de début d'opération de filage, l'élément formant arbre de guidage creux (80) se déplace depuis une position de filage qui est une position de l'élément formant arbre de guidage creux (80) pendant une opération de filage, jusqu'à une position séparée qui est plus loin de la chambre de filage (73) que la position de filage, et de l'air est injecté en provenance de la seconde buse (84) dans le passage (81), dans un état où l'élément formant arbre de guidage creux (80) est positionné au niveau de la position séparée et une sortie (83) du passage (81) est ouverte vers l'extérieur,

caractérisé en ce que l'unité de commande (10) est adaptée pour exercer une commande de sorte que, dans la période entre l'instant de fin d'opération de filage et l'instant de début d'opération de filage, l'élément formant arbre de guidage creux (80) est déplacé de la position séparée à une position de proximité qui est plus près de la chambre de filage (73) que la position séparée, et de nouveau déplacé vers la position séparée, dans un état où de l'air est injecté dans la chambre de filage (73) depuis la première buse (74), et dans lequel la position de proximité est plus loin de la chambre de filage (73) que la position de filage.

2. Dispositif de filage à jet d'air (17) selon la revendication 1, dans lequel l'unité de commande (10) est adaptée pour exercer une commande de sorte que, dans la période entre l'instant de fin d'opération de filage et l'instant de début d'opération de filage, de l'air est injecté depuis la première buse (74) dans la chambre de filage (73) après que l'air a été injecté depuis la seconde buse (84) dans le passage (81).

3. Dispositif de filage à jet d'air (17) selon l'une quelconque des revendications 1 à 2, comprenant en outre un élément de collecte (77) adapté pour collecter les fibres accumulées au niveau d'une entrée (82) du passage (81) et qui est agencé au niveau d'une position plus loin de la chambre de filage (73) que la position de filage.

4. Dispositif de filage à jet d'air (17) selon l'une quelconque des revendications 1 à 3, dans lequel l'unité de commande (10) est adaptée pour exercer une commande de sorte que, à l'instant du début d'opération de filage, de l'air est injecté depuis la seconde buse (84) dans le passage (81), dans un état où l'élé-

ment formant arbre de guidage creux (80) est positionné au niveau de la position de filage.

5. Machine de filage (1) comprenant :

le dispositif de filage à jet d'air (17) selon l'une quelconque des revendications 1 à 4;
un dispositif d'étirage (6) adapté pour étirer des fibres et amener les fibres étirées au dispositif de filage à jet d'air (17) ; et
un dispositif d'enroulement (12) adapté pour enrouler un fil (Y) fourni en provenance du dispositif de filage à jet d'air (17) pour former un emballage (P).

FIG.1

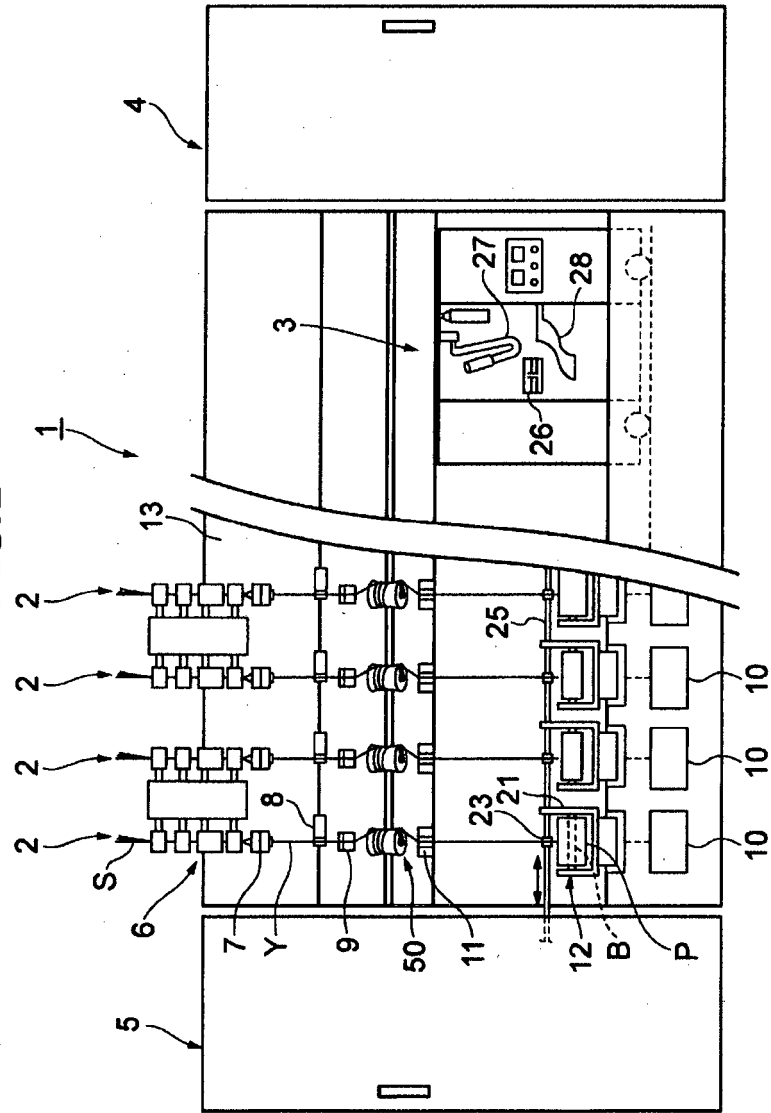


FIG.2

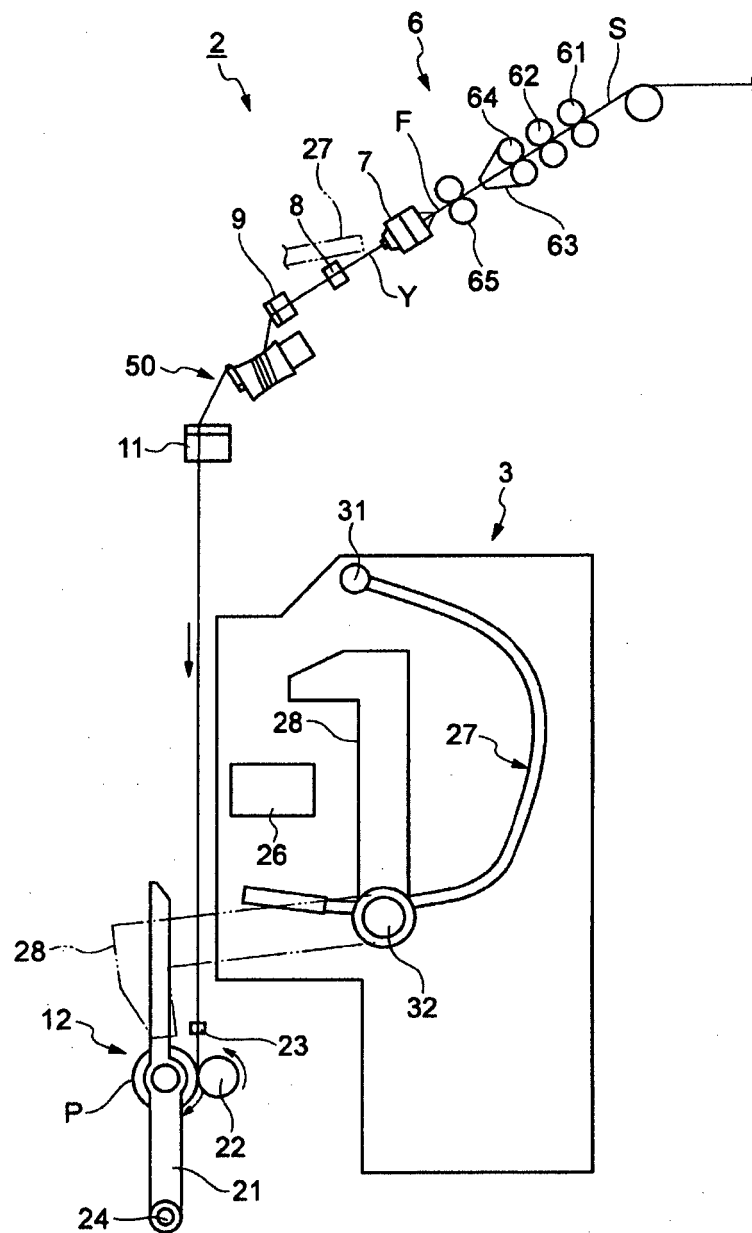


FIG.3

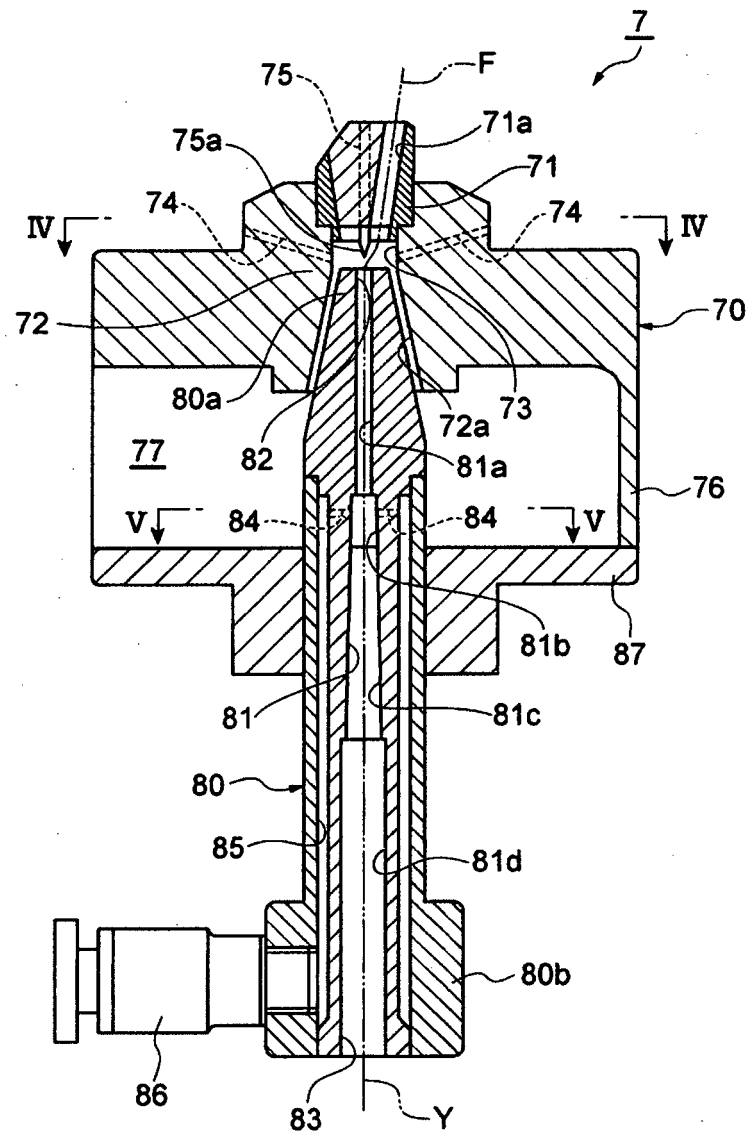


FIG.4

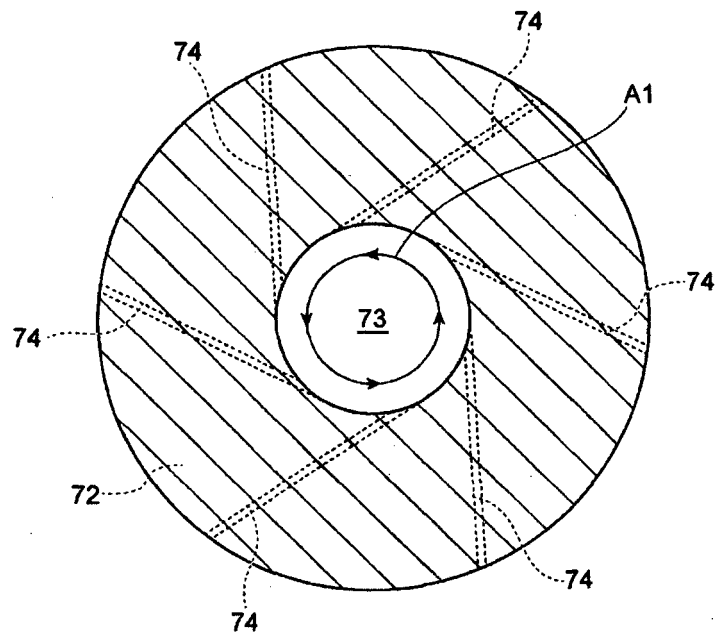


FIG.5

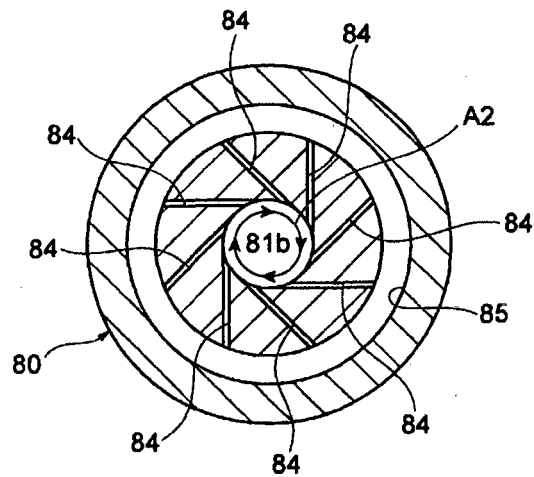
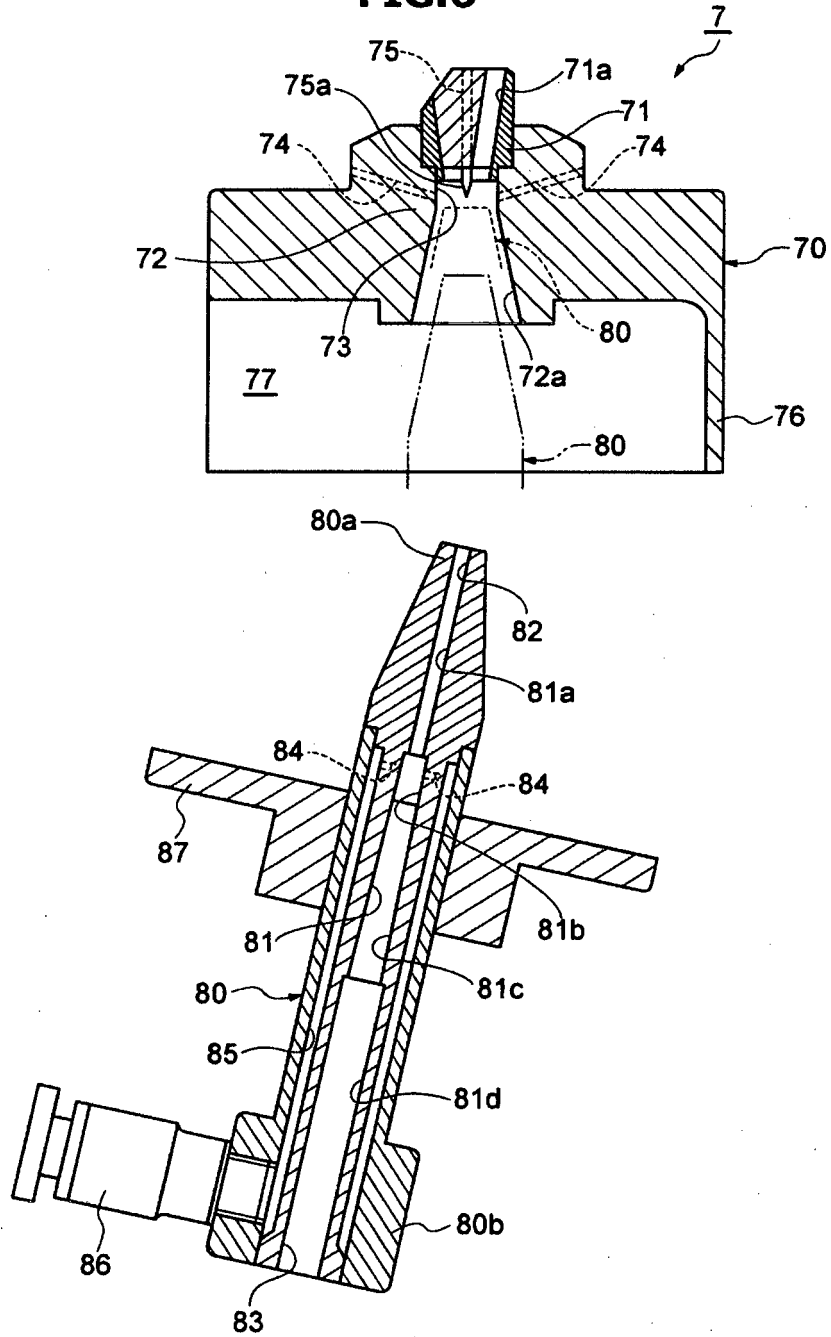


FIG.6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H6287824 A [0002]
- JP 2001040532 A [0002]
- JP 2001064831 A [0002]
- JP 2001073236 A [0004]
- US 2007125062 A1 [0005]
- EP 1072702 A2 [0006]