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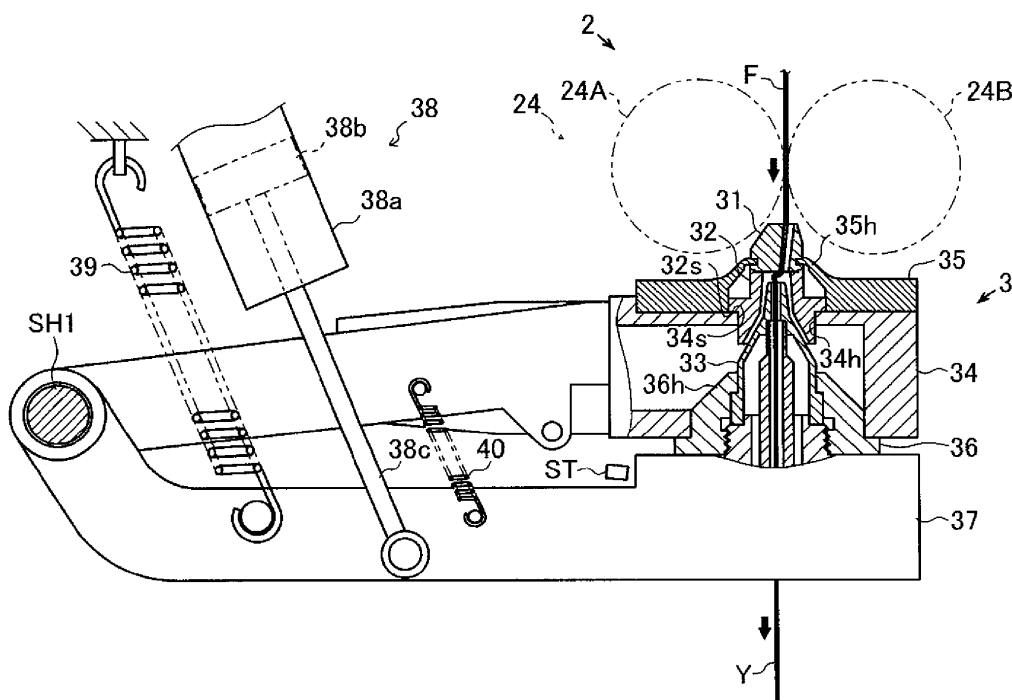
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(54) **Spinning unit and spinning machine**

(57) A spinning unit includes a drafting section (2) adapted to draft a fiber bundle (F), a spinning section (3) adapted to twist the fiber bundle (F) drafted by the drafting section (2), a pneumatic actuator (38) adapted to move

the spinning section (3) in a direction away from the drafting section (2), and an elastic member (39) adapted to move the spinning section (3) in a direction towards the drafting section (2).

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a spinning unit and a spinning machine.

2. Description of the Related Art

[0002] Conventionally, there is known a spinning unit adapted to draft a fiber bundle and twist the drafted fiber bundle to produce a spun yarn (see e.g., Japanese Unexamined Patent Publication No. 2011-99192). Such a spinning unit includes a drafting section adapted to draft the fiber bundle, and a spinning section adapted to twist the drafted fiber bundle.

[0003] The drafting section includes a plurality of draft roller pairs. Each of the draft roller pairs includes a bottom roller, which is rotated via a power mechanism, and a top roller, which makes contact with the bottom roller and rotates accompanying rotation of the bottom roller. Since the bottom rollers and the top rollers rotate while gripping the fiber bundle, the draft roller pairs can feed the fiber bundle. The drafting section can draft the fiber bundle by a difference in a feeding speed of the draft roller pairs adjacent to one another.

[0004] The spinning section includes a fiber guide adapted to guide the fiber bundle into a spinning chamber, a nozzle block adapted to guide air to the spinning chamber, and a spindle adapted to guide the fiber bundle twisted in the spinning chamber to outside. Since the air guided to the spinning chamber generates whirling air flow in the spinning chamber, the spinning section can twist the fiber bundle.

[0005] In the above-described spinning unit, the spinning section is arranged in proximity to the drafting section. Accordingly, the fiber bundle can be twisted by the spinning section before the fiber bundle drafted by the drafting section is disturbed. A gap formed between the drafting section and the spinning section inevitably becomes narrow. Maintenance or the like is carried out by moving the spinning section away from the drafting section. Thus, a known spinning unit is provided with a pneumatic actuator adapted to move the spinning section (see e.g., Japanese Unexamined Patent Publication No. 2011-38210).

[0006] However, in the spinning unit capable of moving the spinning section using the pneumatic actuator, properties of the spun yarn may be changed due to an operation failure of the pneumatic actuator (a contraction failure due to air leakage or the like). Specifically, when a position of the spinning section with respect to the drafting section is displaced or when a position of the spindle or the like of the spinning section is displaced due to the operation failure of the pneumatic actuator, the properties of the spun yarn may be changed.

BRIEF SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a spinning unit in which a spinning section can be moved by a pneumatic actuator when carrying out maintenance or the like, and a position of a spinning section with respect to a drafting section and/or a position of a spindle or the like of the spinning section is not displaced when producing a spun yarn.

[0008] According to a first aspect of the invention, a spinning unit is adapted to draft a fiber bundle and twist the drafted fiber bundle to produce a spun yarn. The spinning unit includes a drafting section adapted to draft a fiber bundle, and a spinning section adapted to twist the drafted fiber bundle. The spinning unit also includes a pneumatic actuator and an elastic member. The pneumatic actuator is adapted to move the spinning section in a direction away from the drafting section. The elastic member is adapted to move the spinning section in a direction towards the drafting section.

[0009] A second aspect of the invention relates to the spinning unit according to the first aspect. The spinning section of the present embodiment includes a fiber guide adapted to guide the fiber bundle into a spinning chamber, a nozzle block adapted to guide air to the spinning chamber, a spindle adapted to guide the fiber bundle twisted in the spinning chamber to outside, a nozzle holder adapted to support the fiber guide and the nozzle block, and a spindle holder adapted to support the spindle. The pneumatic actuator is adapted to move the spindle holder in the direction away from the drafting section. The elastic member is adapted to move the spindle holder in the direction towards the drafting section.

[0010] A third aspect of the invention relates to the spinning unit according to the first or second aspect. The drafting section of the present embodiment includes a plurality of draft roller pairs adapted to feed the fiber bundle. The pneumatic actuator is adapted to move the spinning section in a direction away from a draft roller pair located most downstream in a drafting direction of the fiber bundle. The elastic member is adapted to move the spinning section in a direction towards the draft roller pair.

[0011] A fourth aspect of the invention relates to the spinning unit according to any one of the first to third aspects. The elastic member of the present embodiment is a spring.

[0012] A fifth aspect of the invention relates to the spinning unit according to any one of the first to fourth aspects. The spinning unit according to the embodiment of the present invention further includes a holding section adapted to hold the spinning section at a position located away from the drafting section.

[0013] A sixth aspect of the invention relates to the spinning unit according to the fifth aspect. The spinning section of the present embodiment is provided with a pin. The holding section of the present embodiment includes a hook to be hooked on the pin and an urging member adapted to urge the hook in a direction in which the hook

is released from the pin. Under a state in which the hook is hooked on the pin, when the spinning section is moved in the direction away from the drafting section, the hook is released from the pin by the urging member.

[0014] A seventh aspect of the invention relates to a spinning machine including a plurality of spinning units according to any one of the first to sixth aspects.

[0015] According to the first aspect, when carrying out the maintenance or the like, the spinning section can be moved away from the drafting section by the pneumatic actuator. Thus, the maintenance or the like can be easily carried out. Furthermore, when producing the spun yarn, the spinning section can be urged towards the drafting section by the elastic member. Thus, the position of the spinning section with respect to the drafting section can be prevented from being displaced, and properties of the spun yarn can be stabilized.

[0016] According to the second aspect, when carrying out the maintenance or the like, since the spindle holder can be moved by the pneumatic actuator, the maintenance or the like can be easily carried out. Furthermore, when producing the spun yarn, the spindle holder can be urged towards the drafting section by the elastic member. Thus, the position of the spindle with respect to the drafting section can be prevented from being displaced, and the properties of the spun yarn can be stabilized.

[0017] According to the third aspect, accuracy is required on a distance between the draft roller pair arranged most downstream in the drafting direction and the spinning section when producing the spun yarn. Since the distance between the draft roller pair arranged most downstream in the drafting direction and the spinning section can be managed at high accuracy, the properties of the spun yarn can be stabilized.

[0018] According to the fourth aspect, since the spinning section is reliably urged in the direction towards the drafting section by the spring, the position of the spinning section with respect to the drafting section can be prevented from shifting and the properties of the spun yarn can be stabilized. Furthermore, since the spinning section is reliably urged in the direction towards the drafting section by the spring, the position of the spinning section with respect to the drafting section can be prevented from being displaced, and the properties of the spun yarn can be stabilized.

[0019] According to the fifth aspect, the spinning section is held by the holding section at the position located away from the drafting section. Thus, for example, workability in replacing the bottom roller of the drafting section can be improved.

[0020] According to the sixth aspect, under a state in which the spinning section is held by the holding section, when the spinning section is moved in the direction away from the drafting section, the spinning section is released from the holding section by the urging member. Thus, an operation procedure in producing the spun yarn can be simplified.

[0021] According to the seventh aspect, the spinning

machine has satisfactory maintainability, and the spun yarn having stable properties can be produced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a view illustrating an overall configuration of a spinning unit;

FIG. 2 is a view illustrating a partial structure of a spinning section;

FIG. 3 is a view illustrating an overall structure of the spinning section;

FIG. 4 is a view illustrating a state in which the spinning section is moved away from the drafting section;

FIG. 5 is a view illustrating a state in which a spindle holder is moved away from the nozzle holder;

FIG. 6 is a view illustrating a state in which the spindle holder is moved towards the nozzle holder;

FIG. 7 is a view illustrating a state in which the spinning section is moved towards the drafting section;

FIG. 8 is a view illustrating a state in which the spinning section is held at a position located away from the drafting section; and

FIG. 9 is a view illustrating a state in which holding of the spinning section is released.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] First, an overall configuration of a spinning unit 100 will be briefly described. Black arrows illustrated in FIG. 1 indicate a feeding direction of a fiber bundle F and a spun yarn Y. The spinning unit 100 is a spinning machine adapted to produce the spun yarn Y from the fiber bundle F to form a package P. The spinning unit 100 includes a sliver supplying section 1, a drafting section 2, a spinning section 3, a defect detecting section 4, a tension stabilizing section 5, and a winding section 6 along the feeding direction of the fiber bundle F and the spun yarn Y.

[0024] The sliver supplying section 1 is adapted to supply the fiber bundle F (a sliver) to the drafting section 2. The sliver supplying section 1 includes a sliver case 11 and a sliver guide (not illustrated). The fiber bundle F accumulated in the sliver case 11 is guided by the sliver guide to the drafting section 2.

[0025] The drafting section 2 drafts the fiber bundle F to make a thickness of the fiber bundle F uniform. The drafting section 2 includes four sets of draft roller pairs 21, 22, 23, and 24, i.e., the back roller pair 21, the third roller pair 22, the middle roller pair 23, and the front roller pair 24, along the feeding direction of the fiber bundle F. The draft roller pairs 21, 22, 23, and 24 respectively include bottom rollers 21A, 22A, 23A, and 24A adapted to rotate via a power mechanism (not illustrated), and top rollers 21B, 22B, 23B, and 24B adapted to make contact with the bottom rollers 21A, 22A, 23A, and 24A and rotate

accompanying rotation of the bottom rollers 21A, 22A, 23A, and 24A. Apron bands 23C and 23C are wound around the bottom roller 23A and the top roller 23B, respectively. Since the bottom rollers 21A, 22A, 23A (23C), and 24A and the top rollers 21B, 22B, 23B (23C), and 24B rotate while gripping the fiber bundle F, the draft roller pairs 21, 22, 23, and 24 can feed the fiber bundle F. The drafting section 2 can thus draft the fiber bundle F by a difference in the feeding speed of the draft roller pairs 21, 22, 23, and 24 adjacent to one another.

[0026] The spinning section 3 twists the drafted fiber bundle F to produce the spun yarn Y. The spinning section 3 is arranged in proximity to the drafting section 2. The spinning section 3 can produce the spun yarn Y from the appropriately drafted fiber bundle F. A structure of the spinning section 3 will be described later.

[0027] The defect detecting section 4 detects a defective part of the produced spun yarn Y. Specifically, the defect detecting section 4 irradiates the spun yarn Y with a light emitting diode as a light source (not illustrated), and detects a reflected light quantity from the spun yarn Y. The defect detecting section 4 is connected to a control section (not illustrated) via an analyzer (not illustrated). The control section can determine a presence or an absence of the defective part based on a detection signal from the defect detecting section 4. In addition to abnormalities in which a portion of the spun yarn Y is too thick (a thick yarn) or too thin (a thin yarn), the defective part of the spun yarn Y includes foreign substances contained in the spun yarn Y. Instead of the optical sensor according to the present embodiment, a capacitance sensor can be adopted as the defect detecting section 4.

[0028] The tension stabilizing section 5 is adapted to appropriately maintain and stabilize a tension applied to the spun yarn Y. The tension stabilizing section 5 includes an unwinding member 51 and a roller 52. The unwinding member 51 rotates with the roller 52 when the tension applied to the spun yarn Y is low, and winds the spun yarn Y around the roller 52. The unwinding member 51 rotates independently from the roller 52 when the tension applied to the spun yarn Y is high, and unwinds the spun yarn Y wound around the roller 52. Thus, the tension stabilizing section 5 can appropriately maintain and stabilize the tension applied to the spun yarn Y.

[0029] The winding section 6 is adapted to form the package P by winding the spun yarn Y. The winding section 6 includes a driving roller 61 and a cradle (not illustrated). The driving roller 61 rotates a bobbin B rotatably gripped by the cradle. The winding section 6 can form the package P by winding the spun yarn Y. The winding section 6 traverses the spun yarn Y by a traversing device (not illustrated).

[0030] The overall configuration of the spinning unit 100 according to one embodiment of the present invention has been described above. However, as long as the spinning section 3, which is a characteristic section of the spinning unit 100, is provided, other configurations may be appropriately changed. That is, as long as the

spinning section 3, which is the characteristic section of the spinning unit 100, is provided, the sliver supplying section 1, the drafting section 2, the defect detecting section 4, the tension stabilizing section 5, the winding section 6, and other configurations and arrangements are not limited.

[0031] Next, a structure of the spinning section 3 will be described. In FIG. 2, black arrows indicate a feeding direction of the fiber bundle F and the spun yarn Y, and white arrows indicate a flowing direction of the supplied air.

[0032] The spinning section 3 twists the fiber bundle F guided to a spinning chamber SC to produce the spun yarn Y. The spinning section 3 includes a fiber guide 31, a nozzle block 32, and a spindle 33.

[0033] The fiber guide 31 is one member constituting the spinning chamber SC. The fiber guide 31 guides the fiber bundle F drafted by the drafting section 2 into the spinning chamber SC. Specifically, the fiber guide 31 guides the fiber bundle F into the spinning chamber SC through a fiber passage 31h connected to the spinning chamber SC.

[0034] The nozzle block 32 is a further member constituting the spinning chamber SC. The nozzle block 32 guides air supplied from an air supplying source (not illustrated) to the spinning chamber SC. Specifically, the nozzle block 32 guides the air to the spinning chamber SC through air holes 32a connected to the spinning chamber SC. Since the air holes 32a are connected to the spinning chamber SC such that the air ejected from each of the air holes 32a into the spinning chamber SC flows in the same direction in the spinning chamber SC, the whirling airflow is generated in the spinning chamber SC.

[0035] The spindle 33 is one member constituting the spinning chamber SC. The spindle 33 guides the fiber bundle F twisted in the spinning chamber SC, that is, the spun yarn Y to outside the spinning chamber SC. Specifically, the spindle 33 guides the spun yarn Y to outside the spinning chamber SC through a fiber passage 33h connected to the spinning chamber SC.

[0036] The spinning chamber SC will be more specifically described. The spinning chamber SC is a space surrounded by the fiber guide 31, the nozzle block 32, and the spindle 33. Specifically, the spinning chamber SC is a space surrounded by a substantially conical spindle 33 inserted from one side and the fiber guide 31 attached to the other side with respect to a substantially conical through-hole 32t provided in the nozzle block 32.

[0037] The spinning chamber SC is divided into a space SC1 formed between the fiber guide 31 and the spindle 33, and a space SC2 formed between the nozzle block 32 and the spindle 33. In the space SC1, a trailing end of the fibers constituting the fiber bundle F is reversed by the whirling airflow (see chain double dashed lines in the drawing). In the space SC2, the trailing end of the reversed fibers is whirled by the whirling airflow (see chain double dashed lines in the drawing). The fibers

whirled by the whirling airflow are sequentially wound around fibers at a center portion. In this manner, the spinning section 3 can twist the fiber bundle F.

[0038] The fiber guide 31 of the spinning section 3 is provided with a needle 31n. The needle 31n guides the fiber bundle F to the fiber passage 33h, and prevents the twist of the fiber bundle F from being transmitted upstream. However, the needle 31n may be omitted. In this case, the spinning section 3 realizes a function of the needle 31n with a downstream edge of the fiber guide 31.

[0039] FIG. 3 is a view illustrating the overall configuration of the spinning section 3. Black arrows in the drawing indicate a feeding direction of the fiber bundle F and the spun yarn Y.

[0040] The fiber guide 31 and the nozzle block 32 are supported by a nozzle holder 34. Specifically, the fiber guide 31 is assembled to a recess of the nozzle block 32. The nozzle block 32 is inserted to a through-hole 34h of the nozzle holder 34, and supported while a holding surface 32s of the nozzle block 32 and an upper surface 34s of the nozzle holder 34 make contact with one another. The fiber guide 31 and the nozzle block 32 are fixed to the nozzle holder 34 by a nozzle cap 35. A claw portion 35h of the nozzle cap 35 is hooked to the fiber guide 31. The nozzle holder 34 is swingably attached to a supporting shaft SH1.

[0041] The spindle 33 is supported by a spindle holder 37. Specifically, the spindle 33 is supported while being assembled to a projection of the spindle holder 37. The spindle 33 is fixed to the spindle holder 37 by a spindle cap 36. A claw portion 36h of the spindle cap 36 is hooked to the spindle 33. The spindle holder 37 is also swingably attached to the supporting shaft SH1.

[0042] Furthermore, the nozzle holder 34 and the spindle holder 37 are urged in a direction towards one another by a tension spring 40. Thus, the nozzle holder 34 and the spindle holder 37 can be integrally swung by an urging force of the tension spring 40 (see FIG. 4). However, when the nozzle holder 34 makes contact with a stopper ST, to be described later, the tension spring 40 is extended and only the spindle holder 37 is swung (see FIG. 5).

[0043] A pneumatic actuator 38 includes a cylinder 38a, a piston 38b, and a rod 38c. The air supplied from the air supply source (not illustrated) is supplied to the cylinder 38a to slidably move the piston 38b. The rod 38c attached to the piston 38b is slidably moved with the piston 38b to swing the spindle holder 37. In the present embodiment, the rod 38c of the pneumatic actuator 38 extends when the air is supplied to the cylinder 38a, and the spindle holder 37 is swung. That is, the pneumatic actuator 38 swings the spindle holder 37 in a direction away from the drafting section 2 (see FIG. 4 and FIG. 5).

[0044] An elastic member 39 urges the spindle holder 37 in a direction opposite to a direction in which the spindle holder 37 is swung by the pneumatic actuator 38. That is, when the pneumatic actuator 38 is not activated, the elastic member 39 moves the spindle holder 37 in the direction towards the drafting section 2 (see FIG. 6

and FIG. 7).

[0045] With reference to FIG. 4 to FIG. 7, an operation mode of the spinning section 3 will be hereinafter described in detail. In FIG. 4 to FIG. 7, a black arrow indicates a swinging direction of the nozzle holder 34 and the spindle holder 37, and a white arrow indicates an urging direction of the elastic member 39.

[0046] As described above, the pneumatic actuator 38 swings the spindle holder 37 in the direction away from the drafting section 2. In this case, as illustrated in FIG. 4, the nozzle holder 34 is integrally swung with the spindle holder 37 by the urging force of the tension spring 40.

[0047] The spinning unit 100 can move the spinning section 3 away from the drafting section 2 by the pneumatic actuator 38 when carrying out maintenance or the like. Thus, in the spinning unit 100, the maintenance or the like can be easily carried out.

[0048] Specifically, since the spinning unit 100 swings (moves) the spindle holder 37 by the pneumatic actuator 38 when carrying out the maintenance or the like, the nozzle holder 34 is also integrally swung (moved), and the spinning section 3 can be moved away from the drafting section 2. Thus, in the spinning unit 100, the maintenance or the like can be easily carried out.

[0049] The nozzle holder 34 can be swung until making contact with the stopper ST. Therefore, the swinging is restricted when the nozzle holder 34 makes contact with the stopper ST, and the nozzle holder 34 is stopped while making contact with the stopper ST.

[0050] Furthermore, the pneumatic actuator 38 swings the spindle holder 37. In this case, as illustrated in FIG. 5, the tension spring 40 extends, and only the spindle holder 37 is swung. That is, the spindle holder 37 is swung alone in the direction away from the nozzle holder 34.

[0051] The spinning unit 100 can move the spindle 33 away from the fiber guide 31 and the nozzle block 32. Thus, in the spinning unit 100, a replacement operation or the like of the spindle 33 can be easily carried out.

[0052] When the pneumatic actuator 38 is not activated, the elastic member 39 swings the spindle holder 37 in the direction towards the drafting section 2. In this case, as illustrated in FIG. 6, the tension spring 40 contracts, and only the spindle holder 37 is swung. That is, the spindle holder 37 is swung alone in the direction towards the nozzle holder 34.

[0053] Furthermore, the elastic member 39 swings the spindle holder 37. In this case, as illustrated in FIG. 7, the nozzle holder 34 is pushed by the spindle holder 37 to integrally swing with the spindle holder 37.

[0054] The spinning unit 100 can provide the spinning section 3 urged towards the drafting section 2 by the elastic member 39 when producing the spun yarn Y. Thus, the spinning unit 100 can prevent the position of the spinning section 3 with respect to the drafting section 2 from being displaced, and the properties of the spun yarn Y can be stabilized.

[0055] In the spinning unit 100, since the spindle holder 37 is swung (moved) by the elastic member 39 before

producing the spun yarn Y, the nozzle holder 34 is also integrally swung (moved) and the spinning section 3 can be moved towards the drafting section 2. Thus, changes in the position of the spinning section 3 with respect to the drafting section 2 can be prevented, and the properties of the spun yarn Y can be stabilized. Furthermore, since the elastic member 39 always urges the nozzle holder 34 and the spindle holder 37, the position of the spindle 33 or the like of the spinning section 3 can be prevented from being displaced, and the properties of the spun yarn Y produced by the spinning unit 100 can be stabilized.

[0056] In the spinning unit 100, the spinning section 3 can be moved away from or moved towards the front roller pair 24.

[0057] The distance between the front roller pair (the draft roller pair) 24 arranged most downstream in the drafting direction and the spinning section 3 is required to be accurate when producing the spun yarn Y. Thus, the spinning section 3 is moved with respect to the front roller pair (the draft roller pair) 24. The spinning unit 100 can manage the distance between the front roller pair (the draft roller pair) 24 arranged most downstream in the drafting direction and the spinning section 3 at high accuracy, and the properties of the spun yarn Y can be stabilized.

[0058] In the spinning unit 100, the elastic member 39 is a spring. In the spinning unit 100, the tension spring is used, but other types of springs may be used. As long as the elastic member 39 is an elastic body capable of urging the spinning section 3 in the direction towards the drafting section 2, other elastic bodies can be adopted for the elastic member 39.

[0059] Since the spinning unit 100 reliably urges the spinning section 3 in the direction towards the drafting section 2 by the elastic member 39, which is a spring, the position of the spinning section 3 with respect to the drafting section 2 can be prevented from being displaced. Accordingly, the properties of the spun yarn Y produced by the spinning unit 100 can be stabilized. Since the nozzle holder 34 and the spindle holder 37 are reliably urged by the elastic member 39, which is the spring, the position of the spindle 33 and the like of the spinning section 3 can be prevented from being displaced. Accordingly, the properties of the spun yarn Y produced by the spinning unit 100 can be stabilized.

[0060] Next, a description will be made on other characteristics of the spinning unit 100. In FIG. 8 and FIG. 9, black arrows indicate a swinging direction of a holding section 7, and a white arrow indicates a swinging direction of the spinning section 3.

[0061] The spinning unit 100 includes the holding section 7 adapted to hold the spinning section 3 at a position located away from the drafting section 2. The holding section 7 includes a lever 7a and a hook 7b.

[0062] The lever 7a is swingably supported by a supporting shaft SH2 provided on the spindle holder 37. The operator can swing the hook 7b by swinging the lever 7a.

The lever 7a and the hook 7b are integrally formed.

[0063] The hook 7b is swingably supported by the supporting shaft SH2 provided on the spindle holder 37. When the hook 7b is swung with the supporting shaft SH2 as a center, the hook 7b can be hooked on a pin Pi provided on the nozzle holder 34 (see FIG. 8).

[0064] Accordingly, the spinning unit 100 can hold the spinning section 3 at a position located away from the drafting section 2. In the spinning unit 100, for example, the workability in replacing the bottom roller 24A of the drafting section 2 can be improved.

[0065] Furthermore, the holding section 7 according to the present embodiment includes an urging member 7c. The urging member 7c urges the hook 7b in a direction in which the hook 7b is released from the pin Pi. The urging member 7c urges the hook 7b in a direction opposite to the swinging direction in which the hook 7b can be hooked on the pin Pi.

[0066] When the spinning section 3 is swung (moved) in the direction away from the draft roller pair 24, the spinning section 3 is released from the holding section 7 by the urging member 7c (see FIG. 9). In the spinning unit 100, an operation procedure in producing the spun yarn Y is simplified.

[0067] Conventionally, there have been demands on the spinning machine including a plurality of spinning units in which maintainability thereof is improved, and that the spun yarns Y produced by the spinning units have equal quality. By arranging the plurality of the spinning units 100 according to the embodiment of the present invention, the spinning machine can have satisfactory maintenance property, and the spun yarn Y having stable properties can be produced.

[0068] The spinning unit 100 and the spinning machine according to the embodiment of the present invention have been described above, but the present invention is not limited to the above embodiments and various modifications can be made. For example, the spinning unit 100 pulls out the spun yarn Y from the spinning section 3 by the tension stabilizing section 5. However, a delivery roller and a nip roller may be arranged between the spinning section 3 and the tension stabilizing section 5, and the spun yarn Y may be pulled out from the spinning section 3 with such rollers.

[0069] The spinning section 3 may be a pair of air jet nozzles adapted to twist the fiber bundle F in opposite directions, as described in Japanese Unexamined Patent Publication No. 2011-38210. In this case, an upstream air jet nozzle is held by the nozzle holder 34, and a downstream air jet nozzle is held by the spindle holder 37.

Claims

1. A spinning unit comprising:

a drafting section (2) adapted to draft a fiber bundle (F),

- a spinning section (3) adapted to twist the fiber bundle (F) drafted by the drafting section (2), **characterized by**
 a pneumatic actuator (38) adapted to move the spinning section (3) in a direction away from the drafting section (2), and
 an elastic member (39) adapted to move the spinning section (3) in a direction towards the drafting section (2).
2. The spinning unit according to claim 1, wherein the spinning section (3) includes:
- a fiber guide (31) adapted to guide the fiber bundle (F) into a spinning chamber (SC),
 a nozzle block (32) adapted to guide air to the spinning chamber (SC),
 a spindle (33) adapted to guide the fiber bundle (F) twisted in the spinning chamber (SC) to outside,
 a nozzle holder (34) adapted to support the fiber guide (31) and the nozzle block (32), and
 a spindle holder (37) adapted to support the spindle (33),
characterized in that the pneumatic actuator (38) is adapted to move the spindle holder (37) in the direction away from the drafting section (2), and the elastic member (39) is adapted to move the spindle holder (37) in the direction towards the drafting section (2).
3. The spinning unit according to claim 1 or claim 2, wherein the drafting section (2) includes a plurality of draft roller pairs (21, 22, 23, 24) adapted to feed the fiber bundle (F), **characterized in that** the pneumatic actuator (38) is adapted to move the spinning section (3) in a direction away from a draft roller pair (24) located most downstream in a drafting direction of the fiber bundle (F), and the elastic member (39) is adapted to move the spinning section (3) in a direction towards the draft roller pair (24) located most downstream in the drafting direction of the fiber bundle (F).
4. The spinning unit according to any one of claim 1 through claim 3, **characterized in that** the elastic member (39) is a spring.
5. The spinning unit according to any one of claim 1 through claim 4, **characterized by** a holding section (7) adapted to hold the spinning section (3) at a position located away from the drafting section (2).
6. The spinning unit according to claim 5, **characterized in that** the spinning section (3) is provided with a pin (Pi), and the holding section (7) includes a hook (7b) to be hooked on the pin (Pi) and an urging member (7c) adapted to urge the hook (7b) in a direction
- in which the hook (7b) is released from the pin (Pi), wherein under a state in which the hook (7c) is hooked on the pin (Pi), when the spinning section (3) is moved in the direction away from the drafting section (2), the hook (7c) is released from the pin (Pi) by the urging member (7c).
7. The spinning unit according to any one of claim 2 through claim 6, **characterized in that** the spindle (33) and the spindle holder (37) are movable away from the fiber guide (31) and the nozzle block (32) so that the spinning chamber (SC) can be opened.
8. The spinning unit according to claim 7, **characterized in that** the spindle holder (37) and the nozzle holder (34) are each separately pivotable around a common axis (SH1).
9. The spinning unit according to claim 8, **characterized in that** a stopper device (ST) is provided, which holds back the nozzle holder (34) after moving a certain distance from the drafting section (2) so that the pneumatic actuator (38) then only moves the spindle holder (37) further and away from the nozzle holder (34), thus opening the spinning chamber (SC).
10. The spinning unit according to claim 9, **characterized in that** a further elastic member (40) is provided between the nozzle holder (34) and the spindle holder (37) so that the spindle holder (37) is moved towards the nozzle holder (34) when the actuator (38) moves the spinning section (3) towards the drafting section (2), thus closing the spinning chamber (SC).
11. The spinning unit according to claim 10, **characterized in that** the further elastic member (40) is a spring.
12. A spinning machine comprising a plurality of spinning units (100) according to any one of claim 1 through claim 11.

FIG. 1

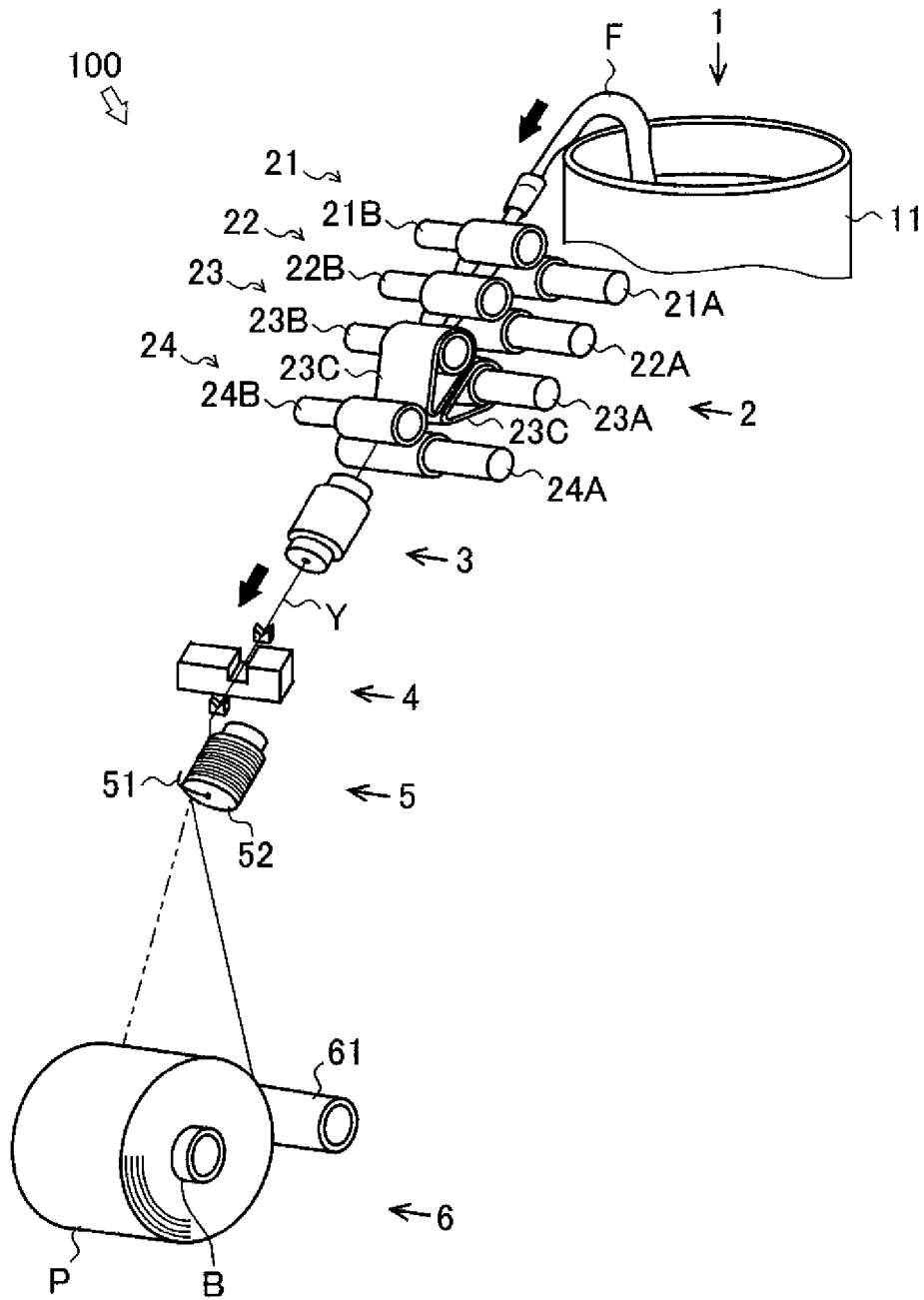


FIG. 2

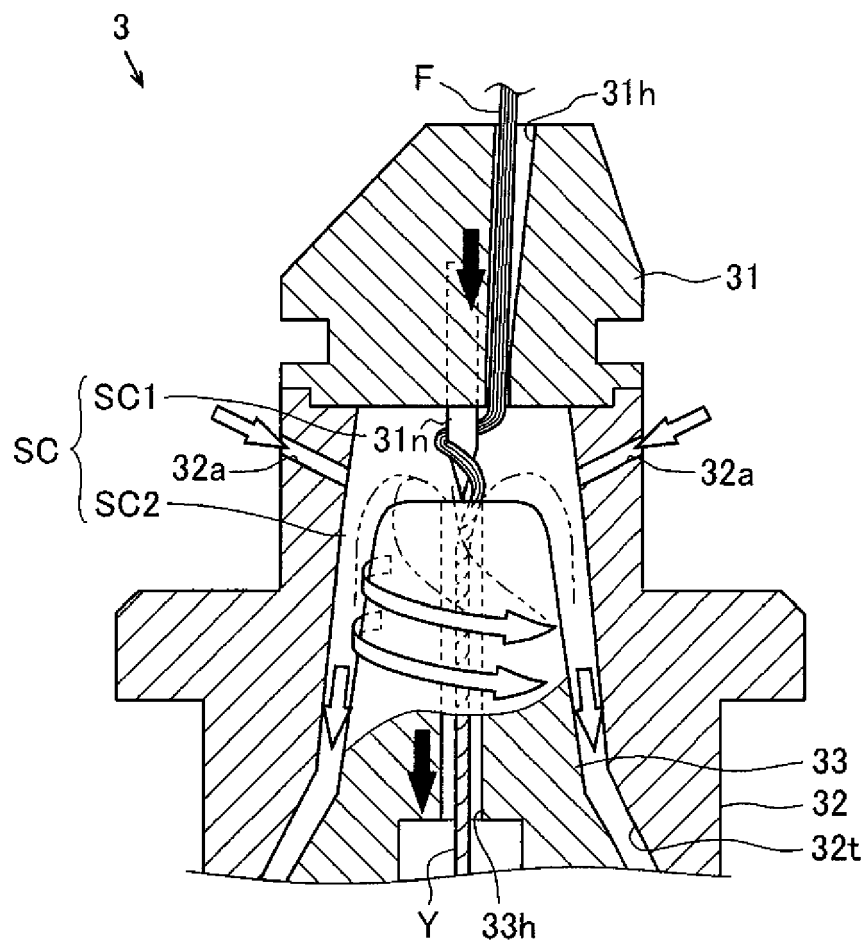


FIG. 3

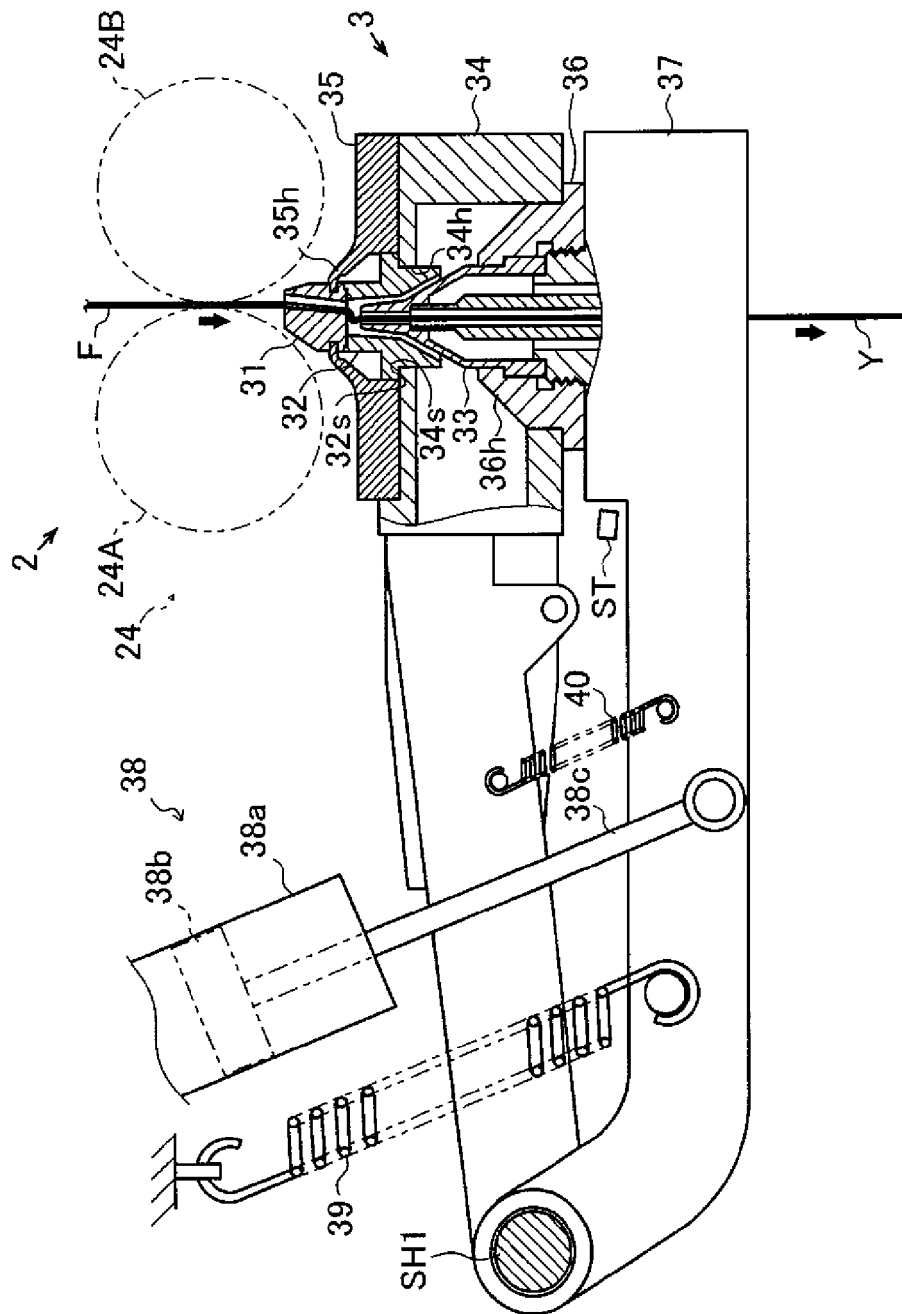
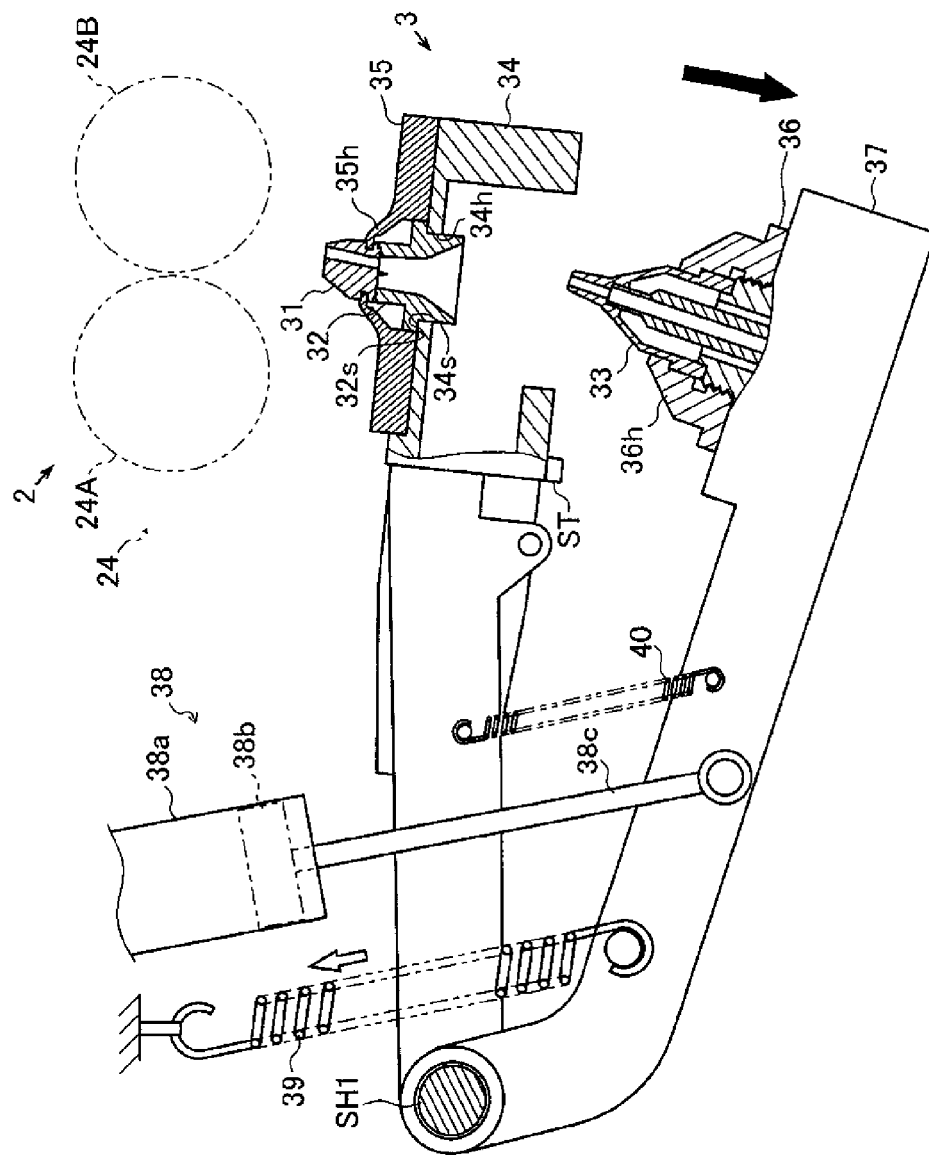


FIG. 5



6.
G
H
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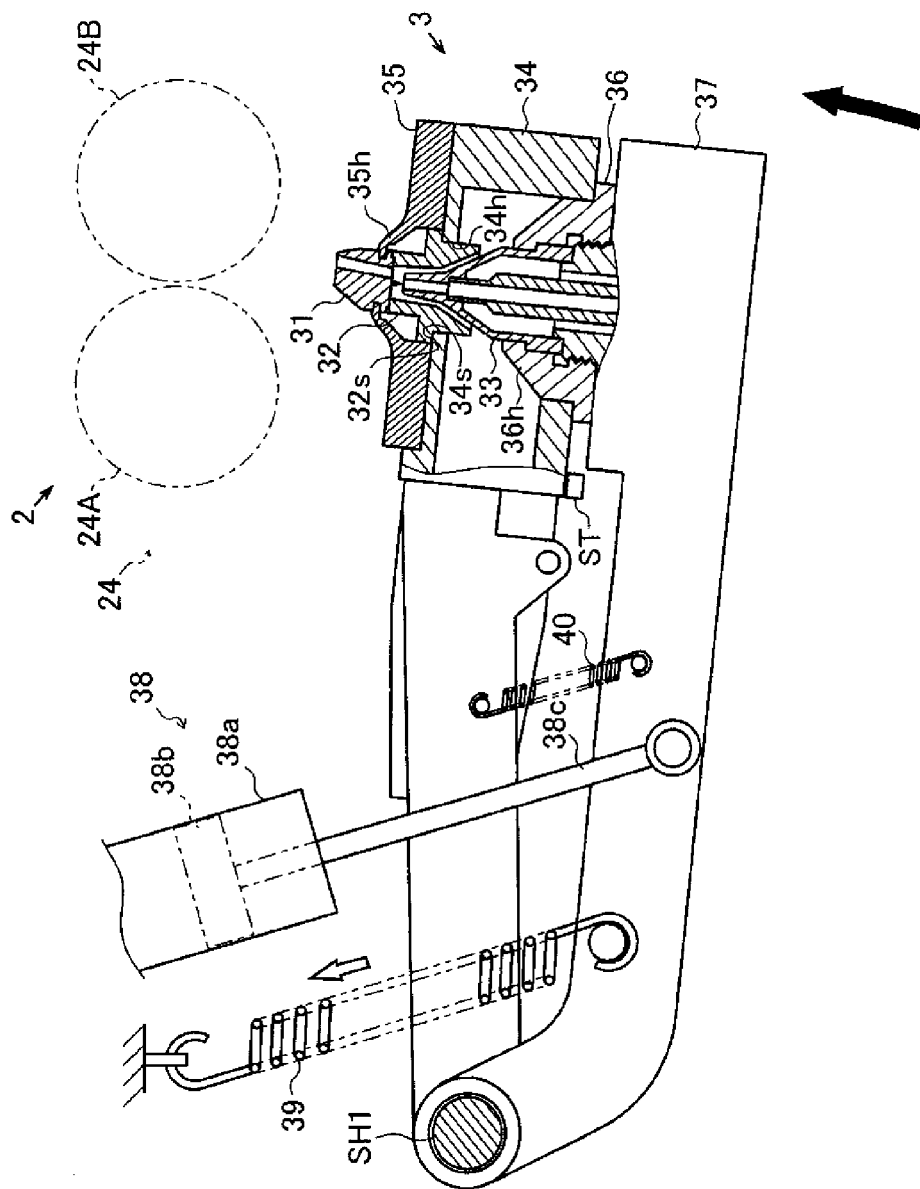
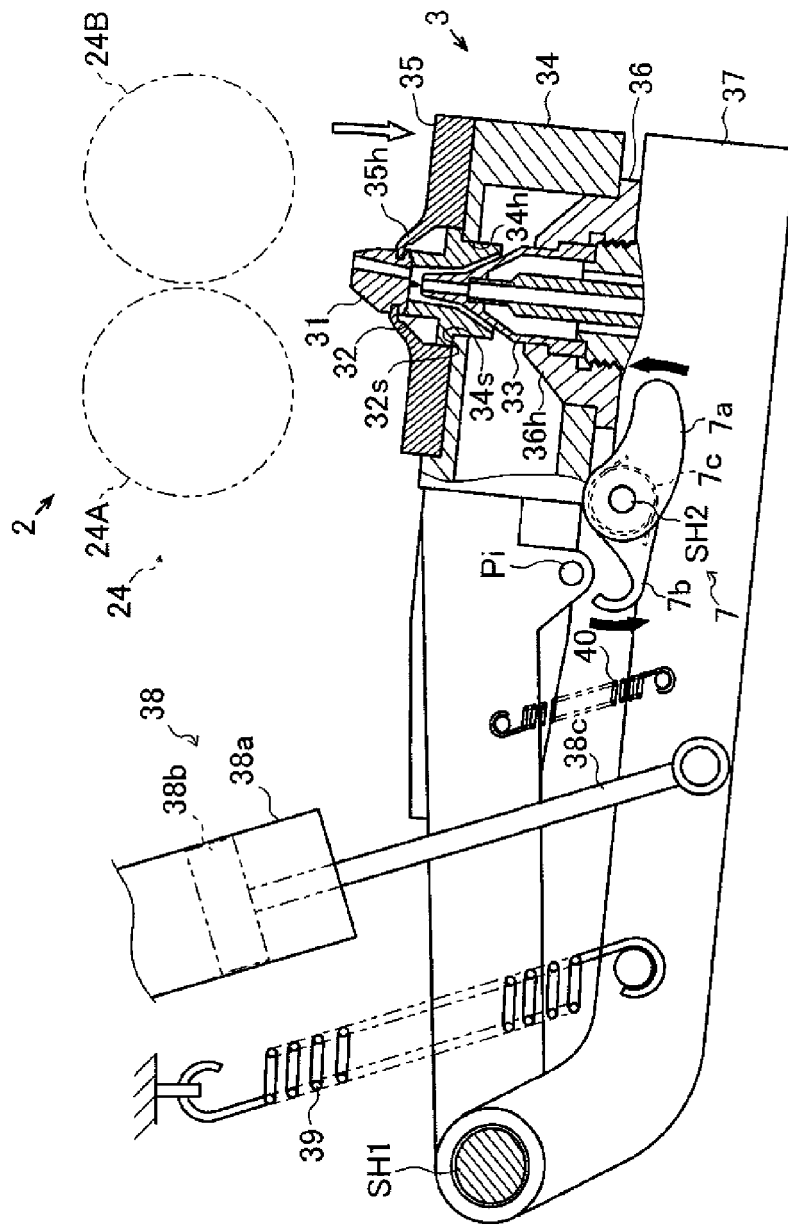


FIG. 9



REFERENCES CITED IN THE DESCRIPTION

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