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(54) **Cleaning device for draft roller, draft device, and textile machine**

(57) A cleaning device 61 for a front bottom roller 28 includes a pad supporting lever 70, a fixed member 90, a first torsion spring, and a pressing lever 31. The pad supporting lever 70 supports a pad body 62. The pad supporting lever 70 is mounted on the fixed member 90 in a manner that the pad supporting lever 70 can be swung. The first torsion spring is mounted on the fixed member 90 and applies force to swing the pad supporting

lever 70 in a direction in which the pad body 62 is made into contact with an outer peripheral surface of the front bottom roller 28. By moving away from the front bottom roller 28, the pressing lever 31 applies force to swing the pad supporting lever 70 in a direction in which the pad body 62 moves away from the outer peripheral surface of the front bottom roller 28.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a cleaning device for removing and cleaning fiber or the like adhered to a draft roller which drafts a fiber bundle.

2. Description of the Related Art

[0002] It is conventionally known that a textile machine such as a spinning machine includes a cleaning device for cleaning an outer peripheral surface of a draft roller by making a pad body to come into contact with the outer peripheral surface of the draft roller. According to one type of such cleaning device, when a yarn breakage or the like occurs during a spinning operation, accompanying receding of a spinning nozzle, which spins a yarn, from a predetermined position, the pad body is automatically moved away from the outer peripheral surface of the draft roller. Japanese Unexamined Patent Application Publication No. 2009-68126 discloses such kind of cleaning device.

[0003] The Japanese Unexamined Patent Application Publication No. 2009-68126 discloses a cleaning device arranged as follow. That is, the cleaning device includes a pad body arranged capable of being made into contact with an outer peripheral surface of a draft roller, and a suction collector arranged so as to face to the outer peripheral surface of the draft roller. A width of the pad body is formed so as to be at least one-half of an average fiber length of a fiber to be drafted, and also to be shorter than or equal to a width of a suction opening of the suction collector. The cleaning device includes a pad supporting member, which is formed of an elastic member and supports the pad body. The pad supporting member is integrally formed from a pad supporting section on which the pad body is mounted, a fixed section fixed to a fixed member, and a driven section driven and pressed in order to move the pad body away from the draft roller. The pad body is pressed against the outer peripheral surface of the draft roller by restoring force of the pad supporting member, which is being elastically-deformed.

[0004] In the structure of the Japanese Unexamined Patent Application Publication No. 2009-68126, during a spinning operation performed by a spinning device, the driven section is pressed by the pad body supporting member, and by such pressing force, the pad body remains to be pressed against the draft roller. However, according to a structure in which the pad body is pressed against the draft roller by using elastic force of the pad supporting member, which is an elastic member, the pad supporting member is likely to be plastically-deformed. As a result, there were cases in which changes occurred in the force for pressing the pad body against the draft roller. When changes occur in the force for pressing the

pad body against the draft roller, the pad body may resonate accompanying rotation of the draft roller, causing negative influence on yarn property. Since a plate-like member is used as an elastic member in the structure of the Japanese Unexamined Patent Application Publication No. 2009-68126, there existed room for improvement from a viewpoint of preventing changes in the pressing force generated by plastic deformation.

10 SUMMARY OF THE INVENTION

[0005] The present invention has been made in view of the above-described problem, and it is an object of the present invention to provide a cleaning device for a draft roller in which a pad body is provided to be made into contact with or to be moved away from the draft roller and pressing force of the pad body against the draft roller is maintained constant.

[0006] According to a first aspect of the present invention, the cleaning device for the draft roller includes a pad supporting member, a fixed member, a torsion spring, and a lever member. The pad supporting member supports the pad body. The pad supporting member is mounted on the fixed member in a manner that the pad supporting member can be swung. The torsion spring is mounted on the fixed member and applies force to swing the pad supporting member in a direction in which the pad body is made into contact with an outer peripheral surface of the draft roller. The lever member can apply force to swing the pad supporting member in a direction in which the pad body is moved away from the outer peripheral surface of the draft roller, by moving away from the draft roller.

[0007] Accordingly, since the pad body is pressed against the draft roller by force of the torsion spring that is unlikely to be plastically-deformed, the pressing force of the pad body against the draft roller can be kept constant for a long period of time. Therefore, since the force for pressing the pad body against the draft roller is stabilized, resonance of the pad body can be prevented, and feeding of the yarn by the draft roller can be stabilized. As a result, generation of variability in yarn property of a spun yarn to be produced can be avoided. In addition, a simple mechanism can be accomplished in which the pad body can be moved away from the draft roller accompanying movement of the lever member away from the draft roller.

[0008] The cleaning device for the draft roller includes a transmission member and a second torsion spring. The transmission member includes a contact section which can be made into contact with the pad supporting member, and a driven section which can be made into contact with the lever member. The transmission member is arranged capable of swinging with respect to the fixed member. One end of the second torsion spring is connected to the transmission member. Another end of the second torsion spring is connected to the pad supporting member. The second torsion spring applies spring force

such that the contact section is pressed against the pad supporting member. The lever member is made into contact with the driven section by moving away from the draft roller, and swings the transmission member. Accompanying the swinging movement of the transmission member, the pad supporting member swings and the pad body moves away from the outer peripheral surface of the draft roller.

[0009] Accordingly, under a state in which movement of the pad supporting member is restricted due to contact with another member or the like, even when force in a direction in which the pad body is moved away from the draft roller is applied to the transmission member, such force can be absorbed by the second torsion spring. In addition, even if force that surpasses the spring force of the second torsion spring is further applied from such a state, the contact section only moves away from the pad supporting member. As described above, under a state in which the movement of the pad supporting member is restricted, even when the lever member moves drastically, excessive force is not directly applied to the pad supporting member. Accordingly, damage of the pad supporting member caused by the movement of the lever member can be effectively prevented.

[0010] It is preferable that the fixed member in the cleaning device for the draft roller has a plurality of positions where the torsion spring can be mounted. Accordingly, pressing force of the pad body applied to the draft roller can be adjusted just by changing the position where the torsion spring is mounted.

[0011] It is preferable that the cleaning device for the draft roller includes a regulating member to regulate swinging movement of the pad supporting member in a direction in which the pad body moves away from the draft roller. Accordingly, even when the lever member moves drastically, the pad supporting member can be prevented from swinging excessively. In addition, when mounting the pad body on the pad supporting body, since a position of the pad supporting member can be fixed by making the pad supporting member to contact with the regulating member, the mounting work can be easily carried out.

[0012] According to a second aspect of the present invention, a draft device includes the above-described cleaning device for the draft roller.

[0013] According to a third aspect of the present invention, a spinning machine includes the above-described draft device. Accordingly, deterioration in yarn property caused by the resonance of the pad body can be suppressed, and quality of spun yarn can be improved.

[0014] The spinning machine includes an apron belt roller, an apron belt shifting member, a mounting member, and a fixed member supporting section. An apron belt is wound around the apron belt roller. The apron belt shifting member is traversed to traverse the apron belt. The apron belt shifting member is mounted on the mounting member. The fixed member supporting section is independent from the mounting member and used to

mount the fixed member.

[0015] Accordingly, local wear on the apron belt caused by running of the yarn can be prevented by traversing the apron belt. In addition, since the apron belt shifting member is mounted on the mounting member which is a different member from the fixing member supporting section on which the fixed member is mounted, influence on the pad body resulting from vibration or the like, which is caused by traversing movement of the apron belt shifting member, can be suppressed effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Fig. 1 is a front view illustrating a general structure of a spinning machine according to an embodiment of the present invention.

[0017] Fig. 2 is a side view illustrating a draft device.

[0018] Fig. 3 is an enlarged side view illustrating a structure of a cleaning device.

[0019] Fig. 4 is an enlarged perspective view illustrating a structure of the cleaning device.

[0020] Fig. 5 is an enlarged perspective view illustrating a main section of a pad supporting mechanism in the cleaning device.

[0021] Fig. 6 is an enlarged side view illustrating a state of the cleaning device when a pad body is moved away from a front bottom roller.

[0022] Fig. 7 is an enlarged side view illustrating a state of the pad supporting mechanism when a transmission lever is moved away from a pad supporting lever.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] Embodiments of the present invention will be described. Fig. 1 illustrates a spinning machine 1 as a textile machine including a plurality of spinning units (yarn processing units) 2 arranged next to one another. As illustrated in Fig. 1, each spinning unit 2 includes a draft device 7, a spinning device 9, a yarn accumulating device 11, and a winding device 12 as main components.

[0024] The draft device 7 is arranged close to an upper end of a frame 6 of the main body of the spinning machine 1. A fiber bundle 8 fed from the draft device 7 is spun by the spinning device 9. After a spun yarn 10 discharged from the spinning device 9 passes through a clearer 52, the spun yarn 10 is delivered to the yarn accumulating device 11. Further, the clearer 52 detects a yarn defect, and cuts such a yarn defect to remove the yarn defect. After passing through the yarn accumulating device 11, the spun yarn 10 is wound by the winding device 12 into a package 45.

[0025] The spinning machine 1 includes a blower box 80 and a motor box 81. The spinning machine 1 includes a yarn splicing cart 3 that can travel in a direction in which the spinning units 2 are arranged next to one another. As illustrated in Fig. 1, the yarn splicing cart 3 of the present embodiment includes a splicer (a yarn joining

device) 43, a suction pipe 44, and suction mouth 46. When a yarn breakage or a yarn cut occurs in one spinning unit 2, the yarn splicing cart 3 travels on a rail 41 fixed to the frame 6 to such a spinning unit 2, and stops in front of such a spinning unit 2. The yarn splicing cart 3 catches a yarn end on the winding device 12 side with the suction mouth 46, and catches a yarn end on the spinning device 9 side with the suction pipe 44. Then, the yarn splicing cart 3 swings each of the suction pipe 44 and the suction mouth 46 to guide the caught yarn end on the spinning device 9 side and the caught yarn end on the winding device 12 side to the splicer 43. The yarn end on the spinning device 9 side and the yarn end on the winding device 12 side guided to the splicer 43 are spliced by the splicer 43. Accordingly, the yarn end on the spinning device 9 side and the yarn end on the winding device 12 side are connected, and a winding operation can be restarted.

[0026] The spinning machine 1 includes a doffing cart (not illustrated in the drawings) for doffing a fully-wound package, and the doffing cart is arranged capable of traveling independently from a yarn splicing cart.

[0027] Fig. 2 is an enlarged side view of the draft device 7, the spinning device 9, and the yarn accumulating device 11. As illustrated in Fig. 2, the draft device 7 includes a plurality of draft rollers for drafting a sliver 13 into the fiber bundle 8. The draft roller includes a top roller and a bottom roller arranged to face one another.

[0028] The top roller includes four draft rollers which are a back roller 14, a third roller 15, a middle roller 16 provided with a top apron belt 17, and a front roller 18. The bottom roller includes four draft rollers which are a back bottom roller 24, a third bottom roller 25, a middle bottom roller (an apron belt roller) 26 provided with a bottom apron belt 27, and a front bottom roller 28. Each of the bottom rollers 24, 25, 26, and 28 are arranged so as to face the top rollers 14, 15, 16, and 18.

[0029] The draft device 7 of the present embodiment includes a cleaning device 61 for removing fiber or the like adhered on the front bottom roller 28. A detailed structure of the cleaning device 61 will be described later.

[0030] In the above structure, the sliver 13 fed to the draft device 7 is drafted into the fiber bundle 8 by the draft rollers and then fed to the spinning device 9. The spinning device 9 performs an air-jet spinning on the fiber bundle 8 fed from the draft device 7. The fiber bundle 8 on which the air-jet spinning has been performed is spun into a spun yarn 10 and fed to the yarn accumulating device 11.

[0031] The yarn accumulating device 11 has a function to draw the spun yarn 10 from the spinning device 9 by applying prescribed tension to the spun yarn 10; a function to prevent a yarn slackening by accumulating the spun yarn 10, which is fed from the spinning device 9 while a yarn splicing operation is performed by the yarn splicing cart 3 or the like; and a function to adjust tension such that change in tension on the winding device 12 side is prevented from propagating to the spinning device 9 side. As illustrated in Fig. 2, the yarn accumulating de-

vice 11 includes a yarn accumulating roller 21, a yarn hooking member 22, and an electric motor 23 as main components.

[0032] The yarn hooking member 22 is formed capable of being engaged with (hooking) the spun yarn 10. The yarn hooking member 22 is supported relatively rotatable with respect to the yarn accumulating roller 21, and is also arranged so as to generate torque which resists the yarn hooking member 22 to rotate relatively with respect to the yarn accumulating roller 21 with an appropriate urging mechanism. The yarn hooking member 22 rotates accompanying rotation of the yarn accumulating roller 21 by the resistance torque. Accordingly, the yarn hooking member 22 and the yarn accumulating roller 21 rotate integrally. When force that surpasses the resistance torque is added to the yarn hooking member 22, the yarn hooking member 22 can rotate relatively with respect to the yarn accumulating roller 21.

[0033] The yarn accumulating roller 21 can accumulate the spun yarn 10 by winding the spun yarn 10 around an outer peripheral surface thereof. The yarn accumulating roller 21 is rotationally driven by the electric motor 23. In the above structure, when the yarn hooking member 22 engaged with the spun yarn 10 rotates integrally with the yarn accumulating roller 21, the spun yarn 10 is swung around by the yarn hooking member 22, and is guided to and wound around the outer peripheral surface of the yarn accumulating roller 21. The spun yarn 10 wound around the yarn accumulating roller 21 is fed to the leading end of the yarn accumulating roller 21 by a new spun yarn 10 which is wound in series around the base end of the yarn accumulating roller 21. The spun yarn 10 is then drawn from the leading end of the yarn accumulating roller 21, passes through the yarn hooking member 22, and then is fed to the winding device 12.

[0034] Next, a description will be made on a tension adjusting function of the yarn accumulating device 11. Under a state in which the spun yarn 10 is wound around the yarn accumulating roller 21, when force is applied to pull the spun yarn 10 engaged with the yarn hooking member 22 towards a downstream side, force to attempt to rotate the yarn hooking member 22 is added to the yarn hooking member 22 so as to unwind the spun yarn 10 from the leading end of the yarn accumulating roller 21. Accordingly, if the yarn tension at the downstream of the yarn accumulating device 11 (yarn tension between the yarn accumulating device 11 and the winding device 12) is strong enough to surpass the resistance torque, the yarn hooking member 22 rotates independently from the yarn accumulating roller 21, and the spun yarn 10 is gradually unwound from the leading end of the yarn accumulating roller 21 via the yarn hooking member 22.

[0035] Meanwhile, when the yarn tension at the downstream of the yarn accumulating device 11 is not strong enough to surpass the resistance torque, the yarn hooking member 22 rotates integrally with the yarn accumulating roller 21. In such a case, the yarn hooking member 22 prevents the spun yarn 10 from being unwound from

the leading end of the rotating yarn accumulating roller 21.

[0036] As described above, by unwinding the yarn when the downstream yarn tension increases and by stopping the yarn from being unwound when the yarn tension decreases (when the yarn is likely to slacken), the yarn accumulating device 11 can eliminate a yarn slackening and apply appropriate tension.

[0037] Next, by referring to Figs. 3 through 5, a description will be made on the cleaning device 61, which is provided in the draft device 7 for cleaning the front bottom roller 28, and the structure close thereto. Fig. 3 is an enlarged side view illustrating a structure of the cleaning device 61. Fig. 4 is an enlarged perspective view illustrating a structure of the cleaning device 61. Fig. 5 is an enlarged perspective view illustrating the main section of a pad supporting mechanism 63 in the cleaning device 61.

[0038] As illustrated in Fig. 3, the cleaning device 61 includes a pad body 62 arranged capable of making contact with the outer peripheral surface of the front bottom roller 28, the pad supporting mechanism 63 supporting the pad body 62, and a pressing lever (a lever member) 31. The pressing lever 31 is used to move the pad body 62 away from the front bottom roller 28.

[0039] The pad body 62 is formed of soft resin, and is formed in a plate shape with a predetermined thickness as illustrated in Fig. 4. The pad body 62 is formed substantially rectangular, and corners thereof are formed circular (in a smooth curved line). The pad body 62 is formed rectangular with rounded corners, and since corners thereof are not sharp as described above, fiber is prevented from being hooked to and entangled with such corners.

[0040] The pad supporting mechanism 63 is located slightly below the front bottom roller 28. As illustrated in Figs. 3 and 4, the pad supporting mechanism 63 includes a fixed member 90, a pad supporting lever (a pad supporting member) 70, a transmission lever (a transmission member) 71, a first torsion spring 94, and a second torsion spring 95.

[0041] The fixed member 90 is fixed to a fixed frame (a fixed member supporting section) 67 supported by the frame 6 of the spinning machine 1. The fixed member 90 includes a main body 85 and a spring force adjusting section 87. The main body 85 is fixed to the fixed frame 67 with an appropriate mechanism such as a bolt, and supports each section of the pad supporting mechanism 63. The pad supporting lever 70 and the transmission lever 71 are supported by the main body 85 in a manner that the pad supporting lever 70 and the transmission lever 71 can be swung. The pad supporting lever 70 and the transmission lever 71 are supported by the main body 85, with the center of swinging movement thereof faced in a horizontal direction (in a direction parallel to an axial direction of the front bottom roller 28).

[0042] As illustrated in Figs. 4 and 5, the spring force adjusting section 87 is formed at one end of the main

body 85 in the horizontal direction and around a part where the transmission lever 71 is supported. The spring force adjusting section 87 has a plurality of hooking sections 87a for mounting one end of the first torsion spring 94. The hooking sections 87a are arranged at prescribed intervals in a circumferential direction around the part in the fixed member 90 where the transmission lever 71 is supported.

[0043] A coil portion of the first torsion spring 94 is inserted into a swing shaft part of the transmission lever 71. One end of spring wire of the first torsion spring 94 is fixed so as to be hooked to one of a plurality of hooking sections 87a. Another end of the spring wire of the first torsion spring 94 is fixed to the transmission lever 71 side that is supported by the main body 85 in a manner that the transmission lever 71 can be swung. Urging force is applied to the pad supporting lever 70 via the transmission lever 71 by the first torsion spring 94 in a direction in which the pad body 62 moves toward the front bottom roller 28 side.

[0044] Since a plurality of hooking sections 87a are formed on the spring force adjusting section 87 according to the present embodiment, an operator can appropriately select a position to which the first torsion spring 94 is hooked. For example, due to usage over a long period of time, the first torsion spring 94 may be worn out, which may weaken the urging force. Even in such a case, according to the structure of the present embodiment, appropriate urging force can be applied to the transmission lever 71 by shifting (changing) a mounting position of one end of the first torsion spring 94 to strengthen elastic force of the first torsion spring 94. That is, by shifting the mounting position of the first torsion spring 94 so as to increase deformation volume of spring elasticity compared with a present state (in case of degradation over time), the force applied to the transmission lever 71 (the pad supporting lever 70) can be strengthened. Accordingly, pressing force of the pad body 62 against the front bottom roller 28 can be maintained at appropriate force.

[0045] As illustrated in Fig. 4, the transmission lever 71 includes a transmission-lever-side driven section 97 pressed by the pressing lever 31 and a lever contact section (a contact section) 96 which presses the pad supporting lever 70. The transmission-lever-side driven section 97 is formed as a plate member in a tapered arm-shape which projects downwards from the center of swinging movement thereof. The lever contact section 96 is formed as a plate member, which projects from an end face on one side of the transmission-lever-side driven section 97 and is bent towards the pad supporting lever 70 side. Accompanying the swinging movement of the transmission lever 71, the leading end portion of the lever contact section 96 can be made into contact with and press a lower portion of the pad supporting lever 70 (a pad-side driven section 98).

[0046] The pad supporting lever 70 includes a clip supporting section 72, a clip 73, and the pad-side driven section 98. The clip supporting section 72, which is used to

support the clip 73, is substantially formed in an L-shape in the side view of Fig. 3. One end of the clip supporting section 72 is connected to a base (swing shaft part) of the pad supporting lever 70, and the clip 73 is mounted on the other end of the clip supporting section 72. The clip 73 is formed capable of sandwiching and holding the pad body 62. The clip 73 is fixed to the leading end of the clip supporting section 72. The pad-side driven section 98 is formed as a plate member in an arm-shape which projects downwards from the base of the pad supporting lever 70. As illustrated in Figs. 3 and 4, during the spinning operation, the lever contact section 96 (the transmission lever 71) is in contact with the pad-side driven section 98 (the pad supporting lever 70).

[0047] A regulating member 74 is mounted on the fixed frame 67 for preventing the pad supporting lever 70 from swinging excessively. The regulating member 74, which is formed as a plate member, is fixed to the fixed frame 67.

[0048] The coil portion of the second torsion spring 95 is inserted into the swing shaft part of the pad supporting lever 70. One end of a spring wire of the second torsion spring 95 is fixed to the transmission lever 71 side. Another end of the spring wire of the second torsion spring 95 is fixed to the pad supporting lever 70 side. The transmission lever 71 and the pad supporting lever 70 are connected to one another by the second torsion spring 95. The second torsion spring 95 applies urging force thereof such that the lever contact section 96 is pressed against the pad-side driven section 98.

[0049] In the spinning machine 1, an elongate shaft (a mounting member) 68 is provided in a horizontal direction. For example, a tensioning bar (a guiding device) (not illustrated in the drawings) or the like for generating tension on the bottom apron belt 27 is mounted on the shaft 68. The shaft 68 is supported on the frame 6 of the spinning machine 1 independently from the fixed frame 67.

[0050] As illustrated in Figs. 4 and 5, an apron fork 99 as an apron belt shifting member is mounted on the shaft 68 via a traverse frame 69. The apron fork 99 having two protrusions is fixed to the traverse frame 69, with the bottom apron belt 27 inserted between the two protrusions. The traverse frame 69 is arranged movable with respect to the shaft 68 in a longitudinal direction of such a shaft 68, and also is connected to a traverse driving device (not illustrated in the drawings).

[0051] In such a structure, by driving the traverse driving device, the apron fork 99 is reciprocated from side to side, and the bottom apron belt 27 can be traversed in a direction substantially parallel to a shaft direction of the middle bottom roller 26. Accordingly, a contact area between the bottom apron belt 27 and the fiber bundle 8 can be changed at all time. As a result, it is possible to prevent a local wear of the bottom apron belt 27 and to increase a period of duration thereof.

[0052] As illustrated in Fig. 3, the pressing lever 31 is fixed to a supporting arm 29 located downstream of the draft device 7 (downstream in a feeding direction of the

fiber bundle 8). The supporting arm 29 is arranged in a vertical direction, and the spinning device 9 is fixed on the upper part of the supporting arm 29. The supporting arm 29 can swing around a supporting shaft 30 provided in a lower portion of the supporting arm 29. When the pressing lever 31 moves accompanying swinging of the supporting arm 29, the pad body 62 can be moved away from the front bottom roller 28. This movement will be described in detail later.

[0053] Fig. 3 illustrates a state during a normal operation in the above-described structure. As illustrated in Fig. 3, during a spinning operation of the spinning machine 1, each of a plurality of the draft rollers including the front bottom roller 28 is rotationally driven, and the sliver 13 is drafted into the fiber bundle 8 and fed to the spinning device 9. During the spinning operation, the transmission lever 71 (a lever contact section 96) urged by spring force of the first torsion spring 94 presses and moves the pad supporting lever 70 (the pad-side driven section 98) such that the pad body 62 moves toward the front bottom roller 28. As a result, the pad supporting lever 70 swings integrally with the transmission lever 71, and the pad body 62 mounted on the clip supporting section 72 is made into contact with an outer peripheral surface of the front bottom roller 28. Under this state, the pad body 62 is making contact with the outer peripheral surface of the front bottom roller 28 at almost constant pressure, and foreign substance adhered on the front bottom roller 28 is scraped off by the pad body 62. Further, such foreign substance may include fiber, fly waste, dust or the like that generates from the sliver 13 or the like.

[0054] Next, by referring to Figs. 6 and 7, an operation to release contact between the pad body 62 and the front bottom roller 28 will be described. Fig. 6 is an enlarged side view illustrating a state of the cleaning device 61 when the pad body 62 is moved away from the front bottom roller 28. Fig. 7 is an enlarged side view illustrating a state of the pad supporting mechanism 63 when the transmission lever 71 is moved away from the pad supporting lever 70.

[0055] When a yarn breakage or the like occurs during an operation of the spinning machine 1, a spinning operation of the spinning device 9 is stopped, and also a drafting operation of the draft device 7 is stopped. An actuator is connected to the supporting arm 29 of each spinning unit 2. A control section (not illustrated in the drawings) controls operation of the actuator in such a spinning unit 2. As a result, the supporting arm 29 swings around on the shaft 30 as illustrated in Fig. 6. In such a case, the pressing lever 31 moves integrally with the supporting arm 29 so as to move away from the pad supporting mechanism 63.

[0056] An end part of the pressing lever 31 is eventually made into contact with the transmission-lever-side driven section 97, and then the pressing lever 31 applies pressing force to the transmission lever 71 via the transmission-lever-side driven section 97. With such pressing force, the transmission lever 71 swings in a direction

against the spring force of the first torsion spring 94. The pad supporting lever 70, which is connected to the transmission lever 71 by the second torsion spring 95, swings so as to follow the swing of the transmission lever 71. As a result, the pad body 62 moves away from the front bottom roller 28.

[0057] As described above, although the pad supporting lever 70 swings accompanying the movement of the pressing lever 31, the upper end of the regulating member 74 is made into contact with the pad supporting lever 70 at the time the pad supporting lever 70 has swung for a predetermined angle. Accordingly, the pad supporting lever 70 is prevented from swinging any further. From such a state, even if the transmission lever 71 is swung in a direction in which the pad body 62 is moved further away from the front bottom roller 28, displacement of the transmission lever 71 is absorbed by elastic deformation of the second torsion spring 95, and the pad supporting lever 70 is not swung. That is, as illustrated in Fig. 7, only the contact between the transmission lever 71 (the lever contact section 96) and the pad supporting lever 70 (the pad-side driven section 98) is released.

[0058] As described above, according to the structure of the present embodiment, after the pad supporting lever 70 comes into contact with the regulating member 74 and cannot be swung any further, even if the pressing lever 31 is moved further, such movement of the pressing lever 31 can be absorbed by the swinging of the transmission lever 71 with respect to the pad supporting lever 70. Accordingly, the pad supporting lever 70 can be prevented from being pressed excessively against the regulating member 74 side. As a result, the pressing lever 31, the pad supporting lever 70, the transmission lever 71, or the like are protected from damages.

[0059] As described above, when the supporting arm 29 is swung, the pressing lever 31 moves away from the front bottom roller 28. The pressing lever 31 presses the transmission lever 71 of the pad supporting mechanism 63, and the pad body 62 moves away from the front bottom roller 28. As a result of movement of the supporting arm 29, the spinning device 9 moves to a position located away from the front roller 18 and the front bottom roller 28. As described above, by mutual mechanical movement of the pad supporting mechanism 63 and the supporting arm 29, appropriate space is formed between the spinning device 9 and the front roller 18 and the front bottom roller 28, and maintenance work such as removal of fiber or the like can be easily carried out.

[0060] The pad body 62 supported by the pad supporting mechanism 63 is removable with respect to the clip 73. When the pad body 62 is worn away by being rubbed against the outer peripheral surface of the front bottom roller 28, it is necessary to replace such a pad body 62 with a new one. However, even when trying to insert the pad body 62 into the clip 73 on the leading end part of the pad supporting lever 70, the pad body 62 made of soft resin may be elastically-deformed, or the pad supporting lever 70 may be swung and move away in a di-

rection in which the pad body 62 is inserted, which may reduce workability. According to the structure of the present embodiment, an operator who would mount a new pad body 62 can swing the pad supporting lever 70 to a position where the pad supporting lever 70 is made into contact with the regulating member 74. Then, the operator can hold the pad supporting lever 70 at such a position with hands of the operator from above. Under such a state, while the pad supporting lever 70 is receiving the regulating member 74 such that the clip 73 does not move away downward, the pad body 62 can be inserted into the clip 73 from upward. Therefore, the operator can easily mount the pad body 62 on the clip 73.

[0061] As indicated above, the draft device 7 according to the present embodiment includes the cleaning device 61 for cleaning the front bottom roller 28. The cleaning device 61 includes the pad supporting lever 70, the fixed member 90, the first torsion spring 94, and the pressing lever 31. The pad supporting lever 70 supports the pad body 62. The pad supporting lever 70 is mounted on the fixed member 90 in a manner that the pad supporting lever 70 can be swung. The first torsion spring 94 is mounted on the fixed member 90, and applies force to swing the pad supporting lever 70 in a direction in which the pad body 62 is made into contact with the outer peripheral surface of the front bottom roller 28. By moving away from the front bottom roller 28, the pressing lever 31 can apply force to swing the pad supporting lever 70 in a direction in which the pad body 62 is moved away from the outer peripheral surface of the front bottom roller 28.

[0062] Accordingly, since the pad body 62 is pressed against the front bottom roller 28 by force of the first torsion spring 94 that is unlikely to be plastically-deformed, pressing force of the pad body 62 against the front bottom roller 28 can be kept constant for a long period of time. Therefore, since the force for pressing the pad body 62 against the front bottom roller 28 is stabilized, resonance of the pad body 62 can be prevented, and feeding of the yarn by the front bottom roller 28 can be stabilized. A simple mechanism can be accomplished in which the pad body 62 can be moved away from the front bottom roller 28 accompanying movement of the pressing lever 31 away from the front bottom roller 28.

[0063] The cleaning device 61 for the front bottom roller 28 according to the present embodiment includes the transmission lever 71 and the second torsion spring 95. The transmission lever 71 includes the lever contact section 96 which can be made into contact with the pad supporting lever 70, and the transmission-lever-side driven section 97 which can be made into contact with the pressing lever 31. The transmission lever 71 is arranged capable of swinging with respect to the fixed member 90. One end of the second torsion spring 95 is connected to the transmission lever 71. Another end of the second torsion spring 95 is connected to the pad supporting lever 70. The second torsion spring 95 applies spring force such that the lever contact section 96 is pressed against

the pad supporting lever 70. The pressing lever 31 is made into contact with the transmission-lever-side driven section 97 by moving away from the front bottom roller 28, and swings the transmission lever 71. Accompanying the swinging movement of the transmission lever 71, the pad supporting lever 70 swings and the pad body 62 moves away from an outer peripheral surface of the front bottom roller 28.

[0064] Accordingly, under a state in which movement of the pad supporting lever 70 is restricted due to contact with another member or the like, even when force in a direction in which the pad body 62 is moved away from the front bottom roller 28 is applied to the transmission lever 71, such force can be absorbed by the second torsion spring 95. In addition, even if force that surpasses the spring force of the second torsion spring 95 is further applied from such a state, the transmission lever 71 (the lever contact section 96) only moves away from the pad supporting lever 70. As described above, under a state in which the movement of the pad supporting member is restricted, even when the pressing lever 31 moves drastically excessive force is not directly applied to the pad supporting lever 70. Accordingly, damage of the pad supporting lever 70 caused by the movement of the pressing lever 31 can be effectively prevented.

[0065] In the cleaning device 61 according to the present embodiment, the fixed member 90 has a plurality of positions on which the first torsion spring 94 can be mounted. Accordingly, pressing force of the pad body 62 applied to the front bottom roller 28 can be adjusted just by shifting the position where the first torsion spring 94 is mounted.

[0066] The cleaning device 61 according to the present embodiment includes the regulating member 74 that regulates swinging movement of the pad supporting lever 70 in a direction in which the pad body 62 moves away from the front bottom roller 28. Accordingly, even when the pressing lever 31 moves drastically, the pad supporting lever 70 can be prevented from swinging excessively. When mounting the pad body 62 on the pad supporting lever 70, since a position of the pad supporting lever 70 can be fixed by making the pad supporting lever 70 into contact with the regulating member 74, the mounting work can be easily carried out.

[0067] The spinning machine 1 according to the present embodiment includes the draft device 7. Accordingly, deterioration in yarn property caused by the resonance of the pad body 62 can be suppressed, and quality of spun yarn which can be improved.

[0068] The spinning machine 1 according to the present embodiment includes the middle bottom roller 26, the apron fork 99, the shaft 68, and the fixed frame 67. The bottom apron belt 27 is wound around the middle bottom roller 26. The apron fork 99 is traversed to traverse the bottom apron belt 27. The apron fork 99 is mounted on the shaft 68. The fixed frame 67 is independent from the shaft 68 and used to mount the fixed member 90.

[0069] Accordingly, local wear on the bottom apron belt 27 caused by running of the yarn can be prevented by traversing bottom apron belt 27. Since the apron fork 99 is mounted on the shaft 68 which is a different member from the fixed frame 67 on which the fixed member 90 is mounted, influence of the pad body 62 resulting from vibration or the like, which is caused by traversing movement of the apron fork 99, can be suppressed effectively.

[0070] While embodiments of the present invention have been described as above, the structure can be modified as below.

[0071] In the above-described embodiment, the urging force of the first torsion spring 94 is applied to the pad supporting lever 70 via the transmission lever 71. This structure can be modified according to situations. For example, a cleaning device can be formed such that a torsion spring applies spring force to a pad supporting lever directly. Since an urging mechanism to press a pad body against a front bottom roller is a torsion spring which is unlikely to be plastically-deformed, pressing force of the pad body against the front bottom roller can also be kept within a certain range for a long period of time by such a structure. In addition, according to such a structure, the structure can be simplified. However, from a viewpoint of preventing damage of the pad supporting lever 70, the structure of the above described embodiment including the transmission lever 71 and the second torsion spring 95 is preferable.

[0072] For material of the pad body 62, in place of soft resin, for example, rubber or non-woven fabric can be adopted.

[0073] The cleaning device 61 can be adopted as a structure for cleaning not only the front bottom roller 28 but also for cleaning other draft rollers.

[0074] In addition to the structure in the embodiment described above, a suction collector can be provided for sucking and removing fiber, fiber waste, or the like adhered on the pad body 62. For example, such suction collector can be mounted on the supporting arm 29 such that a suction opening of the suction collector faces an outer peripheral surface of the front bottom roller 28. In such a case, fiber accumulation on the pad body 62 can be reduced by sucking and removing the fiber, and burden on maintenance can be reduced.

[0075] The draft device 7 according to the above-described embodiment can be applied not only to the spinning machine 1 but also to a textile machine such as a roving frame, and a drawing frame.

Claims

1. A cleaning device (61) for a draft roller (28), comprising:

a pad supporting member (70) which supports a pad body (62),
a fixed member (90) on which the pad supporting

- member (70) is mounted capable of swinging, a torsion spring (94) which is mounted on the fixed member (90) and applies force to swing the pad supporting member (70) in a direction in which the pad body (62) is made into contact with an outer peripheral surface of the draft roller (28), and
- a lever member (31) which applies force to swing the pad supporting member (70) in a direction in which the pad body (62) is moved away from the outer peripheral surface of the draft roller (28).
2. The cleaning device (61) for the draft roller (28) according to claim 1, **characterized by** further comprising:
 - a transmission member (71) which includes a contact section (96) that can be made into contact with the pad supporting member (70) and a driven section (97) that can be made into contact with the lever member (31), and which is arranged capable of swinging with respect to the fixed member (90), and
 - a second torsion spring (95) of which one end is connected to the transmission member (71) and another end is connected to the pad supporting member (70),
 - characterized in that** the second torsion spring (95) applies spring force such that the contact section (96) is pressed against the pad supporting member (70), and
 - the lever member (31) is moved away from the draft roller (28) to be made into contact with the driven section (97) and swing the transmission member (71), and accompanying swinging movement of the transmission member (71), the pad supporting member (70) swings and the pad body (62) is moved away from the outer peripheral surface of the draft roller (28).
 3. The cleaning device (61) for the draft roller (28) according to claim 1 or claim 2, **characterized in that** the fixed member (90) has a plurality of positions where the torsion spring (94) can be mounted.
 4. The cleaning device (61) for the draft roller (28) according to any one of claim 1 through claim 3, **characterized by** further comprising a regulating member (74) that regulates swinging movement of the pad supporting body (70) in a direction in which the pad body (62) moves away from the draft roller (28).
 5. A draft device (7) **characterized by** comprising the cleaning device (61) for the draft roller (28) according to any one of claim 1 through claim 4.
 6. A spinning machine (1) **characterized by** comprising the draft device (7) according to claim 5.
 7. The spinning machine (1) according to claim 6, **characterized by** further comprising an air-jet spinning section (9) that performs a spinning operation to generate spun yarn by applying twists to a fiber bundle by air, **characterized in that** during the spinning operation by the air-jet spinning section (9), the lever member (31) is in a non-contact state with respect to the pad supporting member (70).
 8. The spinning machine according to claim 7, **characterized by** further comprising a swing section (29, 30) that swings the air-jet spinning section (9), **characterized in that** the lever member (31) is connected to the air-jet spinning section (9), and when the spinning operation is not being performed, the swing section (29, 30) swings the air-jet spinning section (9) and the lever member (31) applies force to swing the pad supporting member (70).
 9. The spinning machine (1) according to any one of claim 6 through claim 8, **characterized by** comprising:
 - an apron belt roller (26) on which an apron belt (27) is wound around,
 - an apron belt shifting member (99) which is reciprocated to reciprocate the apron belt (27),
 - a mounting member (68) on which the apron belt shifting member (99) is mounted, and
 - a fixed member supporting section (67) which is independent from the mounting member (68) and used to mount the fixed member (90).

FIG. 1

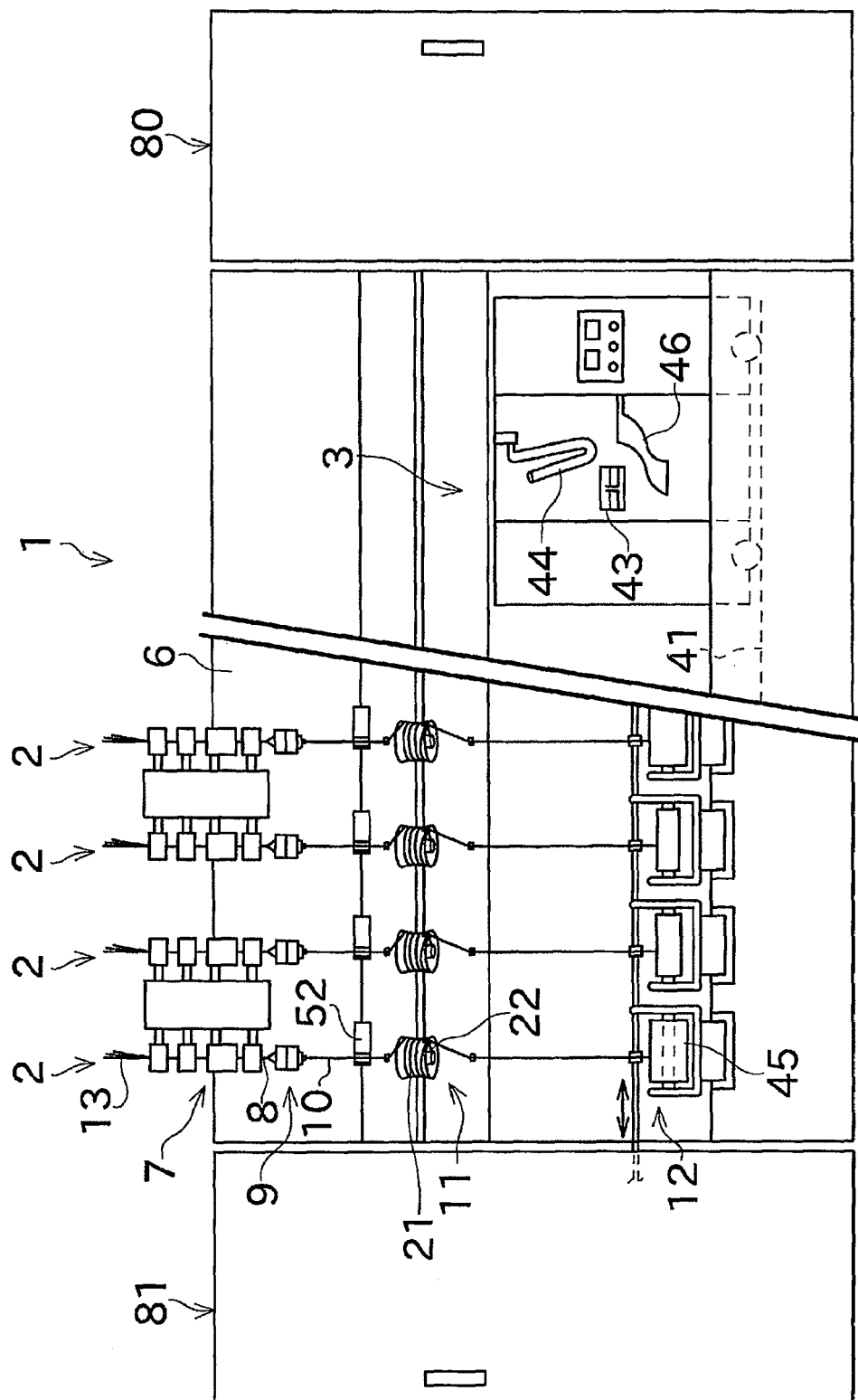


FIG. 2

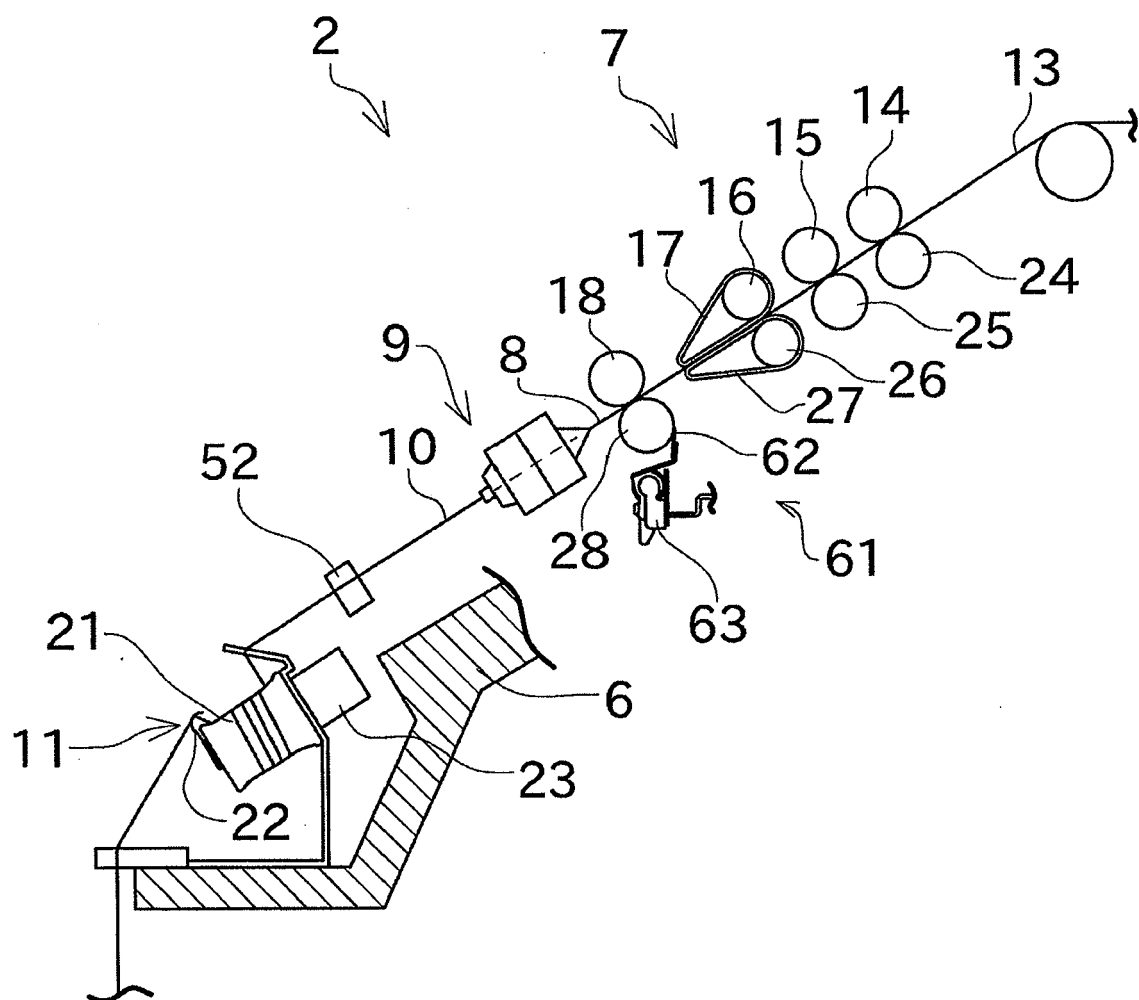


FIG. 3

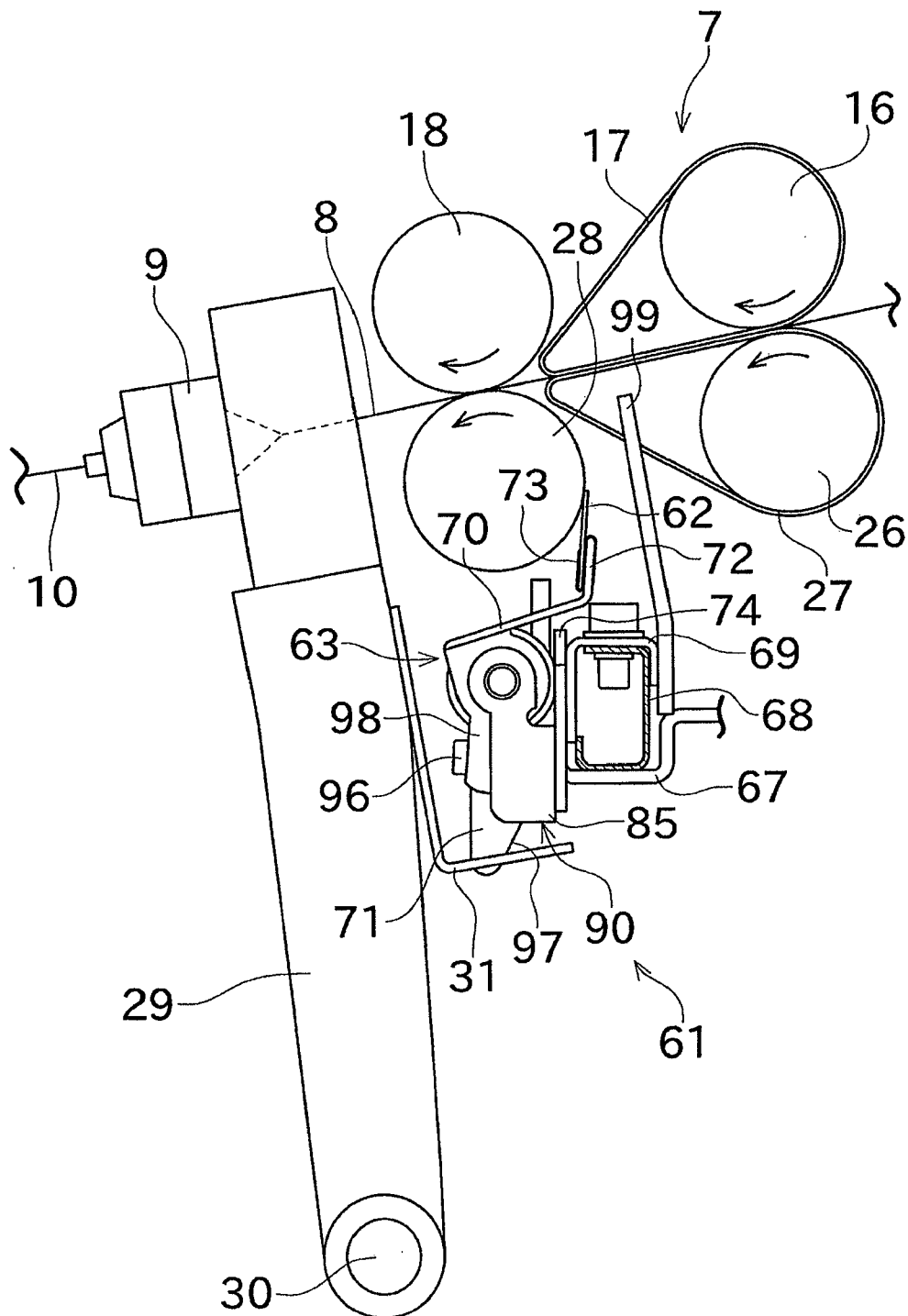


FIG. 4

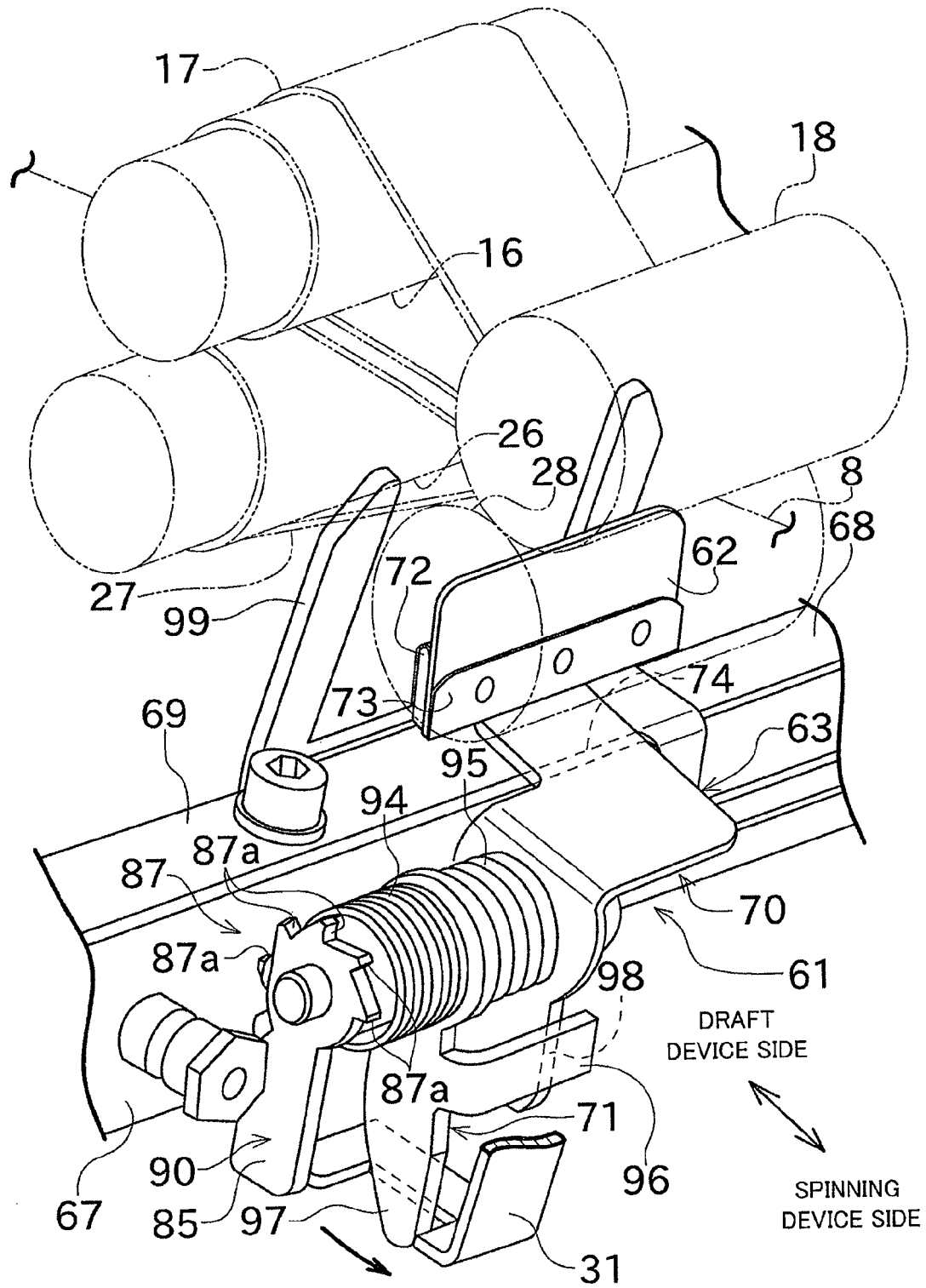


FIG. 5

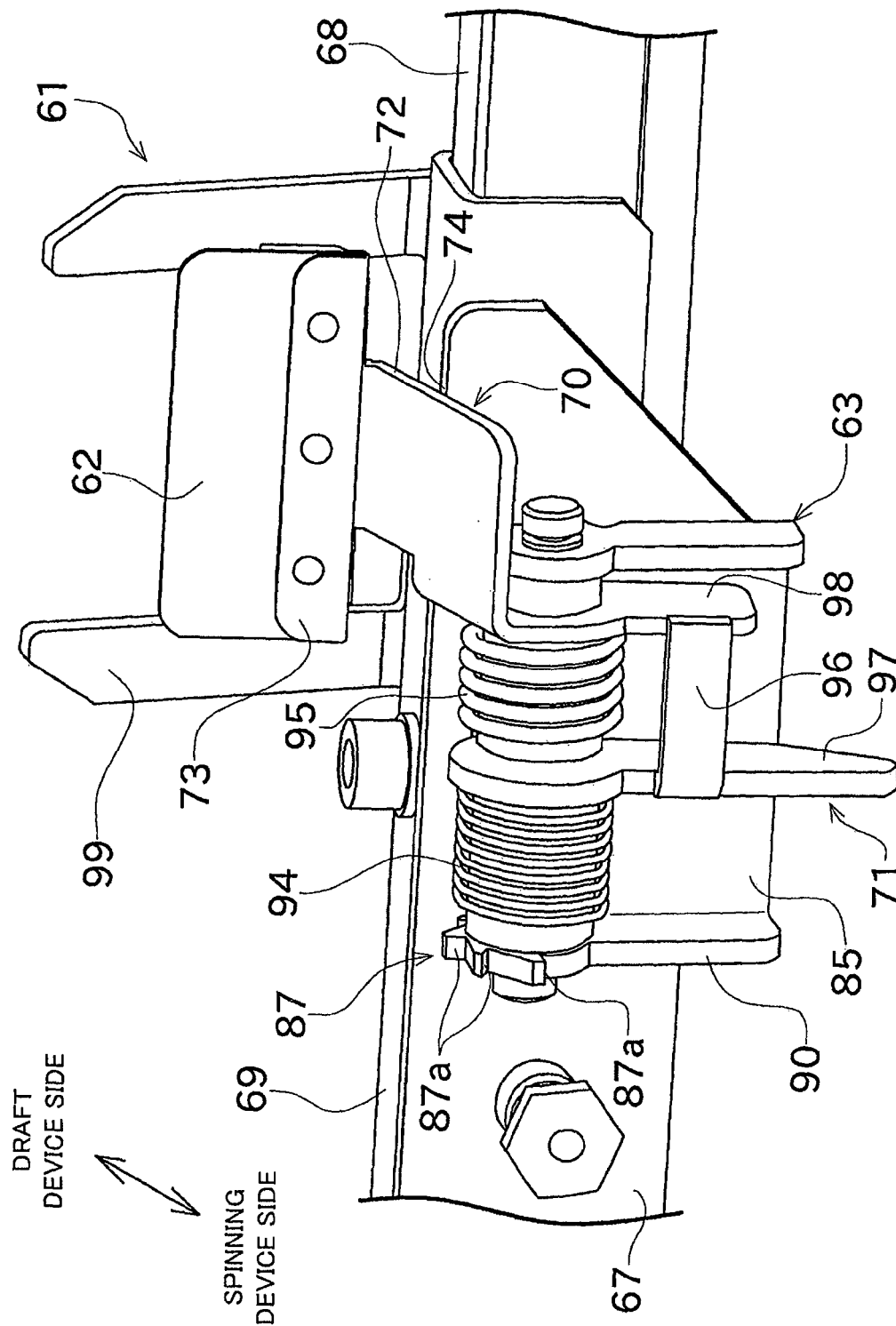


FIG. 6

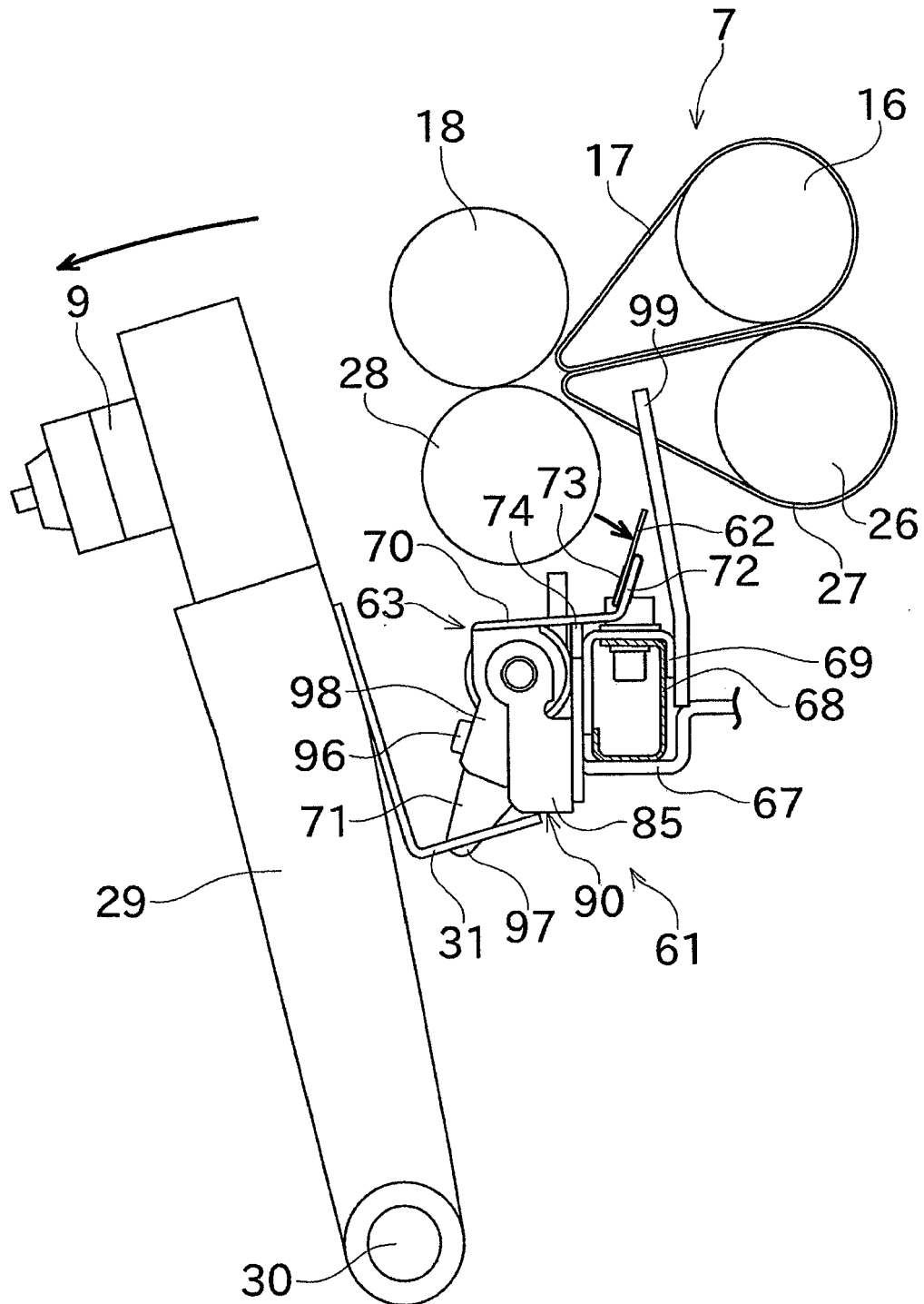
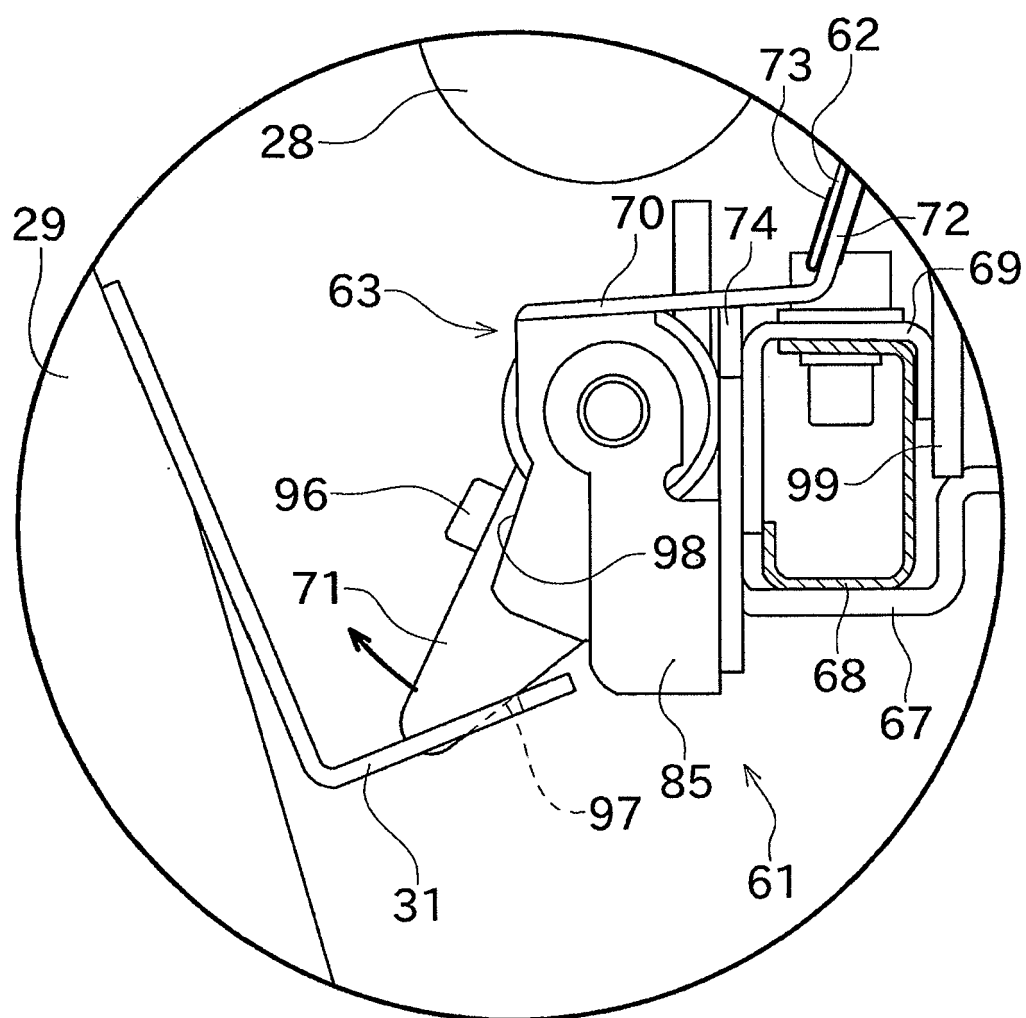


FIG. 7





EUROPEAN SEARCH REPORT

Application Number
EP 10 15 5056

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			D01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 December 2010	Examiner Dupuis, Jean-Luc
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 15 5056

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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14-12-2010

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