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(72) Inventors:
 • **Nakano, Tsutomu**
Kariya-shi, Aichi-ken (JP)
 • **Sano, Akitoshi**
Kariya-shi, Aichi-ken (JP)

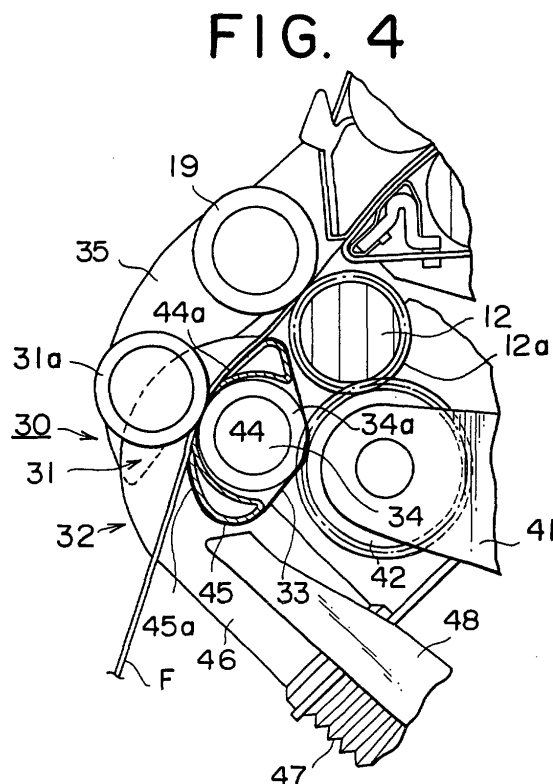
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(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(71) Applicant: **Kabushiki Kaisha Toyota Jidoshokki**
Kariya-shi, Aichi-ken (JP)

(54) **Fiber condensing device for spinning machine**

(57) A rotation shaft (34) is formed in a predetermined length corresponding to four spindles, and the torque of a front bottom roller (12) is transmitted to a gear (40) formed at the center by way of an intermediate gear (42). The rotation shaft (34) has at a position corresponding to each spindle a bottom nip roller (34a) around which a part of an air-permeable apron (33) is wrapped. A sucking portion (32) extends parallel to the rotation shaft (34) and is equipped with suction holes (44a and 45a) in correspondence with the spindles. Further, the sucking portion (32) is equipped with suction pipes (44 and 45) having slide guide surfaces (44b and 45b) around which a part of the air-permeable apron (33) is wrapped so as to cover the suction holes (44a and 45a). The suction holes (44a and 45a) are arranged on the upstream side and the downstream side with the nip point of a nip roller pair therebetween.



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a fiber bundle collecting device and, more specifically, to a fiber bundle collecting device which is arranged on the downstream side, for example, of the drafting device (draft part) of a spinning frame and which collects a fiber bundle drafted by the drafting device.

Description of the Related Art

[0002] German Patent Application Laid-Open No. DE19708410A1 discloses a fiber bundle collecting device of this type, in which, as shown in Figs. 10, 11(a) and 11(b), on the downstream side of a final roller pair 71 constituting a drafting device, there is provided a send-out roller pair 73 equipped with an air-permeable apron 72 forming a fiber bundle conveyance surface, which is provided with an air suction device 74 for applying suction airflow to the conveyance surface of the air-permeable apron 72. In this device, suction airflow is applied to the conveyance surface of the air-permeable apron 72 through a groove hole formed in an apron guide 75 for guiding the air-permeable apron 72.

[0003] A pair of send-out rollers 73a around which the air-permeable apron 72 is wrapped is supported by a support portion 76 in a cantilever-like fashion through a spindle 77, and are rotated through friction with friction roller portions 78a of a rotation shaft 78 arranged parallel to a front bottom roller 71a. The frictional force for the friction roller portions 78a is secured by the pressurizing force of send-out rollers 73b supported by a weighting arm and pressed against the air-permeable apron 72 at positions corresponding to the send-out rollers 73a.

[0004] By adding the above fiber bundle collecting device to the front side of a drafting device, that is, by collecting an untwisted fiber bundle on the downstream side of the drafting device with respect to the fiber bundle moving direction, it is possible to produce high quality thread with little fluff through spinning.

[0005] However, in the above conventional device, in order to drive the send-out roller pair 73, a force is required which pressurizes the send-out rollers 73a against the friction roller portions 78a provided on the rotation shaft 78 arranged parallel to the front bottom roller 71a. Then, since the send-out rollers 73a are supported by the spindle 77 in a cantilever-like fashion, a bending stress is applied to the spindle 77 when the pressurizing force is applied to the send-out rollers 73a.

[0006] In addition, to efficiently secure the frictional force between the send-out rollers 73a and the friction roller portions 78a by the pressurizing force of the send-out rollers 73b, it is necessary for the send-out rollers 73b, the send-out rollers 73a and the friction roller por-

tions 78a to be arranged such that their rotation centers are positioned in a straight line. As a result, the degree of freedom regarding the arrangement positions of the send-out rollers 73a and 73b and the rotation shaft 78 is reduced.

[0007] Further, since the rotation shaft 78 is driven by a motor provided at the gear end of the machine base through a gear row, the production of the spinning machine is difficult with improvement of the conventional machine alone, and it is necessary to newly alter the construction of the machine base of the spinning machine as a whole including the arrangement of the drafting device. If, of the send-out roller pair 73, the send-out roller 73a around which the air-permeable apron 72 is wrapped were formed on the rotation shaft 78, it would be possible to diminish the arrangement space for the fiber bundle collecting device. However, as compared with the middle apron of the drafting device, the air-permeable apron 72 is more subject to wear, and its replacement cycle is relatively short. In this connection, if the air-permeable apron 72 were arranged in a state in which it is fitted onto the rotation shaft 78 extending over the entire length of the machine base, the replacement of the air-permeable apron 72 would disadvantageously take a lot of time.

SUMMARY OF THE INVENTION

[0008] The present invention has been made in view of the above problem in the prior art. It is a first object of the present invention to provide a fiber bundle collecting device in which the driving roller and the sucking portion constituting the fiber bundle collecting device are formed as a unit for each of a predetermined number of spindles, facilitating the mounting and maintenance and the replacement of the air-permeable apron.

[0009] Further, a second object of the present invention is to provide a fiber bundle collecting device for a spinning machine which can be realized through simple modification of a spinning machine equipped with a conventional drafting machine.

[0010] In order to attain the above-mentioned first object of the invention, a first aspect of the present invention relates to a fiber bundle collecting device for a spinning machine, which is provided on the downstream side of a final send-out roller pair of a draft part of the spinning machine, the device including: a send-out portion having a nip roller; a sucking portion equipped with suction holes provided so as to extend at least on the upstream side of a nip point of the send-out portion with respect to the direction in which a fiber bundle moves; and an air-permeable apron constituting the send-out portion and adapted to rotate along the sucking portion. A rotation shaft has a torque transmitting portion for transmitting the torque of a drive source; is formed in a predetermined length corresponding to a plurality of spindles; has at a position corresponding to each spindle a drive roller portion around which a part of the air-

permeable apron is wrapped; and has at a plurality of positions portions to be supported that are supported by support portions provided in a machine base frame. A sucking means extends parallel to the rotation shaft; is equipped with the suction holes in correspondence with the spindles; and is equipped with suction pipes having slide surfaces around which a part of the air-permeable apron is wrapped so as to cover the suction holes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] In the accompanying drawings:

Fig. 1 is a schematic side view, partially in section, of an embodiment of the present invention;
 Fig. 2 is a partial schematic view showing the relationship between a sucking portion and a bottom nip roller;
 Fig. 3(a) is a partial schematic view of a fiber bundle collecting device as seen from the front side with respect to the fiber bundle moving direction, and Fig. 3(b) is a front view of a rotation shaft;
 Fig. 4 is a partial enlarged view of Fig. 1;
 Fig. 5 is a schematic perspective view of an end plug;
 Fig. 6(a) is a schematic side view showing a support portion of a roller stand, and Fig. 6(b) is a schematic side view showing a support portion arranged in the middle of the roller stand;
 Fig. 7 is a partial perspective view of a sucking portion;
 Fig. 8 is a partial schematic view corresponding to Fig. 3(a) with the connection pipe removed;
 Fig. 9(a) is a partial schematic diagram showing operation, and Fig. 9(b) is a schematic view showing the operation when there is no suction pipe on the downstream side;
 Fig. 10 is a schematic side view of a prior-art construction; and
 Fig. 11(a) is a front view of the prior-art construction, and Fig. 11(b) is a sectional view of Fig. 11(a) taken along the line B-B.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] In the following, an embodiment applied to a fiber bundle collecting device mounted in a spinning frame in a four-spindle unit will be described with reference to Figs. 1 through 9. Fig. 1 is a schematic side view, partially in section, showing one side of a drafting device, and Fig. 2 is a partial schematic view with the top roller side omitted, showing the relationship between the bottom roller of the drafting device, the sucking portion of the fiber bundle collecting device, and the bottom nip roller. Fig. 3(a) is a schematic view of the fiber bundle collecting device as seen from the direction in which a fiber bundle is drawn out at a nip point (from the front side with respect to the fiber bundle moving direction in

the drafting device).

[0013] As shown in Fig. 1, a drafting device 11 as a draft part is of a three-line construction equipped with a front bottom roller 12, a middle bottom roller 13, and a back bottom roller 14. The front bottom roller 12 is supported at a predetermined position with respect to a roller stand 15, and the middle and back bottom rollers 13 and 14 are supported through the intermediation of support brackets 13a and 14a secured to the roller stand 15 so as to allow position adjustment in the longitudinal direction. The support brackets 13a and 14a are fastened to predetermined positions by means of bolts passed through an elongated hole formed in the roller stand 15 and nuts (not shown). A bottom apron 16 is wrapped around a bottom tenser 17 and the middle bottom roller 13.

[0014] Supported by a weighting arm 18 through the intermediation of top roller support members are a front top roller 19, a middle top roller 20, and a back top roller 21 at positions respectively corresponding to the front bottom roller 12, the middle bottom roller 13, and the back bottom roller 14. Each of the top rollers 19 through 21 is supported in a two-spindle unit. The front bottom roller 12 and the front top roller 19 constitute the final send-out roller pair of the drafting device 11.

[0015] On the weighting arm 18, there is arranged a lever 18a so as to be rotatable to a pressurizing position and a releasing position. In the condition in which the lever 18a is arranged at the pressurizing position where it abuts the frame 18b of the weighting arm shown in Fig. 1, a lock state is maintained in which the top rollers 19 through 21 supported by the weighting arm 18 are in the pressurizing position (spinning position) in which they are pressurized toward the bottom rollers 12, 13, and 14. In the condition in which the lever 18a has been rotated from the position shown in Fig. 1 to the upper, releasing position, the lock state is canceled.

[0016] As shown in Fig. 1, a fiber bundle collecting device 30 is arranged on the downstream side of the final send-out roller pair of the drafting device 11. The fiber bundle collecting device 30 is equipped with a nip roller pair 31, a sucking portion 32 as a sucking means, and an air-permeable apron 33. The nip roller pair 31 is composed of a bottom nip roller 34a as a driving roller portion formed on a rotation shaft 34 arranged parallel to the front bottom roller 12 and a top nip roller 31a pressurized against the bottom top roller 34a through the intermediation of the air-permeable apron 33.

[0017] As shown in Fig. 3(a), in the fiber bundle collecting device 30 of this embodiment, the top nip roller 31a is, like the top rollers 19 through 21 of the drafting device 11, supported in every two spindles by the weighting arm 18 through the intermediation of a support member 35 (shown only in Fig. 1). In this embodiment, the support member 35 is formed integrally with the support member of the front top roller 19.

[0018] On the other hand, on the bottom side of the fiber bundle collecting device 30, half the spindles ar-

ranged between the roller stands 15 of the drafting device 11, i.e., four spindles, constitute one unit. As shown in Fig. 2, at the middle position of the roller stands 15 arranged at predetermined intervals in the longitudinal direction of the machine base, a support arm 37 is arranged in a state in which its base end is supported by a support beam 36 extending in the longitudinal direction of the machine base, and a rotation shaft 34 is supported between the roller stand 15 and the support arm 37.

[0019] As shown in Fig. 3(b), the rotation shaft 34 is formed in a predetermined length corresponding to a plurality of spindles (four spindles in this embodiment), and a bearing 38 is secured to either end thereof. Then, the bearings 38 are fitted into end plugs 39 serving as the portions to be supported, and, as shown in Fig. 3(a), the end plugs 39 are supported in the engagement portions 39a by support portions 15a and 37a provided on the roller stand 15 and the support arm 37, whereby the rotation shaft 34 is rotatably supported between the roller stand 15 and the support arm 37. The support portions 15a and 37a are formed so as to be capable of supporting two end plugs 39, and are able to support the end plugs 39 mounted to the end portions of the adjacent rotation shafts 34.

[0020] The support portion 15a is formed by a block fixed to the roller stand 15, and, as shown in Fig. 6(a), has engagement recesses 15b and 15c extending obliquely upwards on the front side of the machine base. As shown in Fig. 6(b), the support portion 37a also has an engagement recess 37b extending obliquely upwards on the front side of the machine base. Then, the portion to be supported (end plug 39) has an engagement portion 39a capable of being engaged with the engagement recesses 15b and 37b, and is formed so as to be capable of being snapped in place with a single motion with respect to the support portions 15a and 37a in the engagement portion 39a. The engagement recess 15c of the support portion 15a serves to support the front bottom roller 12.

[0021] The rotation shaft 34 has at its longitudinal center a gear 40 serving as a torque transmitting portion by means of which the torque of a drive source is transmitted. The gear 40 is formed integrally with the rotation shaft 34. In this embodiment, the front bottom roller 12 is used as the drive source of the rotation shaft 34 and, as shown in Fig. 2, the front bottom roller 12 has a gear portion 12a at a position opposed to the gear 40. Further, an intermediate gear 42 in mesh with the gear portion 12a and the gear 40 is rotatably supported by a support arm 41 whose base end is fixed to the support beam 36 like the support arm 37. That is, the torque of the front bottom roller 12 is transmitted to the rotation shaft 34 by way of the gear portion 12a, the intermediate gear 42, and the gear 40.

[0022] As shown in Fig. 1, on the machine base of the spinning frame, there is arranged a suction duct 43 which extends in the longitudinal direction thereof (the

direction perpendicular to the plane of Fig. 1). The sucking portion 32 is equipped with suction pipes 44 and 45 extending parallel to the rotation shaft 34 and a connection pipe 46 connected to the suction duct 43 and adapted to apply negative pressure to the suction pipes 44 and 45. The connection pipe 46 is arranged in front of the gear 40 such that a part thereof serves as a cover for the gear 40 and the intermediate gear 42, and is connected on the base end to the suction duct 43 through a bellows-like connection pipe 47. Fig. 8 is a diagram showing the portion of Fig. 3(a) corresponding to the connection pipe 46 with the connection pipe 46 omitted. As can be confirmed from Figs. 3(a) and 8, the connection pipe 46 serves as a cover for the gear 40 and the intermediate gear 42. The connection pipe 47 is not straight but is arranged in a bending state, and is adapted to impart force to the connection pipe 46 in the direction perpendicular to the direction in which it extends.

[0023] As shown in Fig. 7, in the forward end portion of the connection pipe 46, there are formed engagement holes 46a and 46b to which the suction pipes 44 and 45 are detachably mounted. In addition, to the right and left sides of the connection pipe 46, the first end portions of the suction pipes 44 and 45 are detachably mounted, and the second end portions of the suction pipes 44 and 45 are engaged with the end plug 39. Fig. 7 is a perspective view showing a state in which the suction pipes 44 and 45 are mounted to one side of the connection pipe 46.

[0024] As shown in Fig. 2, the suction pipe 44 has a slide guide surface 44b having slit-like suction holes 44a extending on the upstream side with respect to the direction in which the fiber bundle (fleece) F moves with the nip point of the bottom nip roller 34a being therebetween. The suction pipe 45 has a slide guide surface 45b having slit-like suction holes 45a extending on the downstream side. Then, as shown in Figs. 2 and 4, the suction pipe 44 is arranged so as to be on the upstream side of the nip point of the bottom nip roller 34a with respect to the fiber bundle moving direction, and the suction pipe 45 is arranged so as to be on the downstream side thereof. In Fig. 2, the air-permeable apron 33 is indicated by a chain line so that the suction holes 44a and 45a may be easily seen. Further, as shown in Fig. 3(a), on the slide guide surface 45b of the suction pipe 45, regulation guides 45c for preventing lateral shifting of the air-permeable aprons 33 protrude at positions corresponding to the opposite sides of the sides of the air-permeable aprons 33 opposed to the end plug 39 or the connection pipe 46.

[0025] As shown in Fig. 5, the end plug 39 has, in addition to the engagement hole 39b into which the bearing 38 is fitted, engagement recesses 39c and 39d into which the suction pipe 44 and the suction pipe 45 are fitted. By fitting the second end portions of the suction pipe 44 and the suction pipe 45 into the engagement recesses 39c and 39d, the suction pipes 44 and 45 are thus maintained in an appropriate positional relation-

ship.

[0026] The suction pipe 44 is formed in a configuration which allows guiding of the air-permeable apron 33 to the vicinity of the nip point of the front bottom roller 12 and the front top roller 19. The suction pipe 45 is arranged such that the fiber bundle F sent out from the air-permeable apron 33 is deflected with a certain degree of fleece angle. The fleece angle is the angle made by the line segment connecting the center of curvature of an arcuate surface guiding the fiber bundle F to the extraction position after passing the nip point of the fiber bundle (fleece) F and the nip point and the line segment connecting the center of curvature and the extraction point of the fiber bundle F. The air-permeable apron 33 is wrapped such that a part of it comes into contact with the suction pipes 44 and 45 and that a part of it comes into contact with the bottom nip roller 34a, rotating while sliding on the slide guide surfaces 44b and 45b with the rotation of the bottom nip roller 34a. In this embodiment, the air-permeable apron 33 is formed by a woven material which can ensure an appropriate degree of breathability.

[0027] As shown in Fig. 2, the width of the suction hole 44a situated on the upstream side of the nip point is larger than the width of the suction hole 45a situated on the downstream side. The suction hole 45a on the downstream side is formed such that its width gradually diminishes as it extends downstream.

[0028] Of the suction holes 44a and 45a, the suction hole 44a on the upstream side is formed so as to extend obliquely with respect to the moving direction of the air-permeable apron 33 (the vertical direction in Fig. 2), and the suction hole 45a on the downstream side is formed so as to extend in the same direction as the moving direction of the air-permeable apron 33.

[0029] As shown in Figs. 1, 3(a), etc., in the vicinity of the lower portion of each suction pipe 45, there is arranged the forward end portion of a suction nozzle 48 of a single type pneumatic suction cleaning system adapted to suck the fiber bundle F sent out from the drafting device 11 at the time of thread breakage. The base end of the suction nozzle 48 is connected to the suction duct 43.

[0030] Next, the operation of the device constructed as described above will be described.

[0031] When the spinning frame is operated, the fiber bundle F passes between the bottom rollers 12 through 14 and the top roller 19 through 21 of the drafting device 11 to be thereby drafted, and is then guided to the fiber bundle collecting device 30. The nip roller pair 31 is rotated at a speed somewhat higher than the surface speed of the front rollers 12 and 19; after passing the nip point of the nip roller pair 31 under appropriate tension, the fiber bundle F is deflected and moves downstream while undergoing twisting.

[0032] Further, during nip roller operation, the sucking action of the suction duct 43 reaches the suction pipes 44 and 45 through the connection pipe 47 and the con-

nection pipe 46, and the sucking action of the suction holes 44a and 45a formed in the slide guide surfaces 44b and 45b reaches the fiber bundle F through the air-permeable apron 33. As a result, the fiber bundle F moves in a state in which it is sucked and collected at positions corresponding to the suction holes 44a and 45a.

[0033] In a construction in which the suction holes (slits) are arranged only on the upstream side of the nip point as in the conventional devices, the fiber bundle F once collected before reaching the nip point is diverged after passing the nip point, and, as shown in Fig. 9(b), a fleece triangle T is formed at the outlet of the nip roller pair 31. Thus, separation of fibers from both ends of the fiber bundle F having passed the nip point cannot be restrained to a sufficient degree, resulting in generation of fluff. In this embodiment, however, there exist the suction holes 44a and 45a on the upstream side and the downstream side with the nip point of the nip roller pair 31 therebetween, so that even after passing the nip point, the fiber bundle F moves in a state in which it is collected under the sucking action. Further, as shown in Fig. 9(a), substantially no fleece triangle is formed at the outlet of the nip roller pair 31. As a result, separation of fibers from both ends of the fiber bundle F having passed the nip point is restrained, and generation of fluff and waste cotton are restrained, thereby achieving a substantial improvement in terms of thread quality.

[0034] Further, the collecting effect due to the suction hole 45a provided on the downstream side of the nip point is also propagated to some degree to the upstream side of the nip point, thereby restraining divergence of the fiber bundle F until it reaches the nip point.

[0035] This embodiment provides the following advantages:

(1) The rotation shaft 34 for rotating the bottom nip roller 34a and the sucking portion 32 exerting sucking action on the drafted fiber bundle F are formed in the unit 1 of each of a plurality of spindles, and the rotation shaft 34 is supported at a plurality of portions to be supported (end plugs 39). Thus, the mounting, maintenance, and the replacement of the air-permeable apron 33 are facilitated. Further, even if the bottom nip roller 34a is pressurized by the driven nip roller (top nip roller 31a) through the intermediation of the air-permeable apron 33, no excessive bending stress is applied to the rotation shaft 34.

(2) The gear 40 is the torque transmitting portion for transmitting the torque of the drive source to the rotation shaft 34. Thus, unlike the case in which the torque transmitting portion consists of a friction roller, there is no need to bring the torque transmitting portion into press contact with the drive source side with great force, and the degree of freedom regarding arrangement position is increased, resulting in a simplified construction. Further, as compared with

the case in which the torque transmitting portion consists of a wrapping transmission mechanism, the construction is simplified.

(3) The front bottom roller 12 is the drive source for rotating the rotation shaft 34. Thus, there is no need to newly provide in the machine base of the spinning machine a drive source for driving the rotation shaft 34, thereby achieving simplification in structure and a reduction in production cost.

(4) The sucking means (sucking portion 32) is provided with the connection pipe 46 connected to the suction duct 43 provided in the machine base of the spinning machine and adapted to apply negative pressure to the suction pipes 44 and 45, and the suction pipes 44 and 45 are detachably mounted to the connection pipe 46. Thus, the suction pipes 44 and 45 extending parallel to the rotation shaft 34 can be detached from the connection pipe 46, so that the replacement of the air-permeable apron 33 and the maintenance work on the suction pipes 44 and 45 and the like are further facilitated. Further, when replacing the suction pipes 44 and 45 when they have been worn as a result of the friction with the air-permeable apron 33, there is no need to replace the sucking portion 32 as a whole; it is only necessary to replace the worn suction pipes 44 and 45, thus facilitating the replacement operation and achieving a reduction in cost.

(5) The portions to be supported (end plugs 39) are formed so as to be capable of being snapped into the support portions 15a and 37a with a single motion. Thus, the attachment and detachment of the rotation shaft 34 is further facilitated. Further, since the support portions 15a and 37a have the engagement recesses 15b and 37b extending obliquely upwards on the front side of the machine base, the rotation shaft 34 is reliably retained by the support portions 15a and 37a in a state in which the portions to be supported (end plugs 39) are engaged with the engagement recesses 15b and 37b, whereby the mounting of the rotation shaft 34 and the sucking portion 32 to the spinning machine base is further facilitated.

(6) The portions to be supported are provided at both ends of the rotation shaft 34. Thus, as compared with the case in which the portions to be supported are provided at some midpoints of the rotation shaft 34, the attachment of the portions to be supported is facilitated. Further, the support portion supporting the opposed portions to be supported (end plugs 39) of the adjacent rotation shafts 34 is shared, whereby it is possible to reduce the number of support portions 37a, thereby reducing the production cost of the fiber bundle collecting device 30.

(7) The portions to be supported (end plugs 39) are mounted to the rotation shaft 34 through the intermediation of the bearings 38, and function as support portions for supporting the end portions of the

suction pipes 44 and 45. Thus, it is easier to establish an appropriate positional relationship between the driving roller portion (bottom nip roller 34a) provided on the rotation shaft 34 and the suction holes 44a and 45a provided in the suction pipes 44 and 45.

(8) The portions to be supported consist of end plugs for blocking the open end portions of the suction pipes 44 and 45. Thus, the blocking of the pipe end portions is effected by means of the end plugs 39 as the portions to be supported without blocking those end portions of the suction pipes 44 and 45 farther from the negative pressure source at the time of production of the suction pipes 44 and 45, thus, facilitating the production of the suction pipes 44 and 45.

(9) A part of the sucking means (sucking portion 32) is arranged in front of the torque transmitting portion so that it may serve as a cover for the torque transmitting portion (gear 40). Thus, cotton dust or the like is not easily accumulated on the torque transmitting portion.

(10) The sucking portion 32 is provided such that the suction holes 44a and 45a are situated on both the upstream side and the downstream side of the nip point of the nip roller pair 31 with the nip point therebetween. Thus, the fiber bundle moves in the collected state under the sucking action even after passing the nip point, so that substantially no fleece triangle is formed at the outlet of the bottom nip roller 34a. As a result, generation of fluff and waste cotton is restrained, thereby achieving a substantial improvement in terms of thread quality.

(11) The collecting effect due to the suction hole 45a provided on the downstream side of the nip point is propagated to some degree to the upstream side of the nip point, so that the divergence of the fiber bundle F up to its arrival at the nip point is restrained, thereby further improving the collecting effect.

(12) The air-permeable apron 33 is formed of a woven material. Thus, there is no need to take the trouble to make small holes in the belt forming the porous material 33; by selecting a woven material which allows to secure an appropriate degree of breathability, the air-permeable apron 33 can be produced at low cost.

(13) The end plugs 39 have the engagement portions 39a fitted into the engagement recesses 15b and 37b of the support portions 15a and 37a, and are retained at predetermined positions by the urging force imparted to the connection pipe 46 from the connection pipe 47. Thus, the fiber bundle F can receive the sucking action in a stable state from the suction holes 44a and 45a, thereby stabilizing the thread quality.

[0036] The above-described embodiment should not be construed restrictively; it is also possible, for exam-

ple, to adopt the following construction.

[0037] The rotation shaft 34 and the sucking portion 32 are not restricted to the construction in which four spindles constitute one unit; it is also possible to adopt a construction in which the spindles between the roller stands 15 (e.g., eight spindles) constitute one unit. In this case, the number of parts of the sucking portion 32 and the rotation shaft 34 necessary for one spinning machine is reduced, and it is possible to reduce the number of connection pipes 47 connecting the suction duct 43 and the sucking portion 32, so that the requisite labor for the mounting is reduced. Further, the roller stands 15 are generally arranged at intervals corresponding to the installment intervals of the spring pieces forming the base frame of the spinning machine, and, in many cases, the suction duct 43, etc. connected have a length corresponding to the interval. Thus, by adopting a construction in which the sucking portion 32 and the rotation shaft 34 also have a length corresponding to that length, the packing, etc. at the time of transportation is facilitated.

[0038] It is also possible to adopt a construction in which two spindles constitute one unit; it is not always necessary for all the units to consist of the same number of spindle. It is also possible to provide different numbers of spindles between the roller stands 15 (e.g., six and two spindles), providing two kinds of units accordingly. Further, the rotation shaft 34 may be formed so as to be astride the roller stands 15 in a length corresponding to the number of spindles arranged.

[0039] The positions of the portions to be supported provided on the rotation shaft 34 are not restricted to the ends of the rotation shaft 34; they may also be provided at middle positions. However, by providing them at the ends, interference with the suction pipes 44 and 45 is avoided more easily.

[0040] The number of portions to be supported provided on the rotation shaft 34 is not restricted to two; it is also possible to provide three or more portions to be supported. In the case in which the length of the rotation shaft 34 is in conformity with the roller stands 15, it is desirable to provide the portions to be supported by the roller stands 15 at the ends and to provide a portion to be supported at some midpoint, too.

[0041] In fixing the portions to be supported (end plugs 39) to the support portions 15a and 37a, it is also possible to use screws instead of bringing the portions to be supported (end plugs 39) into press contact with the engagement recesses 15b and 37b of the support portions 15a and 37a through the intermediation of the connection pipe 46. Further, it is also possible to provide snap portions in the support portions 15a and 37a and one of the portions to be supported (end plugs 39) and to provide in the other portion to be supported an engagement portion of a configuration which allows the grasping of the snap portions for fixation at a predetermined position.

[0042] Regarding the directions in which the suction

holes 44a and 45a extend, it is not absolutely necessary to adopt the construction in which the suction hole 44a on the upstream side extends obliquely with respect to the direction in which the air-permeable apron 33 moves and in which the suction hole 45a on the downstream side extends in the direction in which the air-permeable apron 33 moves. For example, it is also possible for both the suction holes 44a and 45a to extend in the direction in which the air-permeable apron 33 moves. Alternatively, it is also possible for both the suction holes 44a and 45a to extend obliquely with respect to the direction in which the air-permeable apron 33 moves.

[0043] The suction holes 44a and 45a may have a fixed width.

[0044] Instead of forming the suction pipes 44 and 45 constituting the sucking portion 32 as separate members, it is also possible to integrate the suction pipes 44 and 45 with each other and form them in an arcuate configuration with the side opposed to the top nip roller 31a being open.

[0045] The configuration of the suction pipes 44 and 45 may be such that the end portions on the side opposite to the side opposed to the connection pipe 46 are blocked. In this case, there is no need for the end plugs 39 to hermetically block the end portions of the suction pipes 44 and 45; it is only necessary to provide an engagement hole 39b into which the bearing 38 is to be fitted and engagement portions (holes) into which the end portions of the suction pipes 44 and 45 are to be fitted, whereby the production is facilitated.

[0046] Instead of forming the air-permeable apron 33 of a woven material, it is also possible to form it of knitting fabric. In this case, as in the case of a woven material, it is possible to obtain an appropriate degree of breathability without taking the trouble to make small holes in the belt constituting the air-permeable apron 33, making it possible to produce the air-permeable apron 33 at low cost. Further, due to the elasticity of the knitting fabric, the air-permeable apron 33 is rotated in an appropriate tension state without having to provide a special tension device.

[0047] Instead of forming the air-permeable apron 33 of a woven material or knitting fabric, it is also possible to realizing the apron by forming a large number of holes in a rubber belt or a resin belt having elasticity.

[0048] It is not absolutely necessary to form the gear 40 integrally on the rotation shaft 34 through machining; it is also possible to fit a separately formed gear onto the rotation shaft 34.

[0049] The torque transmitting portion is not restricted to the gear 40; it may also be a friction roller or a sprocket forming a transmitting device with a wrapped belt or a toothed pulley. When the torque transmitting portion consists of a friction roller, a high friction pressurizing roller with a high friction surface or the like is arranged instead of the intermediate gear 42. As compared with the case in which a gear is used, use of a friction gear leads to a simpler construction and lower cost.

[0050] It is also possible to form the suction pipes 44 and 45 constituting the sucking portion 32 integrally with the suction pipe 46.

[0051] The construction of the sucking portion 32 is not restricted to the one in which the suction holes 44a and 45a are arranged on the upstream side and the downstream side with the nip point of the fiber bundle F therebetween; it is also possible to adopt a construction in which the suction hole 44a is provided solely on the upstream side of the nip point.

[0052] Regarding the pneumatic suction cleaning system, it is also possible to adopt a flute type construction instead of the single nozzle type.

[0053] Instead of connecting the suction nozzle 48 of the pneumatic suction cleaning system to the suction duct 43, it is also possible to adopt a construction in which it branches off from the connection pipe 46.

[0054] It is also possible to provide the negative pressure source of the sucking portion 32 (the suction duct 43) and the negative pressure source of the pneumatic suction cleaning system independently from each other.

[0055] As the drive source, it is also possible to newly provide, instead of the front bottom roller 12, a driving shaft driven through a gear row by a motor provided at the gear end of the machine base.

[0056] The present invention is applicable not only to the drafting device of a spinning frame, but also to the drafting devices of other types of spinning machines. The invention (technical idea) as grasped from the above embodiment will be described below.

Claims

1. A fiber bundle collecting device for a spinning machine, which is provided on the downstream side of a final send-out roller pair (12, 19) of a draft part of the spinning machine, for collecting a fiber bundle (F) drafted by the draft part
 - the device comprising: a send-out portion having a nip roller (31);
 - a sucking portion (32) equipped with suction holes (44a, 45a) provided so as to extend at least on the upstream side of a nip point of the send-out portion with respect to the direction in which the fiber bundle (F) moves;
 - an air-permeable apron (33) constituting the send-out portion and adapted to rotate along the sucking portion (32);
 - a rotation shaft (34) which has a torque transmitting portion (40) for transmitting the torque of a drive source (12); which is formed in a predetermined length corresponding to a plurality of spindles; which has at a position corresponding to each spindle a drive roller portion (34a) around which a part of the air-permeable apron (33) is wrapped; and which has at a plurality of positions portions (39) to be supported that are supported by support

portions (15a, 37a) provided in a machine base frame; and

a sucking means which extends parallel to the rotation shaft (34); which is equipped with the suction holes (44a, 45a) in correspondence with the spindles; and which is equipped with suction pipes (44, 45) having slide surfaces (44b, 45b) around which a part of the air-permeable apron (33) is wrapped so as to cover the suction holes (44a, 45a).

2. A fiber bundle collecting device for a spinning machine according to Claim 1, **characterized in that** the torque transmitting portion (40) consists of a friction roller.
3. A fiber bundle collecting device for a spinning machine according to Claim 1, **characterized in that** the torque transmitting portion (40) consists of a gear.
4. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 3, **characterized in that** the drive source (12) consists of a front bottom roller.
5. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 4, **characterized in that**: the sucking means is equipped with a connection pipe (46) connected to a suction duct (43) provided in the machine base of the spinning machine and adapted to apply negative pressure to the suction pipes (44, 45); and the suction pipes (44, 45) are detachably mounted to the connection pipe (46).
6. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 5, **characterized in that** the portion (39) to be supported is formed so as to be capable of being snapped into the support portion (15a) with a single motion.
7. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 6, **characterized in that** the portion (39) to be supported is provided at either end of the rotation shaft (34).
8. A fiber bundle collecting device for a spinning machine according to Claim 7, **characterized in that** the portions (39) to be supported are attached to the rotation shaft (34) through the intermediation of bearings (38), and support the end portions of the suction pipes (44, 45).
9. A fiber bundle collecting device for a spinning machine according to Claim 8, **characterized in that** the portions (39) to be supported are end plugs for blocking the open end portions of the suction pipes (44, 45).

10. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 9, **characterized in that** a part of the sucking means is arranged in front of the torque transmitting portion (40) so as to serve as a cover for the torque transmitting portion (40). 5

11. A fiber bundle collecting device for a spinning machine according to one of Claims 1 through 10, **characterized in that** the sucking portion (32) is 10 provided such that the suction holes (44a, 45a) are situated on the upstream side and the downstream side of the nip point with the nip point therebetween.

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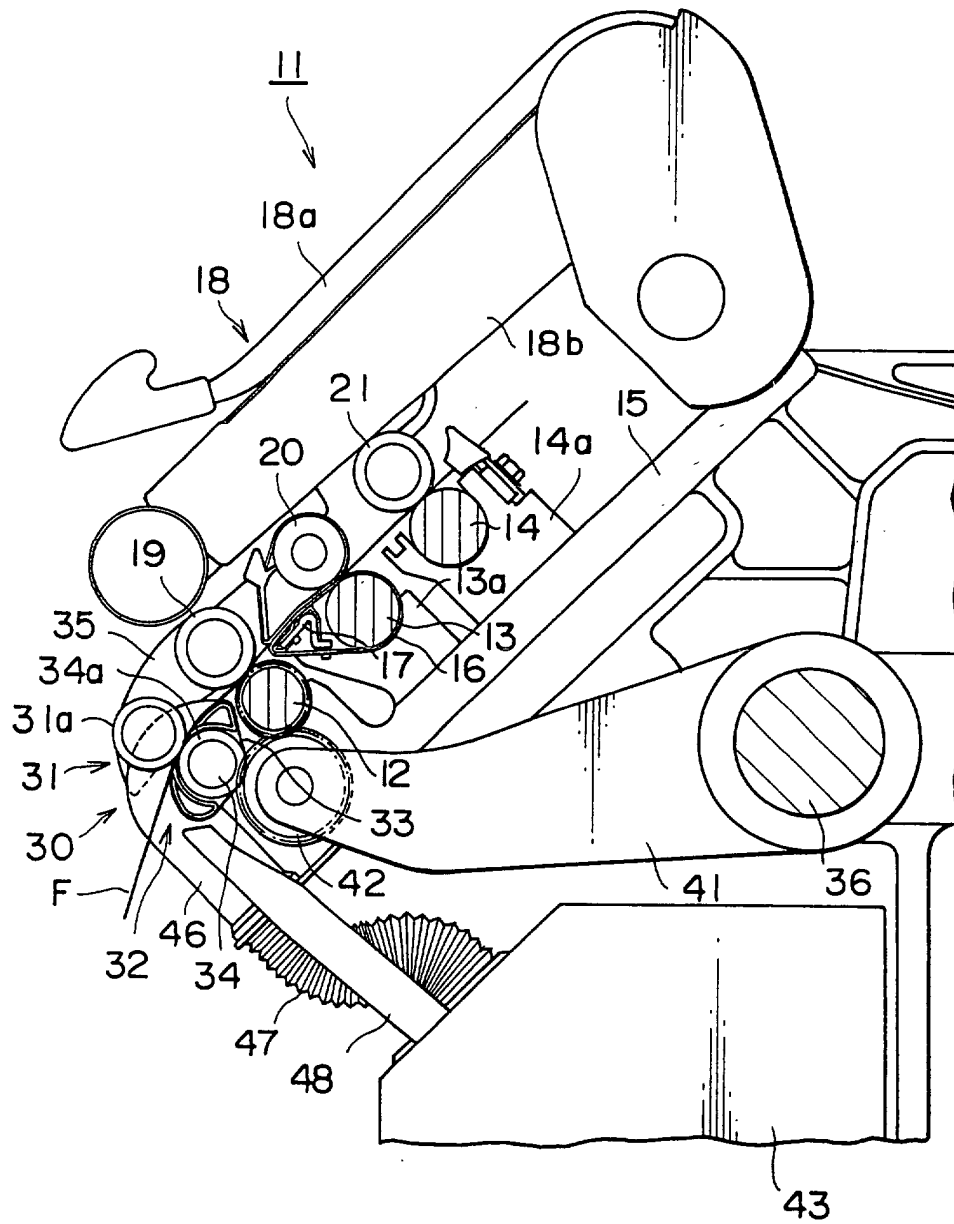
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FIG. 1



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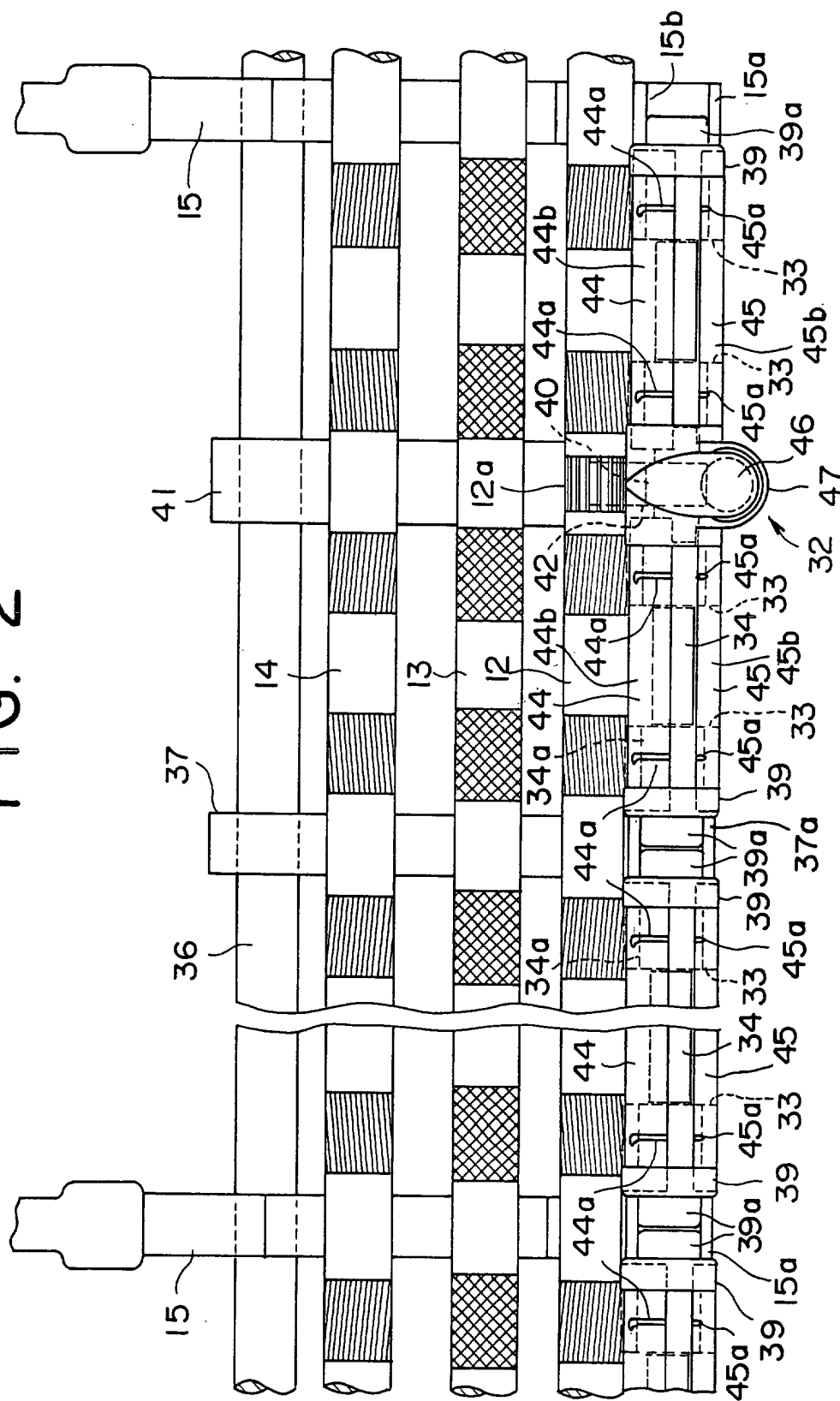


FIG. 3A

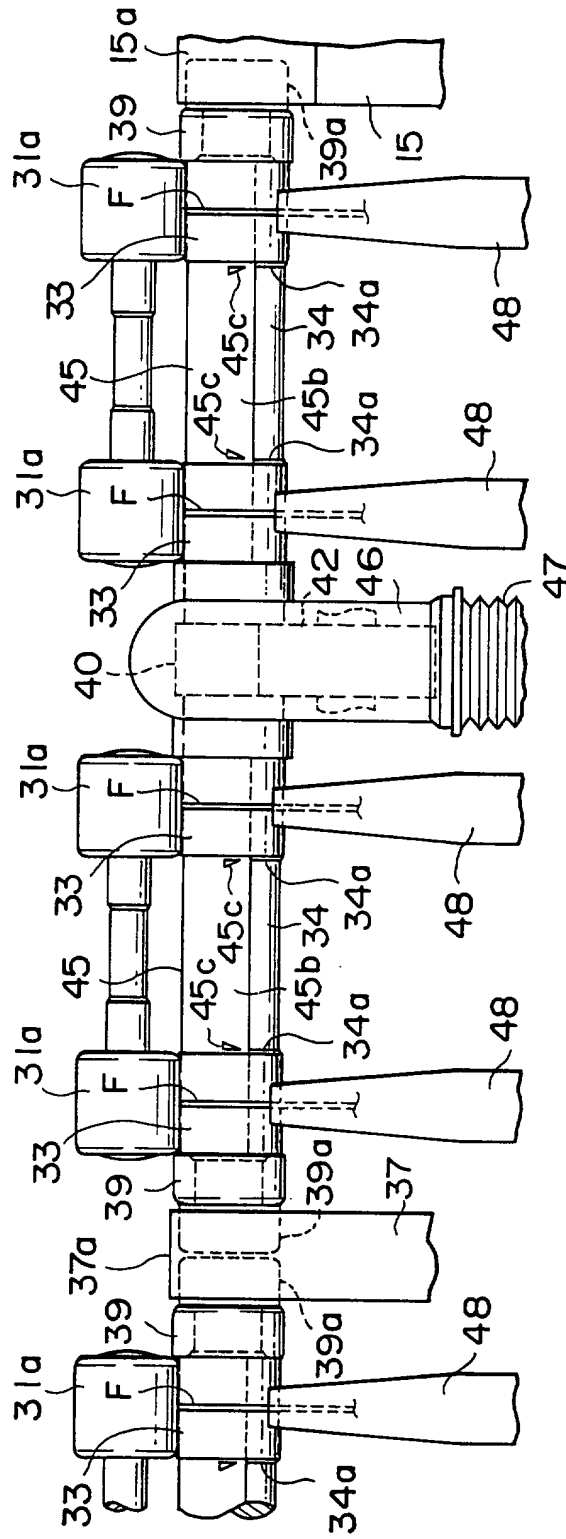


FIG. 3B

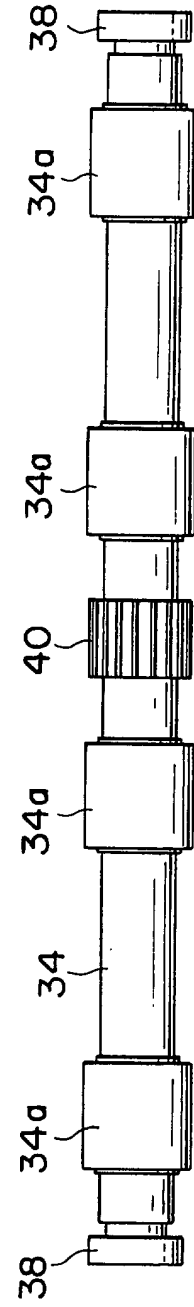


FIG. 4

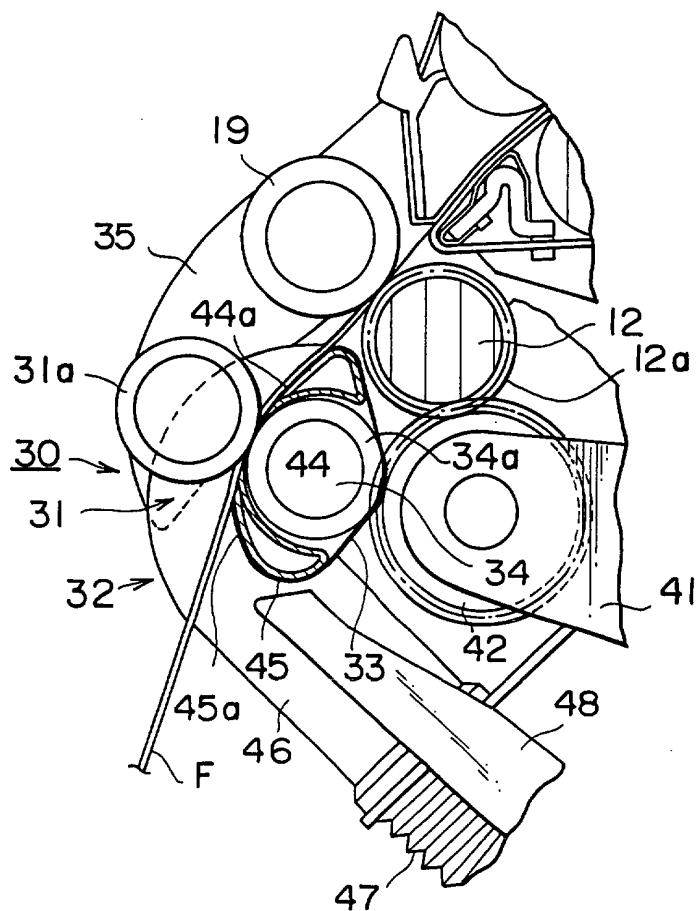


FIG. 5

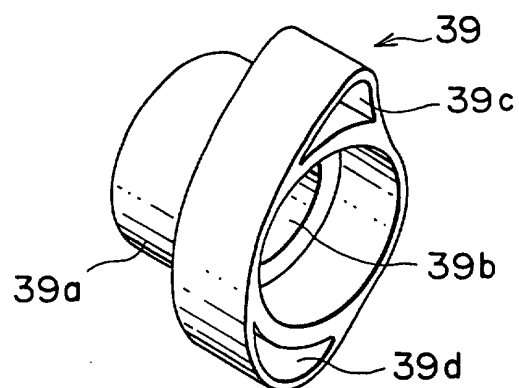


FIG. 6A

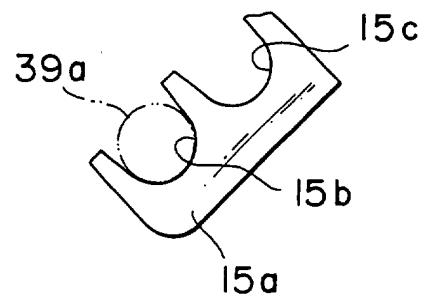


FIG. 6B

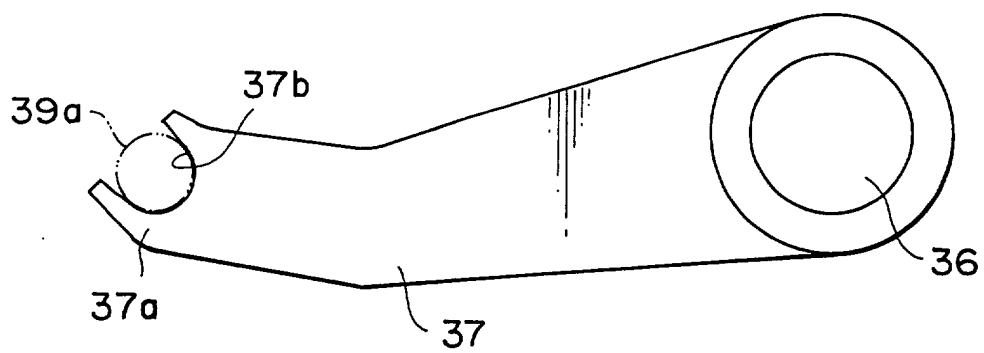


FIG. 7

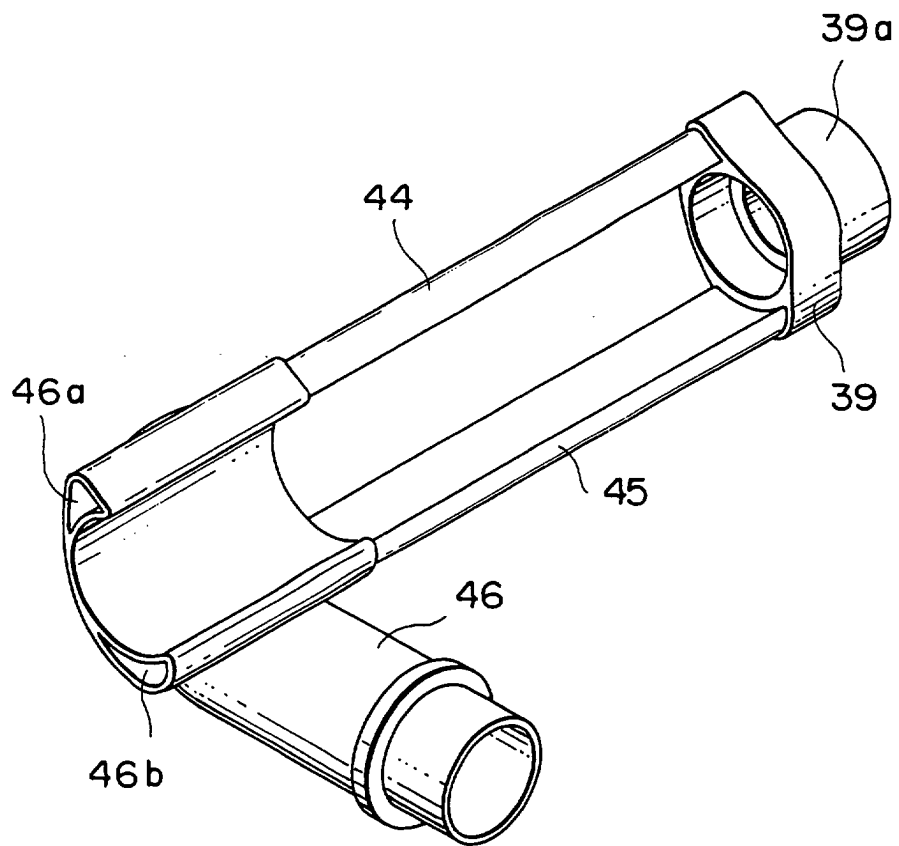


FIG. 8

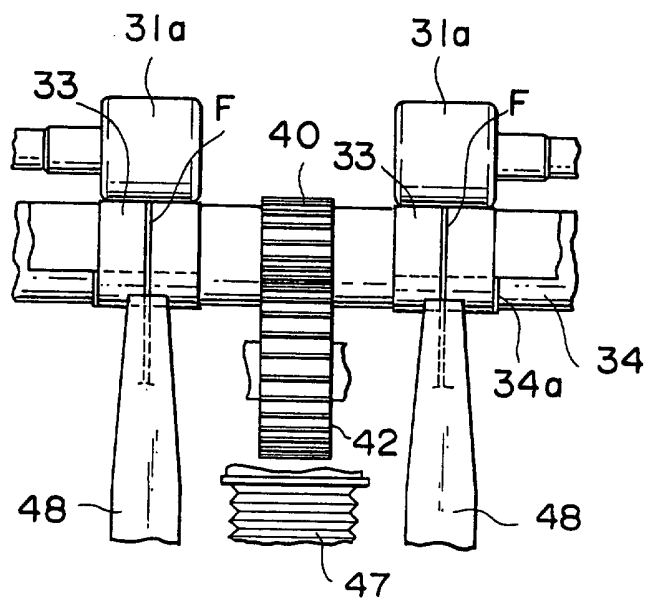


FIG. 9A

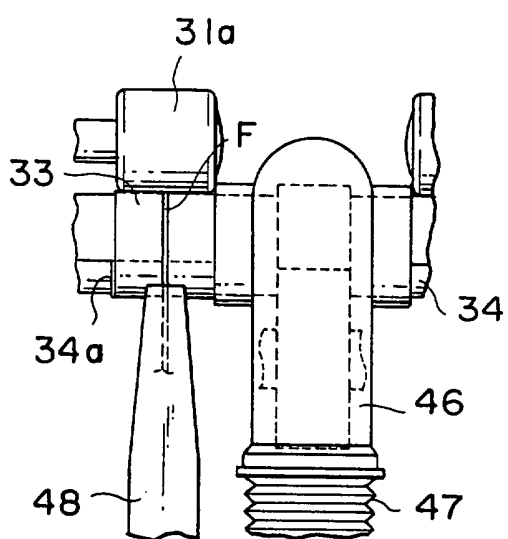


FIG. 9B

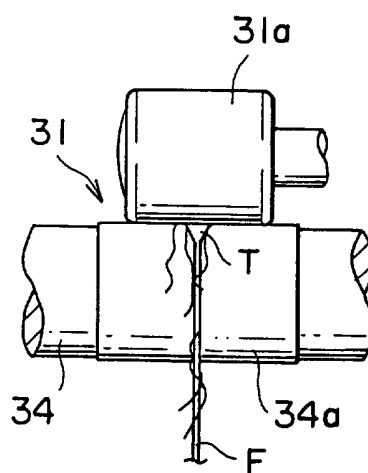


FIG. 10

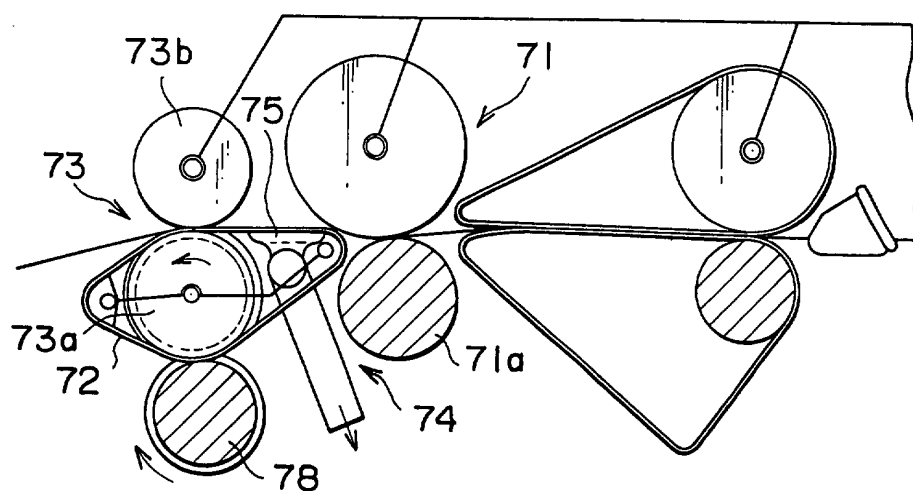


FIG. 11A

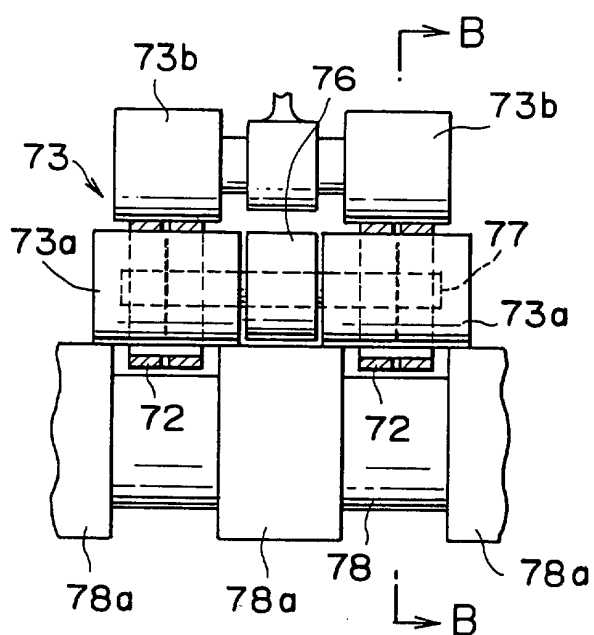
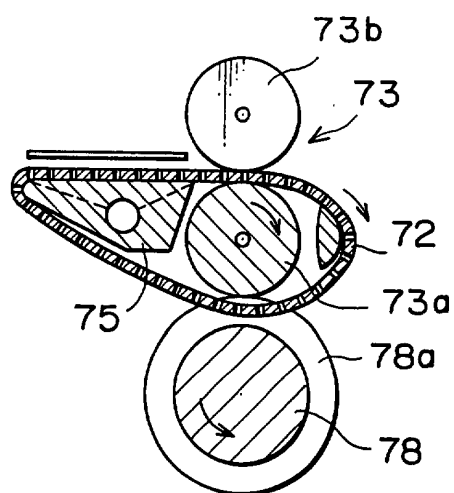


FIG. 11B





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 02 2236

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The present search report has been drawn up for all claims			
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MUNICH		13 January 2003	Dreyer, C
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			

EPO FORM 1503 03.82 (P04C01)

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