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(71) Applicant: **HOWA MACHINERY, LTD.**
Nagoya-shi Aichi (JP)

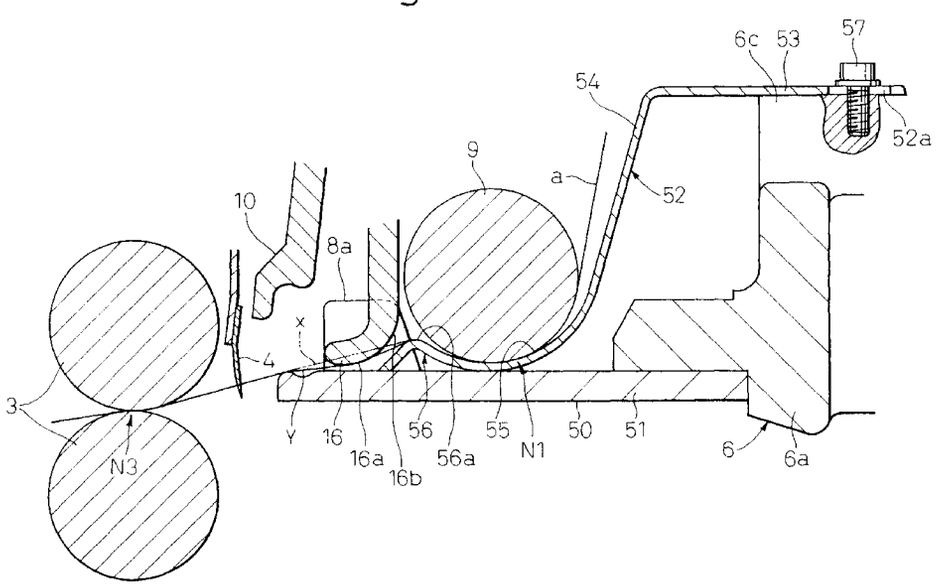
(72) Inventors:
- **Yasuda, Hironori**
  Inazawa-shi, Aichi (JP)
- **Kishi, Katsutoshi**
  Hashima-gun, Gifu (JP)
- **Inagaki, Kazuhiro**
  Kuwana-shi, Mie (JP)

(74) Representative: **Savoye, Jean-Paul et al**
Moinas Kiehl Savoye & Cronin,
42, rue Plantamour
1201 Genève (CH)

(54) Method for delivering fiber bundle in comber and nipper device for working therefore

(57) A cushion plate unit 50 is constructed by a body plate 51 and a feed roller plate 52, on which a feed roller 9 is contacted. The feed roller plate 52 has at a location downstream from the feed roller 9 in the direction of the movement of the fiber bundle a projected portion 56 for deflecting the movement of the fiber bundle in a direction away from the cushion plate for generating a first area for imparting a frictional force in the fibers in the fiber bundle. A deflector plate 16 is arranged downstream from the projected portion 56 for causing the fiber bundle to be deflected in a direction toward the cushion plate for generating a second area for imparting a frictional force in the fibers in the fiber bundle. Due to the increase in the frictional force, fiber bundles not nipped by detaching rollers 3 and the feed roller 9 are prevented from being entrained by the fibers nipped by and moved by the detaching rollers 3 during the detaching process, thereby reducing an amount of long fibers included in a waste.

Fig. 3



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a nipper device, for a combing machine, which is capable of executing an effective feed of fibers. In particular, the present invention relates to a kind of combing machine in which a curved passageway for fibers is created for increasing a frictional force between the fibers when a bundle of the fibers on a cushion plate is withdrawn by a detaching roller.

2. Description of Related Art

Known in the prior art is a combing machine having a nipper device which includes a cushion plate, which forms, on its upper surface, a projected portion at a location downstream from a feed roller in the direction of the flow of the fibers. See Japanese Unexamined Utility Model Publication No. 55-13432. In this prior art, due to the provision of the projected portion on the cushion plate, an upwardly curved passageway for a bundle of the fiber is created, so that a increased frictional force between fibers is obtained in the fiber bundle located around the projection. During an execution of a detaching process of fibers of a longer length by the detaching rollers nipping these longer length fibers, such an increased frictional force is desirable, first, in that short fibers other than the long fibers nipped by the detaching rollers so as to be withdrawn thereby are prevented from being entrained by the long fibers as being withdrawn, which otherwise causes the short fibers to be included in a sliver as produced and, second, in that long fibers to be nipped by the detaching rollers and to be withdrawn thereby so as to be included in the sliver at the following detaching process are prevented from being moved toward the detaching rollers due to the similar entraining action, which otherwise causes the long fibers to be removed as a waste during the execution of a combing step.

A different type of a nipper device in a combing machine is also known, wherein, upstream from a nipper moved upwardly or downwardly with respect to a cushion plate, an auxiliary nipper is arranged. During an execution of delivery of a bundle of nipped fibers to detaching rollers, the auxiliary nipper is moved downwardly, until a predetermined gap, which is determined in accordance with the thickness (grain) of the fiber bundle, is obtained with respect to the cushion plate.

The auxiliary nipper functions to press, slightly, the fiber bundle in the direction of the thickness of the fiber bundle, so that the fiber bundle is subjected to a certain degree of a compression, which causes a frictional force in the direction of the withdrawal is generated between the fibers in the fiber bundle, while a withdrawal of the fiber bundle by the detaching roller is executed. See the Japanese Unexamined Patent Publication No. 2-31128 and Japanese Unexamined Patent Publication No. 3-57971.

In the nipper device in Japanese Unexamined Utility Model Publication No. 55-13432, an increase in the frictional force is obtained by a provision of a curved passageway for the fiber bundle, which is advantageous in that the increase in the frictional force is less influenced by the thickness of the fiber bundle over the type of the nipper device such as in Japanese Unexamined Patent Publication No. 2-31128 or Japanese Unexamined Patent Publication No. 3-57971, where an increase in the frictional force is obtained by a compression of the fiber bundle by an auxiliary nipper. However, a change in the direction of the movement of the fiber bundle is done only once at the projected portion. Thus, short fibers located only at the frictional force imparting area, which is narrow, are prevented from being entrained by the long fibers nipped by the detaching rollers. In other words, the remaining short fibers, which are not located at the frictional force imparting area, are still possibly entrained by the long fibers nipped by the detaching rollers. Furthermore, the long fibers other than those nipped by the detaching rollers are, if not controlled by the frictional force at the frictional force imparting area due to the fact the latter is narrow, also moved by the long fibers withdrawn by the detaching rollers, thereby causing the moved long fibers to be possibly removed as a waste during an execution of a combing step.

In the latter nipper device in Japanese Unexamined Patent Publication No. 2-31128 or Japanese Unexamined Patent Publication No. 3-57971, only one location is provided for imparting the frictional force. Thus, disadvantages arise similar to those at the former type nipper device. Furthermore, an amount of the depression of the fiber bundle, which corresponds to the frictional force between the fibers, is determined only by the dimension of the gap between the auxiliary nipper and the cushion plate. As a result, a tiresome and complicated fine adjustment of the gap in accordance with the thickness of the fiber bundle, i.e., a grain of the fiber bundle, is needed in order to obtain a desired effect.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a nipper device capable overcoming the difficulties in the prior art.

Another object of the present invention is to provide a nipper device, capable of obtaining a positive control of the entrainment of the long and short fibers, while keeping the advantage of the provision of the curved section in the passageway of the fiber bundle.

Still another object of the present invention is to provide a nipper device capable of straightening hooked fibers.

Further another object of the present invention is to

provide a nipper device capable of reducing a waste ratio, while reducing the amount of long fibers in the waste fibers.

In an aspect of the present invention, a method is provided for delivering fibers in a bundle in a comber having a cushion plate, a feed roller on the cushion plate, and detaching rollers, the method comprising the steps of:

nipping the fiber at a first nipping point between the cushion plate and the feed roller and a second nipping point between the detaching rollers;
deflecting, at a first location downstream from the first nipping point, the fiber bundle in a first direction transversely thereto for generating an increased frictional force between the fibers in the bundle;
deflecting, at a second location downstream from the first location but upstream from the second nipping point, the fiber bundle in a second direction which is opposite to the first direction for generating an increased frictional force between the fibers in the bundle;
rotating the detaching roller for detaching, from the fiber bundle, fibers nipped by said detaching rollers at said second nipping point.

According to the present invention, a frictional force is imparted to the fiber bundle at a plurality of locations in the fiber bundle. Thus, an increase in the number of the frictional force imparting areas is obtained. Thus, due to the increased number of the frictional force imparting areas, an entrainment of floating fibers is effectively prevented when compared with the prior art where only a singe frictional force imparting area is provided. Furthermore, a deflection of the fiber bundle is done at a plurality of locations for imparting frictional forces, which makes an adjustment of the degree of the deflection to be unnecessary even in a case where the grain of the fiber bundle is to be changed.

In a second aspect of the present invention, a nipper device of a comber having a detaching roller is provided, comprising:

a cushion plate which is subjected to a reciprocating movement with respect to the detaching rollers;
a nipper which is movable with respect to the cushion plate between a first position where a fiber bundle is nipped between the nipper and the cushion plate and a second position where the fiber bundle is freed between the nipper and the cushion plate;
a feed roller on the cushion plate for feeding the fiber bundle on the cushion plate;
a first deflector at a location downstream from the feed roller for deflecting the movement of the fiber bundle in a first direction away from the cushion plate, and;
a second deflector at a location downstream from the feed roller and upstream from the detaching roller for deflecting the movement of the fiber bundle in a second direction opposite from the first direction.

Advantageously, the said second deflector forms at an end facing the cushion plate an arc or beveled surface, which, on one hand, allows the fiber bundle from the first deflector to be smoothly guided and, on the other hand, allows the frictional contact area to be increased.

Advantageously, the cushion plate includes a plate shaped body and a feed roller plate on the plate shaped body, the feed roller plate having a recessed portion for receiving a lower outer peripheral part of the feed roller and of a curvature larger than the radius of the feed roller and a projected portion as the first deflector, projected from an upper surface of the plate shaped body.

Advantageously, means is further provided for adjusting a relative position of the feed roller plate with respect to the feed roller in a direction of the plane of the cushion plate. According to this structure, a relative position of the feed roller plate with respect to the cushion plate is varied in a forward or rearward direction of the movement of the fiber bundle, so that the nipping point between the arc shaped recessed upper part of the cushion plate and a bottom outer peripheral part of the feed roller, i.e., nipping gauge is varied, without changing the position of the feed roller, when a fiber bundle of a different fiber length is treated.

Advantageously, the feed roller plate is made of a resilient plate. This construction makes it possible that the pressing force to the feed roller from the above causes the recessed part of the feed roller plate to be deformed to follow the shape of the bottom outer periphery of the feed roller, thereby providing an increased nipping area.

BRIEF EXPLANATION OF ATTACHED DRAWINGS

Fig. 1 is a side and partially sectioned view of a nipper device in a rearward position.

Fig. 2 is the same as Fig. 1 but is in a forward position.

Fig. 3 is a partial enlarged view of Fig. 1 illustrating an essential part of the nipper device.

Fig. 4 is a partial top plan view of the nipper part illustrating a mount structure of a feed roller plate.

Fig. 5a shows a positional relationship between a feed roller and a feed roller plate to obtain an increased nipping length.

Fig. 5b is the same as Fig. 5a but illustrating a positional relationship between the feed roller and the feed roller plate to obtain a reduced nipping length.

Figs. 6a to 6g are timing charts illustrating the operation of the nipper device according to the present invention.

DETAILED EXPLANATION OF AN EMBODIMENT

In Fig. 1 showing a nipper device according to an embodiment of the present invention, a reference numeral 1 denotes a combing cylinder, which is mounted to a combing cylinder shaft 2. A reference numeral 3 denotes a pair of detaching rollers, and 4 a top comb. In a well known manner, the top comb 4 is subjected to a back and forth reciprocating movement as well as a top and bottom reciprocating movement during a back and forth reciprocating movement of a nipper body. A reference numeral 5 denotes a nipper device, which is, in Fig. 1, arranged at a backward location of the detaching rollers 3 and the top comb 4. The nipper device 5 is located at a position upstream from the detaching rollers 3 and the top comb 4 in the direction of a movement of the fiber bundle. The nipper device 5 together with the combing cylinder 1, the detaching rollers 3 and the top comb 4 construct a combing mechanism. The nipper device 5 is provided with a nipper body 6, which is constructed by a body portion 6a which extends in the direction of the width of the fiber bundle and supporting arm portions 6 connected to ends of the body portion 6a and extending rearwardly therefrom.

The body portion 6a of the nipper body 6 is connected to a supporting lever (not shown) which is rotatably connected to a machine frame (not shown), while the supporting arm portion 6b of the nipper body 6 is at its rear end 6b-1 rotatably connected to a swing lever (not shown) connected to a nipper shaft 7, which effects a reciprocal rotating movement. In a well known manner, the reciprocal rotating movement of the nipper shaft 7 causes the nipper body 6 to be subjected to a back and forth reciprocating movement between a retracted position as shown in Fig. 1 and a extracted position as shown in Fig. 2. In Figs. 1 and 2, in the reciprocal movement of the nipper body 6 between the retracted and extracted positions, a trajectory of a position P is shown by a dotted line K. The nipper device further includes a cushion plate 50, which is constructed by a plate shaped body 51 and a feed roller plate 52. The plate body 51 is, at its rear end, fixed to a body portion 6a. A pair of selvage guides 8a are integrally formed on side end portions of a top surface of the plate shaped body 51 in such a manner that a bundle a of the fiber is guided by the selvage guides 8a.

The nipper device is further provided with a feed roller 9, which is arranged on the feed roller plate 52 of the cushion plate 50. Namely, the feed roller plate 50 has a width which is equal to a length of the feed roller 9. Furthermore, the feed roller plate 52 is formed from a polished steel plate having a resiliency. The arrangement of the plate 52 with respect to the roller 9 is such that the direction of the polishing coincides with the direction of the movement of the fiber bundle a by the roller 9. In a well known manner, the polished steel plate has a surface, which is easy for a fiber bundle to slide thereon. Thus, additional machining is not required, while a smooth movement of the fiber bundle a on the surface of the plate 52 by means of the feed roller 9 is obtained. In comparison with a conventional structure, where, without intervening the feed roller plate 52, the feed roller 9 is directly contacted with the plate body 51, the employment of the feed roller plate 52 may eliminate a necessity of polishing the surface of the plate 51, resulting in a reduction of a cost due to an elimination of a polishing process.

In Fig. 3, the feed roller plate 52 is formed with a horizontally extending mounting portion 53, a fiber bundle guiding portion 54 extending obliquely and downwardly from the portion 53, an arc shaped recessed portion 55 which is a continuation of the fiber bundle guiding portion 54, has a radius R (Fig. 5a) larger than the radius r of the feed roller 9 and is looped around the roller 9 from a rear, upper position to a front upper position via a bottom position between the front and rear portions, and a projected portion 56 which is located above the upper surface of the plate member 51 and which is inclined upwardly from the end of the arc shaped recessed portion 55. The mounting portion 53 (Fig. 3) of the feed roller plate 52 is, at ends in its width, formed with holes 52a elongated in the direction of the movement of the fiber bundle a, through which bolts 57 are inserted and screwed to base portions 6c at ends of the nipper body 6a in the direction of its width, thereby fixing the mounting plate 52 to the nipper body 6. As a result of this structure, an adjustment of the position of the feed roller plate 52 with respect to the feed roller 9 becomes possible in the back and forth direction. See Figs. 5a and 5b.

The feed roller 9 is rotatably rested on the arc shaped recess 55 of the feed roller plate 52. The feed roller 9 is supported to a rocking arm (not shown) so that the roller 9 is positively driven. The rocking arm is supported concentrically to a shaft which supports a passage changing member 16 for allowing the latter to be subjected to a rocking movement in such a manner that, during the retracting movement of the nipper body 6, a positive rotating movement of the feed roller 9 for a predetermined amount is obtained, thereby feeding the fiber bundle a in a forward direction.

In the structure of the embodiment according to the present invention, a center C1 of the circle of the upper recessed portion 55 of the feed roller plate 52 (Fig. 5a) is located forwardly with respect to a center C2 of the rotating movement of the feed roller 9, i.e., the axis of the rotor 9. As a result of this geometry, a contact point between the feed roller 9 and the upper recessed portion 55 of the feed roller plate 52, i.e., a nip point N1 between the feed roller 9 and the plate 52 is determined as a nodal point between the line passing the centers C1 and C2 and the arc shaped recess portion 55, as shown in Fig. 5a. According to the embodiment, the feed roller plate 52 is itself constructed as a plate having an elasticity, so that an arrangement of the feed roller 9 on the arc shaped recessed portion 55 of the plate 52 automatically causes the plate 52 to be slightly deformed along the

contour of the lower portion of the feed roller 9, so that a nipping between the roller 9 and the plate 52 is occurred along a surface which extends in a forward and a rearward direction with respect to the nipping point N1, thereby obtaining an increased nipping force.

Again in Fig. 1, a reference numeral 10 denotes a nipper, which is arranged to be moved up and down with respect to the cushion plate 50. The nipper 10 has ends, which are fixedly connected to nipper arms 11 at their front ends lla. The nipper arms 11 are rotatably connected to front ends of a pair of supporting arm parts 6b of the nipper body 6. In a well known manner, the nipper arms 11 have rear ends 11b, to which a first spring rod 12 is at its end connected by means of a pin 100. The other end of the rod 12 is inserted to a first pivot member 13 via its opening 13a, which pivot member 13 is rotatably connected to the machine frame. The rod 12 is projected out of the hole 13a, while a nut 14 is screwed to the projected end of the rod 12. A coil spring 15 is arranged between a flange portion 12-1 of the rod 12 and a recess 13-1 (Fig. 2) of the pivot member 13, so that the nut 14 is urged forwardly in order to make a contact with the pivot member 13.

In a well known manner, during the forward movement of the nipper body 6, at a location adjacent the forward end of the movement, the forward movement of the rear end 11b of the nipper arm 11 is stopped by the spring rod 12. The following continuation of the forward movement of the nipper body causes the nipper 10 to be moved upwardly as shown in Fig. 2, thereby causing the nipping of the fiber bundle a to cease. When the rearward movement of the nipper body 6 is commenced, the nipper 10 is moved downwardly so that the fiber bundle a is nipped between the nipper 10 and the cushion plate 50 as shown in Fig. 1. A continuation of the rearward movement of the nipper body 6 causes the spring 15 to be compressed, while the spring rod 12 is moved in the rearward direction.

In Fig. 1, a reference numeral 16 denotes a member for changing a passageway for the fiber bundle and is arranged so as to be moved up and down with respect to the cushion plate 50. The member 16 has a width which corresponds to that of the fiber bundle a. The member 16 has ends fixed to arms 17 at their front ends 17a, while the arms 17 are rotatably connected to front ends of the pair of the supporting arms 6b of the nipper body 6. A reference numeral 18 denotes a connecting bar for connecting the pair of the arms 17 which are spaced along the width of the machine. A lever 19 is fixedly connected to the connecting bar 18 at its central part in its length. The lever 19 has a top end which is connected to an end of a second spring rod 20 by means of a pin 102. Connected to the other end of the spring rod 20 is a second pivot member 22, which is rotatably connected to a drive plate 21, which is fixedly connected to the nipper shaft 7. Namely, the pivot member 22 is formed with an opening 22a to which the spring rod 20 is slidable inserted and is projected out of the opening 22a. An adjusting nut 23 and a lock nut 24 are screwed to the end of the rod 20 projected from the pivot member 22. A coil spring 25 is arranged between a flange portion 20-1 of the rod 20 and the pivot member 22, so that the spring rod 20 is urged to be moved forwardly, so that the lock nut 23 is contacted with the pivot member 22.

An adjustment of the position of the adjustment nut 23 on the rod 20 is such that, during the rearward movement of the nipper body 6, an upward movement of the passageway changing member 16 occurs, while, during the forward movement of the nipper body 6, a downward movement of the passageway changing member 16 occurs.

In Fig. 3 showing an essential an arrangement of the present invention, the projected portion 56 of the feed roller plate 52 has an apex 56a, while the passageway changing member 16 has a bottom end 16a faced with the cushion plate 50. An arrangement of the apex 56a of the projected portion 56 and the passage changing member 16 is such that the apex 56a is located above the bottom end 16a of the passageway changing member 16 when the latter is located at its lowest position, so that the fiber bundle, which otherwise will be in a straight condition as shown by a phantom line X, is displaced downwardly as shown by a solid line Y. In other words, due to a provision of the projected portion 56 as well as the deflector 16 according to present invention, an upwardly and downwardly angled passageway of the fiber bundle a is created. As a result, as shown in Fig. 4, the projected portion 56 of the feed roller plate 52 contacting with the fiber bundle a generates a frictional force imparting area P1, while the deflector 16 contacting with the fiber bundle a generates a frictional force imparting area P2. These areas P1 and P2 extend not only along the total width of the fiber bundle a but also along a length of the fiber bundle a. As a result, an increase area of the frictional contact with respect to the fiber bundle is obtained.

As shown in Fig. 3, the outer surface of the projected portion 16a of the deflector 16 contacting with the fiber bundle a is constructed as a arc shaped surface 16b, which allows the fiber bundle a to be smoothly guided and which allows the fiber bundle to contact with the surface under an increased contact angle, thereby increasing the area P2 for imparting the frictional force to the fiber bundle a. As an alternative, the surface 16b may be a straight surface, which is inclined so that it is an extension as the inclined surface of the projected portion 56.

The deflector 16 has a similar outer profile as a auxiliary nipper in a prior art. The function of the auxiliary nipper is, however, for nipping a fiber bundle with respect to the cushion plate. This function of the auxiliary nipper is quite different from that of the deflector 16 according to present invention, since the latter is for deflecting the direction of the movement of the fiber bundle downwardly. In other words, the deflector 16 according to present invention does not function to nip the fiber

bundle with respect to the cushion plate 50. In view of this, the portion of the cushion plate 50 faced with the lower end 16a of the deflector 16 may be largely recessed, so as to prevent the deflector end 16a from being contacted with the cushion plate 16.

In Fig. 1, a reference numeral 26 denotes a positioning device, which is constructed by a stopper formed as an adjusting screw 29 screwed into a screwed hole 27 in the connecting bar 18 of the arm 17 and a lock nut 29 for fixing the adjusting screw 28. A degree of a projection of the adjusting screw 28 from the bar 18 is adjusted that the adjusting screw 28 is contacted with a stopper portion 6c of the nipper body 6 for preventing the arm 17 from being rotated further, when the deflector 16 is lowered to a position capable of deflecting, from a position X, slightly downwardly the fiber bundle a of the least thickness which is supposed to be treated by the instant combing machine, and the following forward rotating movement of the drive lever 21 causes the pivot member 22 to compress the spring 25.

In the above structure of the positioning device 26, the adjusting screw 28 may, as an alternative, be connected to the nipper body 6 or the lever 19. The spring 25 is not for generating a pressing force to the fiber bundle a as in the case in the prior art but for making the adjusting nut 23 to be positively contacted with the pivot member 22 in the condition as shown in Fig. 1. Furthermore, in the structure in the embodiment, the lowest position of the deflector 13 may be-adjusted for controlling a degree of the angle of the fiber bundle 2 between the deflector 16 and the nip point N1 in accordance with factors such as a length of the fibers constructing the bundle, a fiber thickness and a friction coefficient of the fiber.

In an operation of the comber according to the present invention, a forward movement as shown by a_1 in Fig. 6a of the nipper body 6 from a condition as shown in Fig. 1 by a rotating movement of the nipper shaft 7 causes the deflector 16 to be gradually moved downwardly as shown by C_1 in the timing chart as shown in Fig. 6c, while the nipper 10 is gradually moved upwardly as shown by b_1 in Fig. 6b. Due to the upward movement a_1 of the nipper 10, the fiber bundle a is freed. Contrary to this, due to the downward movement of the deflector 16, the fiber bundle a, which was previously deflected upwardly by the projected portion 56, is deflected downwardly by the deflector 16. The fiber bundle a is then delivered forwardly via the space between the nipper 10 and the cushion plate 50. When the deflector 16 is moved to the lowest position as shown in Fig. 2, the adjusting screw 28 is contacted with a stopper portion 6c at the end of the nipper body 6, which causes the lowest position of the deflector 16 to be maintained, regardless a continuation of a further rotating movement of the drive lever 21. At the lowest position of the deflector member 16, the lower end 16a of the deflector 16 is, as shown in Fig. 3, located below the apex 56a of the projected portion 56 of the feed roller plate 52, so that the angled state of the fiber bundle a is obtained at the location just downstream from the feed roller 9. As a result, an increased frictional force between the fibers is obtained at two frictional force imparting areas P1 and P2, which correspond the projected portion 56 and the deflector 16, respectively.

During the forward movement as shown by a_1 of the nipper body 6, at a time t_0, a switching of a direction of a rotating movement of the detaching rollers 3 from a forward direction as shown by g_1 in Fig. 6g to a reverse direction g_2 occurs. Thus, a continuation of the forward movement of the nipper body 6 causes the front end of the fiber bundle a to be nipped by the detaching rollers 3 which are now rotating forwardly as shown by g_2 in Fig. 6g. As a result, a fleece of the fibers, which is nipped by the detaching rollers 3, is withdrawn from the fiber bundle a from the feed roller 9.

When the nipper body 6 is moved to the position which is adjacent to the forward end position as shown in Fig. 2, the top comb 4 is moved downwardly as shown by a curve f_1, which causes the top comb 4 to penetrate into the fiber bundle a moving between the detaching rollers 3 and the deflector 16. As a result, the forward rotating movement of the detaching rollers 3 as shown by g2 in Fig. 6g causes the fibers nipped by the rollers 3 to be withdrawn by the rollers 3, while the fiber bundle is subjected by the combing operation by the top comb 4, so that the short fibers in the bundle are blocked and prevented from being entrained by the fibers nipped and withdrawn by the detaching rollers 3. In a known manner, the short fibers in the fiber bundle are, in the following combing period, removed by the combing cylinder 3.

As explained above, during the detaching process of the fibers in the bundle a by the detaching rollers 3, a situation will be more likely where short fibers floating in the fiber bundle a are located at the frictional force imparting areas P_1 and P_2, which correspond to the projected portion 56 and the deflector 16, respectively. Namely, at the area P_1 and P_2, an increased frictional force between the fibers is obtained. As a result, when the fibers of a longer length nipped by the detaching rollers 3 are withdrawn by the rollers 3 which rotate in the forward direction as shown by g_2 in Fig. 6g, the floating fibers of a shorter length stay without being moved. In other words, an entrainment of the floating fibers by the movement of the fibers of the longer length nipped by the detaching rollers 3 is less likely, so that straightening of hooked portions at the ends of the fibers are promoted. Furthermore, as to the fibers of the longer length, which are not nipped by the detaching rollers 3 and which are to be drawn by the detaching rollers 3 at the following detaching period, it is more likely that these fibers stay without, being moved under the effect of the increased frictional force between the fibers at the area P_1 and P_2 i.e., are prevented from being entrained by the movement of the fibers nipped by the detaching rollers 3. As a result, a reduction of an amount of fibers of a longer length which are located at the rear side of the top comb 4 is obtained in comparison with the prior art,

thereby reducing a total amount of fibers to be wasted, i. e. , reducing a rate of wasted long fibers in the total amount of fibers.

Furthermore, according to present invention, due to a provision of the projected portion 56 and the deflector 16, a week resistance force is generated to the fiber bundle a, so that an increased tension is generated in the fiber bundle a, which allows the top comb 4 to be deeply penetrated into the fiber bundle a, thereby allowing short fibers to be positively separated from the fibers drawn by the detaching rollers 3.

Then, the nipper body 6 commences a rearward movement as shown by a_2 in Fig. 6a and the combing operation by top comb 4 is ceased as shown by f_2 in Fig. 6f. Then, the deflector 16 commences an upward movement as shown by c_2 in Fig. 6c, so that the downward deflection of the fiber bundle a by means of the deflector 16 ceases. The rearward movement of the nipper body 6 to the position as shown by Fig. 1 as shown by a_2 in Fig. 6a causes the nipper to be also subjected to a downward movement as shown by b2 in Fig. 6b, so that the fiber bundle a is nipped between the nipper 10 and the cushion plate 50. Then, a rotating movement of the feed roller 9 is commenced as shown by d_1 in Fig. 6e, so that a feeding of the fiber bundle a is commenced. However, due to the nipped condition of the end of the fiber bundle at the nipper 10, the fibers in the fiber bundle a at a location between the nipper 10 and the feed 3 roller 9 are held there while being slightly folded. On the other hand, the nipped end of the fiber bundle a projected from the nipper 10 is subjected to a combing operation by the combs at the combing cylinder 1, as shown in Fig. 6f.

The above explanation is directed to a so-called backward feed system where a feed of the fiber bundle a is done during a rearward movement of the cushion plate 50. However, the idea of the present invention is applicable to a so-called forward feed system, where the feed of the fiber bundle a is done during a forward movement of the cushion plate 50.

Now, a process for adjustment of the feeding device according to present invention, when a change in a fiber length occurs, will explained. First, from the feed roller plate 52, the feed roller 9 is swung upwardly by an upward swing movement of arms (not shown in the drawings). Then, the screw 57 (Fig. 3) is loosened, which allows the feed roller plate 52 to be horizontally moved, while guided by the elongated slot 52a of the plate 52 to which the screw member 57 is passed, so that a desired position of the roller plate 52 is obtained in accordance with the fiber length. Namely, when the fiber length is increased, the feed roller plate 52 is moved correspondingly forwardly. Contrary to this, when the fiber length is decreased, the feed roller plate 52 is moved correspondingly rearwardly. Due to such a movement of the feed roller plate 52, a position of contact of the arc shaped recessed portion 55 with respect to the feed roller 9, i.e., a position of a contact of the feed roller 9 with respect to the feed roller plate 52 is varied. For example, in Fig. 5a, a position of a contact of the feed roller plate 52 with respect to the feed roller 9 is shown by N1. Fig. 5b shows a state where the feed roller plate 52 is, from the position in Fig. 5a, moved rearwardly. In Fig. 5b, the position of a contact of the feed roller plate 52 with respect to the feed roller 9 is shown by N2. In this case, a distance between the nip point N2 between the feed roller 9 and the feed roller plate 52 and the nip point between the detaching rollers 3 is reduced over that in Fig. 5a. Thus, due to the arrangement in Fig. 5b, treatment of a fiber bundle a of shorter length is possible compared to that in Fig. 5a.

According to the present invention, due to the provision of a plurality of locations for imparting frictional force, the chances are increased that short fibers in the fiber bundle are controlled by the frictional force imparting areas. Thus, an occurrence of an entrainment of short fibers is effectively suppressed, and straightening of hooked portions at rear ends of the fibers is obtained. Furthermore, as far as long fibers other than those detached by the detaching roller and to be detached at the following detaching process are concerned, the chances are also increased that the long fibers are controlled by the increased area of the frictional force imparting area, resulting in a reduction of a ratio of long fibers which are included in waste fibers. Furthermore, due to the deflection at different locations of the fiber bundle, an increased tension is generated in the fiber bundle, which allows a top comb 4 to deeply penetrate into the fiber bundle, resulting in an effective elimination of short fibers by the top comb 4. Furthermore, according to present invention, an increase in the frictional force is obtained by the provision of a plurality of frictional force imparting areas P_1 and P_2. As a result, a reduction of a change in the frictional force by a change in the thickness of the fiber bundle is reduced over that in the prior art where a compression of the fiber bundle is done along the thickness of the fiber bundle by an auxiliary nipper. As a result, fiber bundles with an increased range of a grain can be handled without changing a setting.

Claims

1. A method for a delivery fibers in a bundle in a comber having a cushion plate, a feed roller on the cushion plate, and detaching rollers, the method comprising the steps of:

   nipping the fiber at a fist nipping point between the cushion plate and the feed roller and a second nipping point between the detaching rollers;

   deflecting, at a first location downstream from the first nipping point, the fiber bundle in a first direction transversely thereto for generating an increased frictional force between the fibers in

the bundle;
deflecting, at a second location downstream from the first location but upstream from the second nipping point, the fiber bundle in a second direction which is opposite to the first direction for generating an increased frictional force between the fibers in the bundle;
rotating the detaching roller for detaching, from the fiber bundle, fibers nipped by said detaching rollers at said second nipping point.

2. A nipper device of a comber having a detaching roller, comprising:

a cushion plate which is subjected to a reciprocating movement with respect to the detaching roller;
a nipper which is movable with respect to the cushion plate between a first position where a fiber bundle is nipped between the nipper and the cushion plate and a second position where the fiber bundle is freed between the nipper and the cushion plate;
a feed roller on the cushion plate for feeding the fiber bundle on the cushion plate;
a first deflector at a location downstream from the feed roller for deflecting the movement of the fiber bundle in a first direction away from the cushion plate, and;
a second deflector at a location downstream from the feed roller and upstream from the detaching roller for deflecting the movement of the fiber bundle in a second direction opposite from the first direction.

3. A nipper device according to claim 2, wherein said cushion plate includes a plate shaped body and a feed roller plate on the plate shaped body, the feed roller plate having a recessed portion for receiving a lower outer peripheral part of the feed roller and of a curvature larger than the radius of the feed roller and a projected portion as the first deflector, projected from an upper surface of the plate shaped body.

4. A nipper device according to claim 3, further comprising means for adjusting a relative position of the feed roller plate with respect to the feed roller in a direction of the plane of the cushion plate.

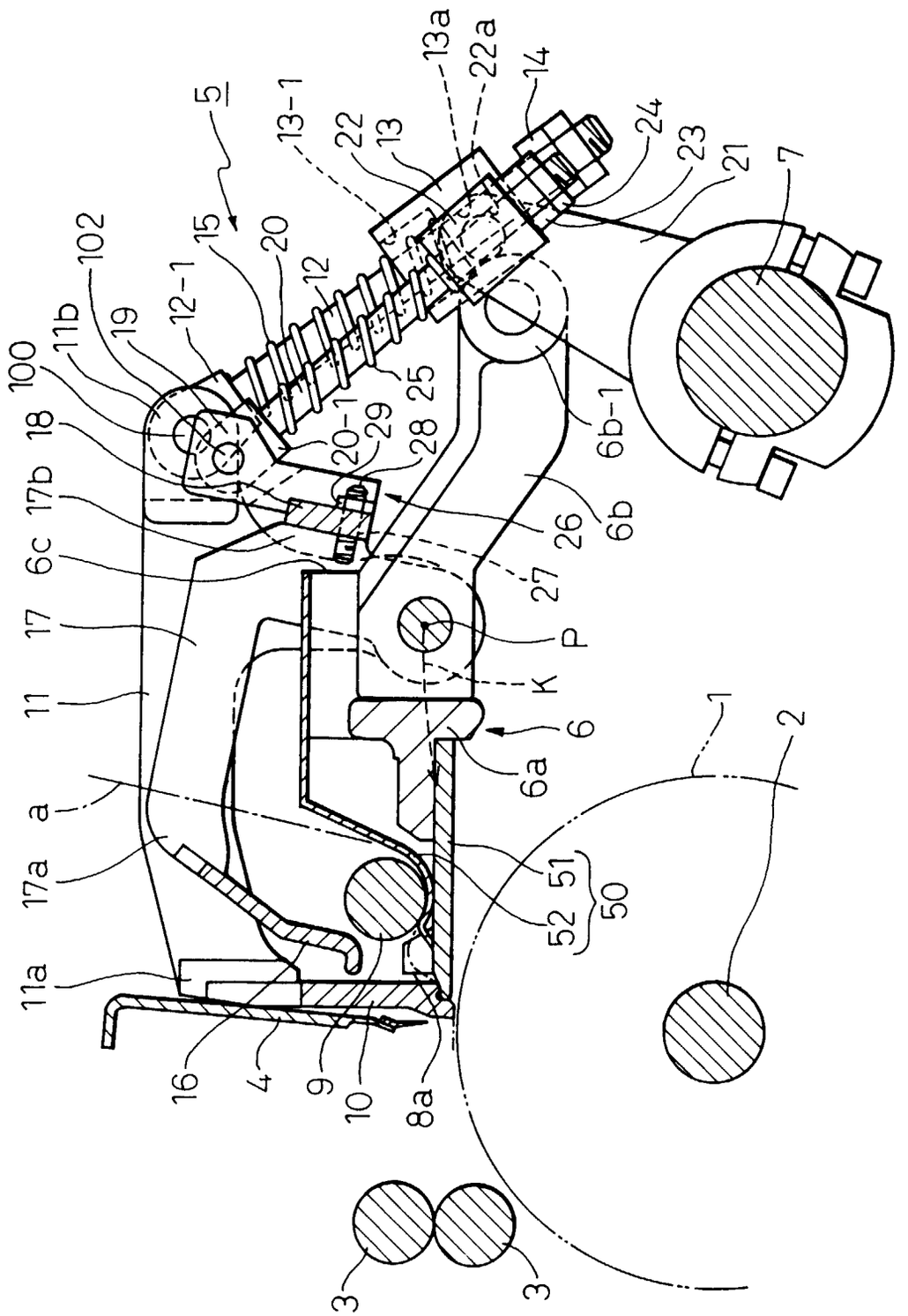
5. A nipper device according to claim 3, wherein said feed roller plate is made of a resilient plate.

6. A nipper device according to claim 2, wherein said second deflector forms, at an end facing the cushion plate, an arc or a beveled surface.

7. A nipper device according to claim 1, wherein said second deflector is formed as an arm which is rotatable about an axis to be moved between a working position for deflecting the fiber bundle and a rest position and the device further comprises a stopper for contacting with the second deflector to obtain said working position.

8. A nipper device according to claim 7, further comprising an adjusting means for adjusting the stopper means so that the working position of the second deflector is adjusted.

Fig.1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11
a
17a
11a
16
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9
10
8a
3
3
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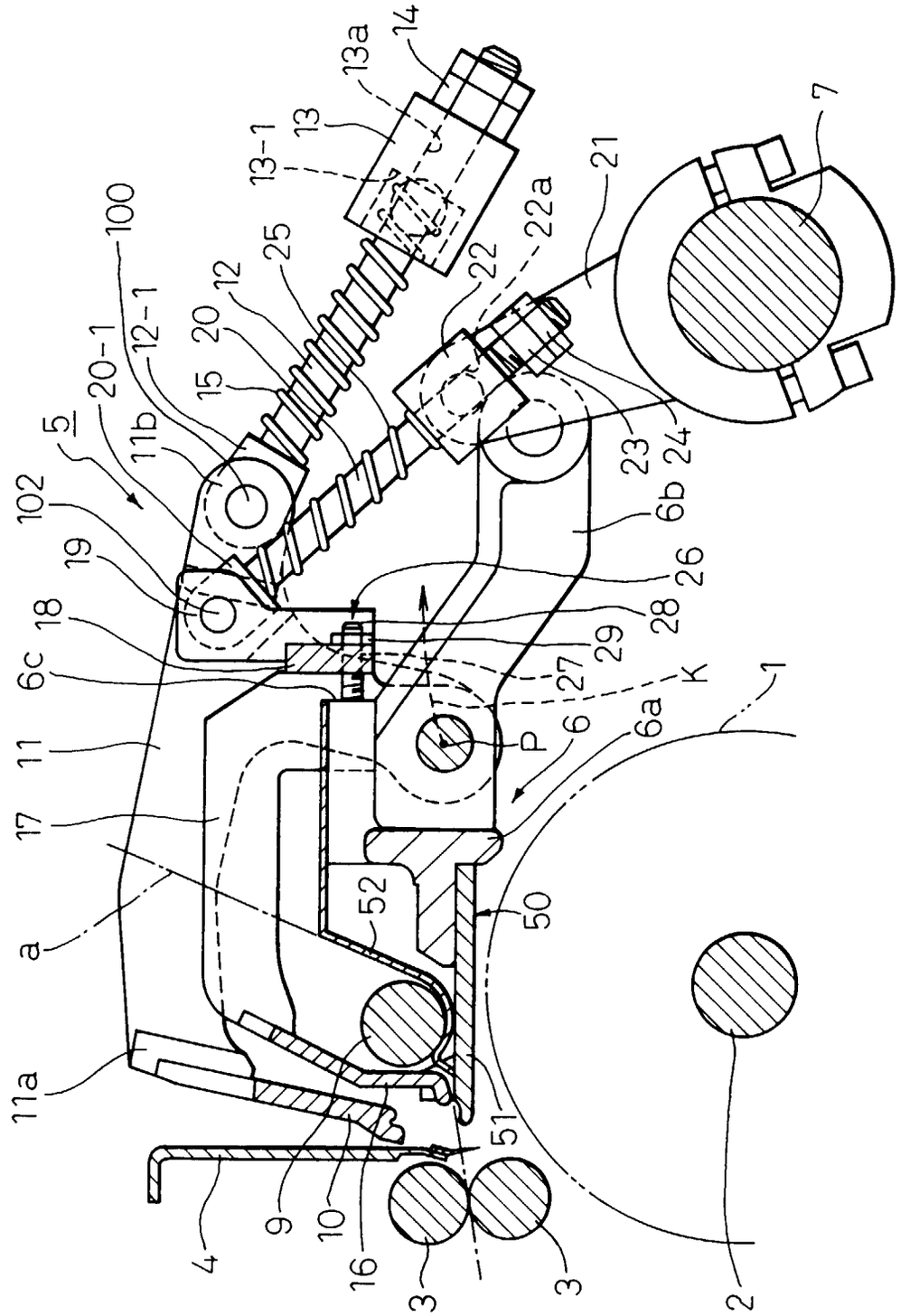
51
52
50

Fig.2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29
27
K
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6
6a
P
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2

Fig.3

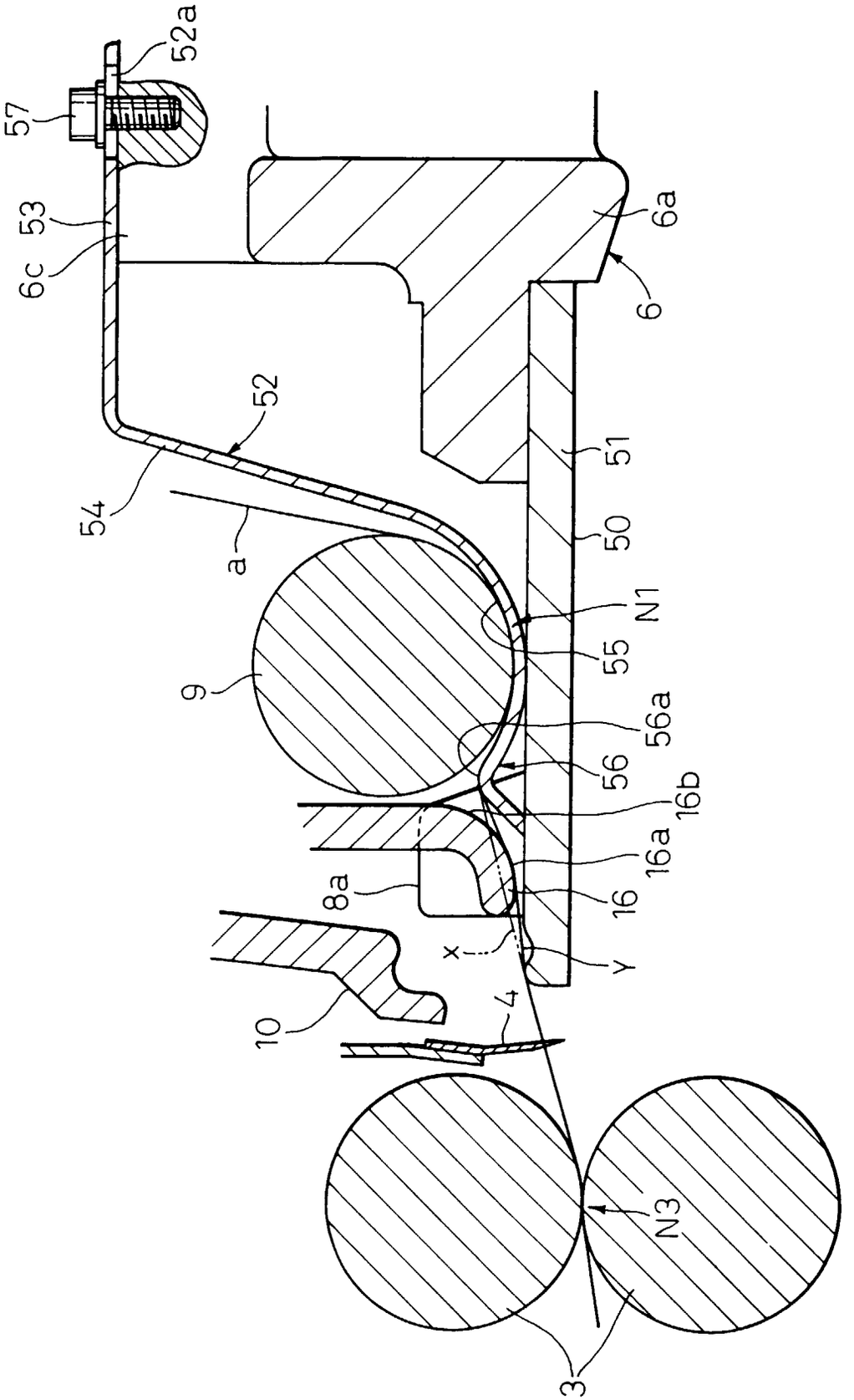


Fig. 4

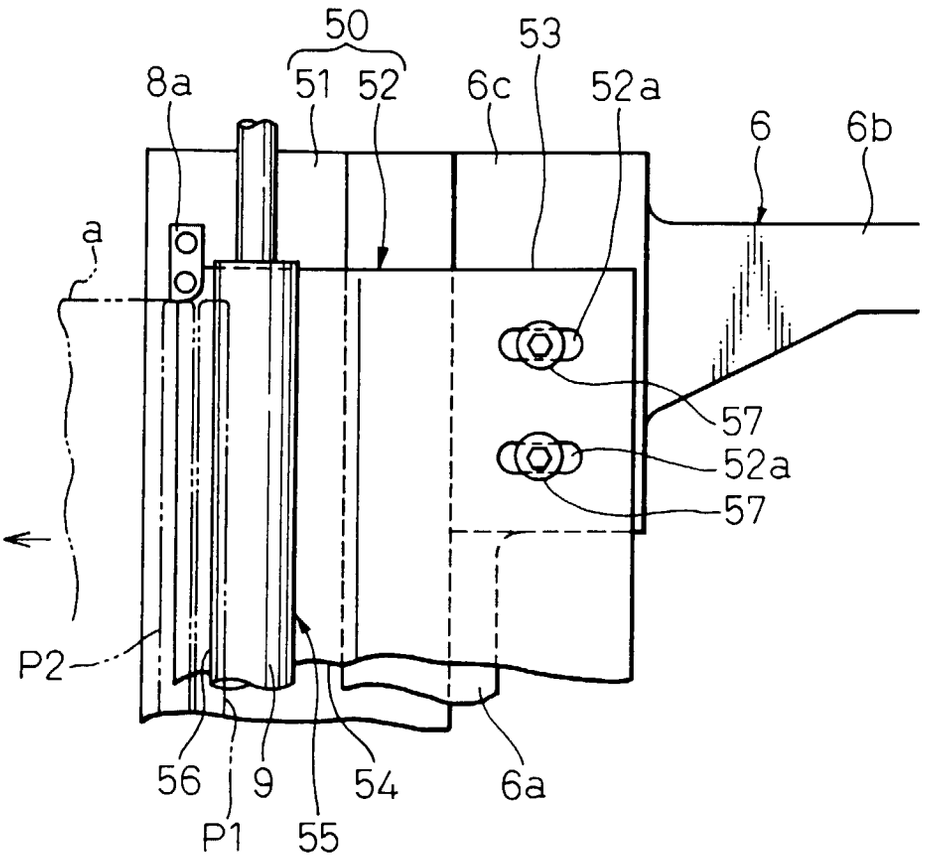


Fig.5a

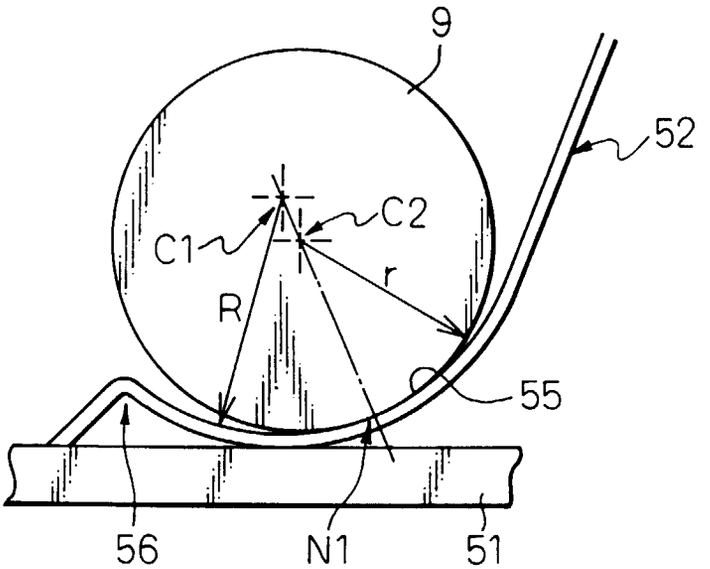
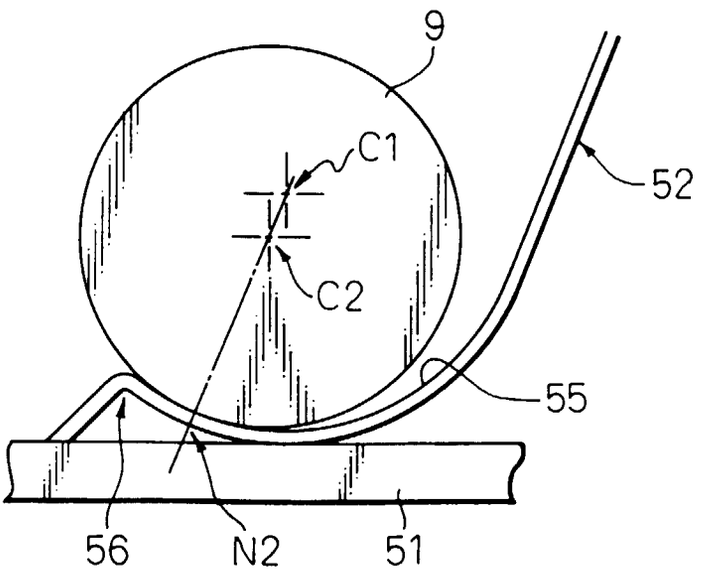
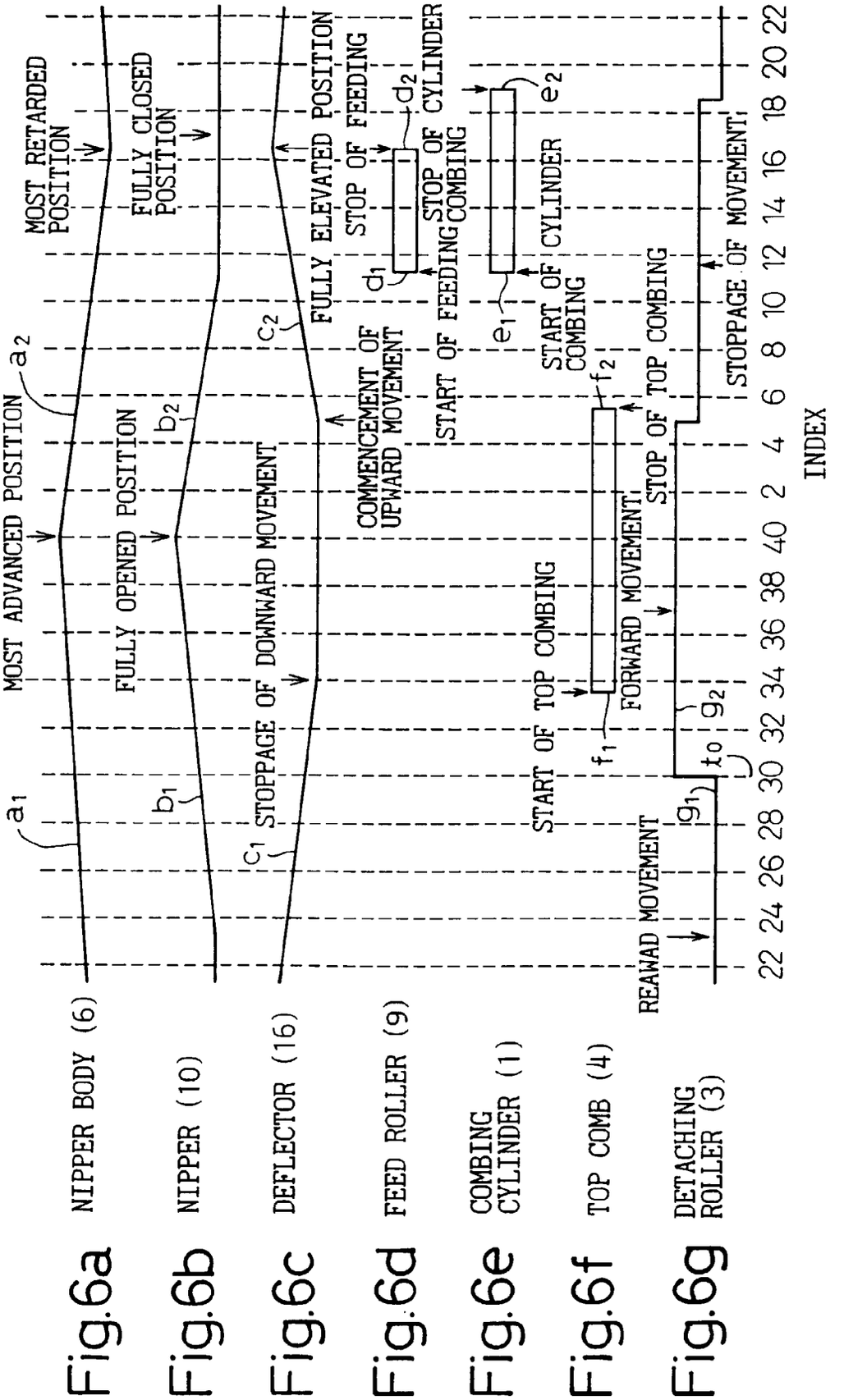


Fig.5b




MOST ADVANCED POSITION
MOST RETARDED POSITION
FULLY OPENED POSITION
FULLY CLOSED POSITION
STOPPAGE OF DOWNWARD MOVEMENT
FULLY ELEVATED POSITION
COMMENCEMENT OF UPWARD MOVEMENT
STOP OF FEEDING
START OF FEEDING
STOP OF CYLINDER COMBING
START OF TOP COMBING
START OF CYLINDER COMBING
FORWARD MOVEMENT
STOP OF TOP COMBING
REAWAD MOVEMENT
STOPPAGE OF MOVEMENT
INDEX
NIPPER BODY (6)
NIPPER (10)
DEFLECTOR (16)
FEED ROLLER (9)
COMBING CYLINDER (1)
TOP COMB (4)
DETACHING ROLLER (3)
Fig.6a
Fig.6b
Fig.6c
Fig.6d
Fig.6e
Fig.6f
Fig.6g

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 81 0396

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 571 324 A (MASCHINENFABRIK RIETER A.G.)	1,2	D01G19/16
A	* column 2, line 22 - column 4, line 37; claims 1,3; figures 1-3 *	7	
A	EP 0 452 677 A (MASCHINENFABRIK RIETER A.G.) * column 4, line 54 - column 7, line 50; claim 1; figures 1-6 *	1	
A	DE 72 108 C (WEELE TER,F.)		
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 383 (C-393), 23 December 1986 & JP 61 174425 A (HOWA MACH LTD), 6 August 1986, * abstract *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D01G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 September 1997	Munzer, E

CATEGORY OF CITED DOCUMENTS

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