(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 124 658 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
06.03.2019 Bulletin 2019/10

(21) Application number: **16179877.2**

(22) Date of filing: **18.07.2016**

(51) Int Cl.:
D01H 5/36 *(2006.01)* ***D01H 5/88*** *(2006.01)*
D02G 3/34 *(2006.01)*

(54) **DRAFTING DEVICE FOR SPINNING FRAME**

STRECKVORRICHTUNG FÜR SPINNRAHMEN

DISPOSITIF DE DESSIN POUR UN CADRE DE FILATURE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **29.07.2015 JP 2015149848**

(43) Date of publication of application:
01.02.2017 Bulletin 2017/05

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EP 3 124 658 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a drafting device for a spinning frame that spins a strand of yarn while changing the combination ratio of a first roving and a second roving.

[0002] For example, International Publication No. WO2015/033811 discloses such type of drafting device. As shown in Figs. 16 and 17, a drafting device 100 includes front rollers 101, middle apron pairs 102, and back apron pairs 103. The middle apron pairs 102 and the back apron pairs 103 are located at the rear of the front rollers 101. Each middle apron pair 102 feeds a first roving S11 to the front rollers 101. Each back apron pair 103 feeds a second roving S12 to the front rollers 101. The two apron pairs are arranged in two rows at the rear of the front rollers 101.

[0003] The front rollers 101 include a front bottom roller 101a and front top rollers 101b. Each middle apron pair 102 includes a middle bottom apron 104 and a middle top apron 105. The middle bottom apron 104 runs around a tensor bar 106, a middle bottom roller 107, and a tensioner 108. The middle top apron 105 runs around a middle top roller 109 and a tensioner 111 of an apron cradle 110.

[0004] Each back apron pair 103 includes a back bottom apron 112 and a back top apron 113. The back bottom apron 112 runs around the tensor bar 106, a back bottom roller 114, and the tensioner 108. The back bottom apron 112, which shares the tensor bar 106 and the tensioner 108 with the middle bottom apron 104, runs around the back bottom roller 114 passing by the circumference of the middle bottom roller 107.

[0005] The back top apron 113 runs around a back top roller 115 and the tensioner 111 of the apron cradle 110. The back top apron 113, which shares the tensioner 111 with the middle top apron 105, runs around the back top roller 115 passing by the circumference of the middle top roller 109.

[0006] The first roving S11 is fed to the middle apron pair 102 and then drafted into a fleece between the front rollers 101 and the middle apron pair 102. The second roving S12 is fed to the back apron pair 103 and then drafted into a fleece between the front rollers 101 and the back apron pair 103. The fleece is discharged from the front rollers 101 and then twisted into a strand of yarn.

[0007] The second roving S12 fed to the back apron pair 103 is formed by fibers. Some of the fibers are not held by any roller between a position where fibers are held by the front bottom roller 101a and the front top roller 101b and a position where fibers are held by the back bottom roller 114 and the back top roller 115. Some of such fibers are tangled with fibers that are held by the front bottom roller 101a and the front top roller 101b and pulled by the fibers held by the front bottom roller 101a and the front top roller 101b. This may separate fibers from the second roving S12 and break the second roving S12 between the holding position of the front bottom roller 101a and the front top roller 101b and the holding position of the back bottom roller 114 and the back top roller 115.

[0008] In this regard, the contact pressure between the back bottom apron 112 and the back top apron 113 may be increased by reducing the clearance between the tensor bar 106 and the tensioner 111 of the apron cradle 110. This limits the separation of fibers from the second roving S12 and the breaking of the second roving S12 between the holding position of the front bottom roller 101a and the front top roller 101b and the holding position of the back bottom roller 114 and the back top roller 115.

[0009] However, when the clearance is reduced between tensor bar 106 and the tensioner 111 of the apron cradle 110, the contact pressure between the middle bottom apron 104 and the middle top apron 105 is also increased. This hinders the feeding of fibers that form the first roving S11, which is fed to the middle apron pair 102, and are held by the front bottom roller 101a and the front top roller 101b. Thus, the drafting of the first roving S11 is hindered between the front rollers 101 and the middle apron pair 102.

[0010] JP S48 43976 B1 teaches a spinning frame that includes front rollers, cradle rollers, inter rollers, and apron pressing rollers. The spinning frame further includes a middle apron pair that feeds a rove to the front rollers and a back apron pair that feeds multi-filament yarn to the front rollers. The spinning frame includes a single lower apron.

[0011] US 2 239 863 A discloses a drawing frame including drawing rollers, a driving roller, a top roller, feed rollers, and two leather belts. The leather belts are driven by the driving and top rollers corresponding to the middle rollers. A contact pressure is adjusted between the two leather belts.

[0012] DE 195 47 462 A1 discloses a drafting system for spinning machines having drawing rollers, a driving roller, a top roller, feed rollers, and a pair of aprons. A contact pressure is adjusted between the pair of aprons.

SUMMARY OF THE INVENTION

[0013] It is an object of the present invention to provide a drafting device for a spinning frame that limits breaking of a second roving fed to a back apron pair while facilitating drafting of a first roving fed to a middle apron pair.

[0014] This object is solved by a drafting device for a spinning frame having the features of claim 1. Further developments are stated in the dependent claims.

[0015] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The invention, together with objects and advan-

tages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1 is a schematic perspective view showing one embodiment of a drafting device according to the present invention;
Fig. 2 is a schematic cross-sectional view of the drafting device;
Fig. 3 is a schematic perspective view of a middle trumpet member;
Fig. 4 is a cross-sectional view of the middle trumpet member;
Fig. 5A is an exploded perspective view showing a modified example of a middle trumpet member and a pressing member;
Fig. 5B is a schematic perspective view of the middle trumpet member;
Fig. 6 is a cross-sectional view of the middle trumpet member;
Fig. 7 is a schematic perspective view showing a modified example of a tensor bar;
Fig. 8 is a side view of the tensor bar;
Fig. 9 is a schematic perspective view showing a modified example of a tensor bar;
Fig. 10 is a schematic perspective view showing a modified example of a middle top roller;
Fig. 11A is a schematic diagram showing a state when a pressing member is not coupled to the middle top roller;
Fig. 11B is a schematic diagram showing a state when the pressing member is coupled to the middle top roller;
Fig. 12 is a schematic perspective view showing a portion of a modified example of a drafting device;
Fig. 13 is a cross-sectional view showing a modified example of a middle trumpet member;
Fig. 14 is a cross-sectional view showing a modified example of a middle trumpet member;
Fig. 15A and 15B are cross-sectional views showing modified examples of a middle trumpet member;
Fig. 16 is a schematic perspective view of a prior art drafting device; and
Fig. 17 is a schematic cross-sectional view of the prior art drafting device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] One embodiment of a drafting device for a spinning frame will now be described with reference to Figs. 1 to 4.

[0018] Referring to Figs. 1 and 2, a drafting device 10 includes front rollers 11, middle rollers 12 located at the rear of the front rollers 11, and back rollers 13 located at the rear of the middle rollers 12. The drafting device 10 is of a three-roller configuration. The front rollers 11 include a front bottom roller 11a and front top rollers 11b. Each middle roller 12 includes a middle bottom roller 12a and a middle top roller 12b. Each back roller 13 includes a back bottom roller 13a and a back top roller 13b. The drafting device 10 includes middle apron pairs 14, which feed a first roving S1 to the front rollers 11, and back apron pairs 15, which feed a second roving S2 to the front rollers 11. The drafting device 10 includes apron pairs in two rows so that two kinds of roving are fed to the common front rollers 11.

[0019] The front bottom roller 11a is supported by a roller stand (not shown). The front top rollers 11b are supported by a weighting arm 16, which is located above the middle top rollers 12b and the back top rollers 13b, with a support arm 17. The drafting device 10 is of a two-spindle integrated type and includes top rollers such as the front top rollers 11b at opposite sides of the weighting arm 16.

[0020] Each middle apron pair 14 includes a middle bottom apron 14a and a middle top apron 14b. The middle bottom apron 14a runs around the middle bottom roller 12a, a tensor bar 20, and a tensioner 21. The tensor bar 20 and the tensioner 21 are located between the front rollers 11 and the middle roller 12. The middle top apron 14b runs around the middle top roller 12b and an apron cradle 22, which is located between the front rollers 11 and the middle roller 12. The middle top apron 14b is driven by the middle bottom roller 12a while pressed by the middle bottom apron 14a.

[0021] Each back apron pair 15 includes a back bottom apron 15a and a back top apron 15b. The back bottom apron 15a runs around the back bottom roller 13a, the tensor bar 20, and the tensioner 21. Thus, the middle bottom apron 14a and the back bottom apron 15a both run around the tensor bar 20 and the tensioner 21. The back bottom apron 15a runs around the back bottom roller 13a passing by the circumference of the middle bottom roller 12a.

[0022] The back top apron 15b runs around the back top roller 13b and the apron cradle 22. Thus, the middle top apron 14b and the back top apron 15b both run around the apron cradle 22. The back top apron 15b runs around the back top roller 13b passing by the circumference of the middle top roller 12b. The back top apron 15b is driven by the back bottom roller 13a while pressed by the back bottom apron 15a.

[0023] A support bar 18 extends along the middle rollers 12 and the back rollers 13 between the middle rollers 12 and the back rollers 13. Middle trumpet members 30 are coupled to the support bar 18. Thus, the middle trumpet members 30 are located between the middle rollers 12 and the back rollers 13. Additionally, a support bar 19 is located at the rear of the back rollers 13. Back trumpets 19a are coupled to the support bar 19. Each back trumpet 19a guides the second roving S2 to the corresponding back apron pair 15.

[0024] As shown in Fig. 3, the middle trumpet member 30 includes an oblong tetragonal coupling portion 31. The

coupling portion 31 includes a rear surface 31a, which is in contact with the support bar 18. When the longitudinal direction of the coupling portion 31 conforms to the longitudinal direction of the support bar 18, the coupling portion 31 is coupled to the support bar 18.

[0025] The coupling portion 31 includes an upper edge that is formed integrally with a tetragonal tubular middle trumpet 32. The middle trumpet 32 guides the first roving S1 to the corresponding middle apron pair 14. The middle trumpet 32 is located on a first end of the coupling portion 31. The middle trumpet 32 includes a feed port 32a, to which the first roving S1 is fed, and a discharge port 32b, which discharges the first roving S1. The feed port 32a and the discharge port 32b open in directions orthogonal to each other.

[0026] Additionally, the upper edge of the coupling portion 31 is formed integrally with a plate-shaped back apron pair guide 33, which guides the back apron pair 15. Thus, the middle trumpet member 30 includes the middle trumpet 32 and the back apron pair guide 33. The back apron pair guide 33 is located on a second end of the coupling portion 31. The back apron pair guide 33 includes a flat guide surface 33a opposed to the middle trumpet 32. The back apron pair 15 runs between the middle trumpet 32 and the guide surface 33a of the back apron pair guide 33 as guided by the guide surface 33a.

[0027] As shown in Fig. 4, the support bar 18 is provided with a female-threaded hole 18a. The coupling portion 31 is provided with a screw insertion hole 31h. When a screw 35 is inserted through the screw insertion hole 31h and fitted into the female-threaded hole 18a, the coupling portion 31 is coupled to the support bar 18.

[0028] The upper edge of the coupling portion 31 includes a portion between the middle trumpet 32 and the back apron pair guide 33 defining a pressing portion 31f. The pressing portion 31f presses the back bottom apron 15a to the back top apron 15b. As indicated by arrow X1 in Fig. 4, the pressing portion 31f is inclined toward a direction in which the back apron pair 15 runs relative to the lateral direction of the coupling portion 31. The pressing portion 31f partially increases the contact pressure between the back bottom apron 15a and the back top apron 15b by pressing the back bottom apron 15a and the back top apron 15b. However, the contact pressure between the middle bottom apron 14a and the middle top apron 14b does not change. Thus, the pressing portion 31f functions to increase the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15 without changing the contact pressure between the middle bottom apron 14a and the middle top apron 14b. The pressing portion 31f, which functions as a contact pressure adjustment portion, is located between the middle roller 12 and the back roller 13.

[0029] Referring to Fig. 1, the first roving S1 is fed from a first roving winding, which is suspended from a creel (not shown), through the middle trumpet 32 and to the middle apron pair 14. Also, the second roving S2 is fed from a second roving winding, which is suspended from a creel (not shown), through the back trumpet 19a and to the back apron pair 15.

[0030] The first roving S1 is fed to the middle apron pair 14 and drafted into a fleece between the front rollers 11 and the middle apron pair 14. Subsequently, the fleece formed from the first roving S1 is guided to a snail wire (not shown) and a traveler (not shown) and wound around a bobbin. The second roving S2 is fed to the back apron pair 15 and drafted into a fleece between the front rollers 11 and the back apron pair 15. Subsequently, the fleece formed from the second roving S2 is guided to the snail wire (not shown) and the traveler (not shown) and wound around the bobbin.

[0031] When the first roving S1 and the second roving S2 are simultaneously fed, the three bottom rollers, namely, the front bottom roller 11a, the middle bottom roller 12a, and the back bottom roller 13a are all driven. The first roving S1 is fed from the middle trumpet 32 and drafted into a first fleece between the front rollers 11 and the middle apron pair 14. The second roving S2 is fed from the back trumpet 19a and drafted into a second fleece between the front rollers 11 and the back apron pair 15. The first fleece and the second fleece are fed from the front rollers 11 and then twisted into a strand of yarn.

[0032] A spinning condition may change from a state in which the first roving S1 and the second roving S2 are simultaneously fed to a state in which only one of the first roving S1 and the second roving S2 is fed. In such a case, when stopping the feeding of a roving, the apron pair corresponding to the roving is deactivated. For example, when stopping the feeding of the first roving S1, the middle bottom roller 12a is deactivated. The deactivation of the middle bottom roller 12a deactivates the middle bottom apron 14a. At the same time, the middle top apron 14b is also deactivated. This deactivates the middle apron pair 14. When the middle apron pair 14 is deactivated, the first roving S1 is broken between the middle apron pair 14 and the front rollers 11 during spinning. When starting to feed the first roving S1 again, the middle bottom roller 12a is activated. This activates the middle apron pair 14. Thus, the first roving S1 is smoothly drafted between the front rollers 11 and the middle apron pair 14.

[0033] When stopping the feeding of the second roving S2, the back bottom roller 13a is deactivated. The deactivation of the back bottom roller 13a deactivates the back bottom apron 15a. At the same time, the back top apron 15b is deactivated. This deactivates the back apron pair 15. When the back apron pair 15 is deactivated, the second roving S2 is broken between the back apron pair 15 and the front rollers 11 during spinning. When starting to feed the second roving S2 again, the back bottom roller 13a is activated. This activates the back apron pair 15. Thus, the second roving S2 is smoothly drafted between the front rollers 11 and the back apron pair 15.

[0034] During spinning, the combination ratio of the

first roving S1 and the second roving S2, which form two kinds of rovings, is changed by controlling the activation and deactivation of the middle apron pair 14 and the back apron pair 15. This continuously spins a strand of target yarn.

[0035] In one example, when spinning slub yarn, the activation and deactivation of the middle apron pair 14 and the back apron pair 15 are controlled so that one of the first roving S1 and the second roving S2 is continuously fed while the other roving is intermittently fed. In one example, when the first roving S1 and the second roving S2 have different colors, the activation and deactivation of the middle apron pair 14 and the back apron pair 15 are controlled so that the first roving S1 and the second roving S2 are alternately fed. This spins yarn in which portions having different colors continuously alternate. The slub yarn may be set to have any thickness, any length, any interval, and any color combination ratio. When the middle bottom roller 12a and the back bottom roller 13a are activated in accordance with the above setting, desired yarn may be spun.

[0036] The operation of the present embodiment will now be described.

[0037] Some of fibers forming the second roving S2, which is fed to the back apron pair 15, are not held by any roller between the holding position of the front bottom roller 11a and the front top roller 11b and the holding position of the back bottom roller 13a and the back top roller 13b. Some of such fibers are tangled with fibers that are held by the front bottom roller 11a and the front top roller 11b and pulled by the fibers held by the front bottom roller 11a and the front top roller 11b. This may separate fibers from the second roving S2 and break the second roving S2 between the holding position of the front bottom roller 11a and the front top roller 11b and the holding position of the back bottom roller 13a and the back top roller 13b.

[0038] In this regard, in the present embodiment, the pressing portion 31f increases the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15 by pressing the back bottom apron 15a to the back top apron 15b. This limits the separation of fibers from the second roving S2 and the breaking of the second roving S2 between the holding position of the front bottom roller 11a and the front top roller 11b and the holding position of the back bottom roller 13a and the back top roller 13b.

[0039] The present embodiment has the advantages described below.

(1) The drafting device 10 includes the pressing portions 31f. Each pressing portion 31f functions as a contact pressure adjustment portion that increases the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15 without changing the contact pressure between the middle bottom apron 14a and the middle top apron 14b. In this configuration, the contact pressure between the middle bottom apron 14a and the middle top apron 14b will not be increased in accordance with the contact pressure between the back bottom apron 15a and the back top apron 15b. Thus, the contact pressure between the middle bottom apron 14a and the middle top apron 14b does not increase. This does not hinder the feeding of the fibers of the first roving S1 that are held by the front bottom roller 11a and the front top roller 11b. Additionally, as compared to a configuration that does not include the pressing portions 31f, the separation of fibers from the second roving S2 and the breaking of the second roving S2 are limited between the holding position of the front bottom roller 11a and the front top roller 11b and the holding position of the back bottom roller 13a and the back top roller 13b. Therefore, the breaking of the second roving S2, which is fed to the back apron pair 15, is controlled while facilitating the drafting of the first roving S1, which is fed to the middle apron pair 14.

(2) The pressing portion 31f is located between the middle roller 12 and the back roller 13. Thus, the position where the pressing portion 31f increases the contact pressure between the back bottom apron 15a and the back top apron 15b may be separated from the front rollers 11 more than when the pressing portion 31f is located between the front rollers 11 and the middle roller 12. This prevents a situation in which the feeding of the second roving S2 held by the front bottom roller 11a and the front top roller 11b is hindered due to the contact pressure between the back bottom apron 15a and the back top apron 15b that is increased by the pressing portion 31f.

(3) The pressing portion 31f is arranged on the middle trumpet member 30. The middle trumpet member 30 is located between the middle roller 12 and the back roller 13. Thus, a support member for arranging the pressing portion 31f on the middle trumpet member 30 does not need to be separately arranged between the middle roller 12 and the back roller 13. This simplifies the entire structure of the device.

(4) When the pressing portion 31f and the middle trumpet member 30 are separate members, a task for coupling the pressing portion 31f to the middle trumpet member 30 is necessary. In this regard, in the present embodiment, the pressing portion 31f is formed integrally with the middle trumpet member 30. This configuration eliminates the need of the task for coupling the pressing portion 31f to the middle trumpet member 30. Thus, the coupling efficiency is improved. Also, the number of components is reduced.

(5) The pressing portion 31f is inclined toward the running direction of the back apron pair 15 relative to the lateral direction of the coupling portion 31. This allows the back apron pair 15 to be smoothly run compared to when the pressing portion 31f is inclined toward a side opposite to the running direction of the

back apron pair 15 relative to the lateral direction of the coupling portion 31.

[0040] It should be apparent to those skilled in the art that the present invention may be embodied in many other specific forms without departing from the scope of the invention. Particularly, it should be understood that the present invention may be embodied in the following forms.

[0041] As shown in Figs. 5A and 5B, a pressing member 41 that includes a pressing portion 41f may be separated from the middle trumpet member 30. The pressing member 41 is an oblong tetragonal plate. When the longitudinal direction of the pressing member 41 conforms to the lateral direction of the coupling portion 31, the pressing member 41 is located between the middle trumpet 32 and the back apron pair guide 33. The pressing member 41 is provided with an oblong hole defining a screw insertion hole 41h. The screw insertion hole 41h extends in the longitudinal direction of the pressing member 41. When a screw 35 is inserted through the screw insertion hole 41h and the screw insertion hole 31h and fitted into the female-threaded hole 18a, the pressing member 41 and the coupling portion 31 are coupled to the support bar 18.

[0042] As shown in Fig. 6, the pressing member 41 includes an upper end that upwardly projects beyond a portion of the upper edge of the coupling portion 31 located between the middle trumpet 32 and the back apron pair guide 33. Additionally, the upper end of the pressing member 41 defines the pressing portion 41f, which presses the back bottom apron 15a to the back top apron 15b. When the pressing portion 41f presses the back bottom apron 15a to the back top apron 15b, the contact pressure between the back bottom apron 15a and the back top apron 15b is increased in at least a portion of the back apron pair 15 without changing the contact pressure between the middle bottom apron 14a and the middle top apron 14b.

[0043] In the above configuration, the pressing member41 is attached to the middle trumpet member 30 in a removable manner. Thus, the contact pressure between the back bottom apron 15a and the back top apron 15b may be adjusted. This further limits the breaking of the second roving S2, which is fed to the back apron pair 15. Additionally, the screw insertion hole 41h is an oblong hole. Thus, a projection amount of the pressing member 41 from the upper edge of the coupling portion 31 may be adjusted by adjusting the position of the screw 35 relative to the screw insertion hole 41h. Consequently, the contact pressure between the back bottom apron 15a and the back top apron 15b may be easily adjusted.

[0044] As shown in Figs. 7 and 8, the tensor bar 20, around which the middle bottom apron 14a and the back bottom apron 15a both run, may include a pressing portion 51f. The pressing portion 51f is located on a surface of the tensor bar 20 where the back bottom apron 15a runs. The surface of the tensor bar 20 where the back bottom apron 15a runs, that is, the pressing portion 51f, is located above a surface of the tensor bar 20 where the middle bottom apron 14a runs. In this case, the back bottom apron 15a runs on a position proximate to the back top apron 15b compared to when the pressing portion 51f and the surface of the tensor bar 20 where the middle bottom apron 14a runs are located at the same height. Thus, the back bottom apron 15a is pressed to the back top apron 15b by the pressing portion 51f. In this configuration, the tensor bar 20, which is a conventional member located between the front rollers 11 and the middle roller 12, includes the pressing portion 51f. Thus, a member that supports the pressing portion 51f does not need to be separately arranged between the front rollers 11 and the middle roller 12. This simplifies the entire structure of the device.

[0045] As shown in Fig. 9, a pressing member 61 that includes a pressing portion 61f may be coupled to the tensor bar 20. More specifically, the pressing portion 61f and the tensor bar 20 may be separate members.

[0046] As shown in Fig. 10, a pressing member 71 may be located on a circumferential surface of each middle top roller 12b at a position overlapped with the back top apron 15b. The pressing member 71, which is tubular, is coupled to a circumferential surface of the middle top roller 12b and rotationally supported by the middle top roller 12b. The pressing member 71 increases the contact pressure between the back bottom apron 15a and the back top apron 15b without allowing the back bottom apron 15a to contact the middle bottom roller 12a. A portion of the middle top roller 12b that is overlapped with the back top apron 15b has a smaller outer diameter than a portion of the middle top roller 12b that is overlapped with the middle top apron 14b. The pressing member 71 has a smaller outer diameter than the portion of the middle top roller 12b that is overlapped with the middle top apron 14b.

[0047] As shown in Fig. 11A, when the pressing member 71 is not coupled to the middle top roller 12b, the back top apron 15b is not in contact with the middle top roller 12b. Also, the back bottom apron 15a is not in contact with the middle bottom roller 12a. As shown in Fig. 11B, when the pressing member 71 is coupled to the middle top roller 12b, the pressing member 71 is in contact with the back top apron 15b and presses the back top apron 15b to the back bottom apron 15a. This increases the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15. Even in this state, the back bottom apron 15a is not in contact with the middle bottom roller 12a. Additionally, the pressing member 71 is rotational relative to the middle top roller 12b. This reduces friction between the pressing member 71 and the back top apron 15b. The pressing member 71, which functions as a contact pressure adjustment portion, may be arranged on the middle top roller 12b, which is a conventional member. The pressing member 71 may be arranged on the middle top roller 12b so that the pressing

member 71 rotates integrally with the middle top roller 12b instead of rotating relative to the middle top roller 12b.

[0048] As shown in Fig. 12, a pressing member 81 may be located between each middle top roller 12b and the corresponding back top roller 13b. The pressing member 81 includes a pressing portion 81f that presses the back top apron 15b to the back bottom apron 15a. The pressing member 81 includes the pressing portion 81f and a support portion 81a that is continuous with the pressing portion 81f and supported by the middle top roller 12b. The pressing portion 81f and the support portion 81a are rod-shaped. The support portion 81a may pivot about the rotation axis of the middle top roller 12b. When the support portion 81a pivots about the rotation axis of the middle top roller 12b toward the back bottom apron 15a, the pressing portion 81f presses the back top apron 15b to the back bottom apron 15a. This increases the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15.

[0049] As shown in Fig. 13, the upper end of the pressing member 41 may include a rotation member 41a. The rotation member 41a may rotate while contacting the back bottom apron 15a. The rotation member 41a presses the back bottom apron 15a to the back top apron 15b. Thus, the rotation member 41a functions as a contact pressure adjustment portion that increases the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15. In this case, the rotation member 41a rotates while contacting the back bottom apron 15a. This allows the back apron pair 15 to smoothly run.

[0050] As shown in Fig. 14, in the embodiment shown in Fig. 13, a rotation member 41b may be located opposing the rotation member 41a. The rotation member 41b is supported by the weighting arm 16 so that the rotation member 41b may rotate while contacting the back top apron 15b. The rotation member 41b presses the back top apron 15b to the back bottom apron 15a. Thus, the back apron pair 15 is held between the two rotation members 41a, 41b. This increases the contact pressure between the back bottom apron 15a and the back top apron 15b. The two rotation members 41a, 41b function as contact pressure adjustment portions that increase the contact pressure between the back bottom apron 15a and the back top apron 15b in at least a portion of the back apron pair 15. This limits bends of the running path of the back apron pair 15 and allows the back apron pair 15 to smoothly run.

[0051] As shown in Fig. 15A, the pressing portion 31f may extend in the lateral direction of the coupling portion 31. Alternatively, as shown in Fig. 15B, the pressing portion 31f may be inclined toward a side opposite to the running direction of the back apron pair 15 relative to the lateral direction of the coupling portion 31.

[0052] The middle trumpet member 30 does not have to include the middle trumpet 32 and the back apron pair guide 33. The middle trumpet member 30 only needs to include the middle trumpet 32. Thus, the middle trumpet member 30 only needs to at least guide the first roving S1 to the middle apron pair 14.

[0053] The drafting device is not limited to the three-roller configuration and may be of a four-roller configuration. For example, a second back roller may be arranged at the rear of the back apron pair 15. Then, the first roving S1 and the second roving S2 may be drafted between the middle apron pair 14 and the second back roller and between the back apron pair 15 and the second back roller. In the four-roller configuration, instead of roving, slivers may be supplied to the drafting device 10 to spin yarn.

[0054] The spinning frame may be a roving frame.

[0055] The present examples and embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope of the appended claims.

[0056] A drafting device includes a pressing portion that increases the contact pressure between a back bottom apron and a back top apron without changing the contact pressure between a middle bottom apron and a middle top apron. This does not hinder feeding of fibers of a first roving that are held by a front bottom roller and a front top roller. Additionally, separation of fibers from a second roving and breaking of the second roving may be limited between the holding position of the front bottom roller and the front top roller and the holding position of the back bottom roller and the back top roller.

Claims

1. A drafting device (10) for a spinning frame that spins a strand of yarn while changing a combination ratio of a first roving (S1) and a second roving (S2), wherein the drafting device includes front rollers (11) including a front bottom roller (11a) and a front top roller (11b), middle rollers (12) including a middle bottom roller (12a) and a middle top roller (12b), back rollers (13) including a back bottom roller (13a) and a back top roller (13b), a middle apron pair (14) that feeds the first roving (S1) to the front rollers (11), and a back apron pair (15) that feeds the second roving (S2) to the front rollers (11), wherein the middle apron pair (14) includes a middle bottom apron (14a) that runs around the middle bottom roller (12a) and a middle top apron (14b) that runs around the middle top roller (12b), the middle top apron (14b) is driven by the middle bottom roller (12a) while pressed by the middle bottom apron (14a), the back apron pair (15) includes a back bottom apron (15a) that runs around the back bottom roller (13a) and a back top apron (15b) that runs around the back top roller (13b), the middle bottom apron (14a) and the back bottom apron (15a) both run around a tensor bar (20) and a tensioner (21), the back top apron (15b) is

driven by the back bottom roller (13a) while pressed by the back bottom apron (15a), the drafting device (10) being **characterized by**:

a contact pressure adjustment portion (31f, 41f, 51f, 61f, 81f, 71, 41a, 41b) that increases a contact pressure between the back bottom apron (15a) and the back top apron (15b) in at least a portion of the back apron pair (15) without changing a contact pressure between the middle bottom apron (14a) and the middle top apron (14b).

2. The drafting device (10) for a spinning frame according to claim 1, being **characterized in that** the contact pressure adjustment portion (31f, 41f, 81f, 41a, 41b) is located between the middle roller (12) and the back roller (13).

3. The drafting device (10) for a spinning frame according to claim 2, being **characterized by** a middle trumpet member (30) located between the middle roller (12) and the back roller (13) to guide the first roving (S1) to the middle apron pair (14),

wherein the middle trumpet member (30) includes the contact pressure adjustment portion (31f, 41f, 41a, 41b).

4. The drafting device (10) for a spinning frame according to claim 3, being **characterized in that** the contact pressure adjustment portion (31f) is formed integrally with the middle trumpet member (30).

5. The drafting device (10) for a spinning frame according to claim 3, being **characterized in that** the contact pressure adjustment portion (41f, 41a, 41b) and the middle trumpet member (30) are separate members.

6. The drafting device (10) for a spinning frame according to claim 1, being **characterized by** the tensor bar (20) is located between the front roller (11) and the middle roller (12), wherein the contact pressure adjustment portion (51f, 61f) is located on a surface of the tensor bar (20) where the back bottom apron (15a) runs.

7. The drafting device (10) for a spinning frame according to claim 1, being **characterized in that**:

the back top apron (15b) runs around the back top roller (13b) passing by a circumference of the middle top roller (12b); and
the contact pressure adjustment portion (71) is located on a circumferential surface of the middle top roller (12b) at a position overlapped with the back top apron (15b).

Patentansprüche

1. Streckvorrichtung (10) für einen Spinnrahmen, der einen Strang eines Garns spinnt, während ein Kombinationsverhältnis aus einem ersten Roving (S1) und einem zweiten Roving (S2) geändert wird, wobei die Streckvorrichtung vordere Rollen (11) inklusive einer vorderen Bodenrolle (11a) und einer vorderen oberen Rolle (11b), mittlere Rollen (12) inklusive einer mittleren Bodenrolle (12a) und einer mittleren oberen Rolle (12b), hintere Rollen (13) inklusive einer hinteren Bodenrolle (13a) und einer hinteren oberen Rolle (13b), ein mittleres Schürzenpaar (14), das das erste Roving (S1) zu den vorderen Rollen (11) zuführt, und ein hinteres Schürzenpaar (15), das das zweite Roving (S2) zu den vorderen Rollen (11) zuführt, wobei das mittlere Schürzenpaar (14) eine mittlere Bodenschürze (14a), die um die mittlere Bodenrolle (12a) läuft, und eine mittlere obere Schürze (14b), die um die mittlere obere Rolle (12b) läuft, aufweist, wobei die mittlere obere Schürze (14b) durch die mittlere Bodenrolle (12a) angetrieben wird, während sie durch die mittlere Bodenschürze (14a) gedrückt wird, wobei das hintere Schürzenpaar (15) eine hintere Bodenschürze (15a), die um die hintere Bodenrolle (13a) läuft, und eine hintere obere Schürze (15b) aufweist, die um die hintere obere Rolle (13b) läuft, wobei die mittlere Bodenschürze (14a) und die hintere Bodenschürze (15a) beide um eine Spannstange (20) und eine Spanneinrichtung (21) laufen, wobei die hintere obere Schürze (15b) durch die hintere Bodenrolle (13a) angetrieben wird, während sie durch die hintere Bodenschürze (15a) gedrückt wird, wobei die Streckvorrichtung (10) **gekennzeichnet ist durch**:

einen Kontaktdruckeinstellabschnitt (31f, 41f, 51f, 61f, 81f, 71, 41a, 41b), der einen Kontaktdruck zwischen der hinteren Bodenschürze (15a) und der hinteren oberen Schürze (15b) in zumindest einem Abschnitt des hinteren Schürzenpaars (15) erhöht, ohne einen Kontaktdruck zwischen der mittleren Bodenschürze (14a) und der mittleren oberen Schürze (14b) zu ändern.

2. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Kontaktdruckeinstellabschnitt (31f, 41f, 81f, 41a, 41b) sich zwischen der mittleren Rolle (12) und der hinteren Rolle (13) befindet.

3. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 2, **gekennzeichnet durch** ein mittleres Trompetenelement (30), das sich zwischen der mittleren Rolle (12) und der hinteren Rolle (13) befindet, um das erste Roving (S1) zu dem mittleren Schürzenpaar (14) zu führen,

wobei das mittlere Trompetenelement (30) den Kontaktdruckeinstellabschnitt (31f, 41f, 41a, 41b) aufweist.

4. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 3, **dadurch gekennzeichnet, dass** der Kontaktdruckeinstellabschnitt (31f) mit dem mittleren Trompetenelement (30) einstückig ausgebildet ist.

5. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 3, **dadurch gekennzeichnet, dass** der Kontaktdruckeinstellabschnitt (41f, 41a, 41b) und das mittlere Trompetenelement (30) separate Elemente sind.

6. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Spannstange (20) zwischen der vorderen Rolle (11) und der mittleren Rolle (12) angeordnet ist, wobei

der Kontaktdruckeinstellabschnitt (51f, 61f) sich an einer Oberfläche der Spannstange (20) befindet, an der die hintere Bodenschürze (15a) läuft.

7. Streckvorrichtung (10) für einen Spinnrahmen gemäß Anspruch 1, **dadurch gekennzeichnet, dass**:

die hintere obere Schürze (15b) um die hintere obere Rolle (13b) läuft, wobei sie an einem Umfang der mittleren oberen Rolle (12b) vorbeitritt; und
der Kontaktdruckeinstellabschnitt (71) an einer Umfangsfläche der mittleren oberen Rolle (12b) an einer Position angeordnet ist, die mit der hinteren oberen Schürze (15b) überlappt.

Revendications

1. Dispositif d'étirage (10) pour un métier à filer qui file un brin de fil tout en changeant un rapport d'une première mèche (S1) et d'une seconde mèche (S2) en combinaison, dans lequel le dispositif d'étirage comprend des rouleaux avant (11) comprenant un rouleau inférieur avant (11a) et un rouleau supérieur avant (11b), des rouleaux centraux (12) comprenant un rouleau inférieur central (12a) et un rouleau supérieur central (12b), des rouleaux arrière (13) comprenant un rouleau inférieur arrière (13a) et un rouleau supérieur arrière (13b), une paire de manchons centraux (14) qui amène la première mèche (S1) aux rouleaux avant (11), et une paire de manchons arrière (15) qui amène la seconde mèche (S2) aux rouleaux avant (11), dans lequel la paire de manchons centraux (14) comprend un manchon inférieur central (14a) qui s'étend autour du rouleau inférieur central (12a) et un manchon supérieur central (14b) qui s'étend autour du rouleau supérieur central (12b), le manchon supérieur central (14b) est entraîné par le rouleau inférieur central (12a) tout en étant comprimé par le manchon inférieur central (14a), la paire de manchons arrière (15) comprend un manchon inférieur arrière (15a) qui s'étend autour du rouleau inférieur arrière (13a) et un manchon supérieur arrière (15b) qui s'étend autour du rouleau supérieur arrière (13b), le manchon inférieur central (14a) et le manchon inférieur arrière (15a) s'étendent tous deux autour d'une barre de tension (20) et d'un tensionneur (21), le manchon supérieur arrière (15b) est entraîné par le rouleau inférieur arrière (13a) tout en étant comprimé par le manchon inférieur arrière (15a), le dispositif d'étirage (10) étant **caractérisé par** :

une partie d'ajustement de pression de contact (31f, 41f, 51f, 61f, 81f, 71, 41a, 41b) qui augmente une pression de contact entre le manchon inférieur arrière (15a) et le manchon supérieur arrière (15b) dans au moins une partie de la paire de manchons arrière (15) tout en changeant une pression de contact entre le manchon inférieur central (14a) et le manchon supérieur central (14b).

2. Dispositif d'étirage (10) pour un métier à filer selon la revendication 1, **caractérisé en ce que** la partie d'ajustement de pression de contact (31f, 41f, 81f, 41a, 41b) est positionnée entre le rouleau central (12) et le rouleau arrière (13).

3. Dispositif d'étirage (10) pour un métier à filer selon la revendication 2, **caractérisé par** un élément d'entonnoir de filature central (30) positionné entre le rouleau central (12) et le rouleau arrière (13) afin de guider la première mèche (S1) vers la paire de manchons centraux (14),
dans lequel l'élément d'entonnoir de filature central (30) comprend la partie d'ajustement de pression de contact (31f, 41f, 41a, 41b).

4. Dispositif d'étirage (10) pour un métier à filer selon la revendication 3, **caractérisé en ce que** la partie d'ajustement de pression de contact (31f) est formée de manière solidaire avec l'élément d'entonnoir de filature central (30).

5. Dispositif d'étirage (10) pour un métier à filer selon la revendication 3, **caractérisé en ce que** la partie d'ajustement de pression de contact (41f, 41a, 41b) et l'élément d'entonnoir de filature (30) sont des éléments séparés.

6. Dispositif d'étirage (10) pour un métier à filer selon

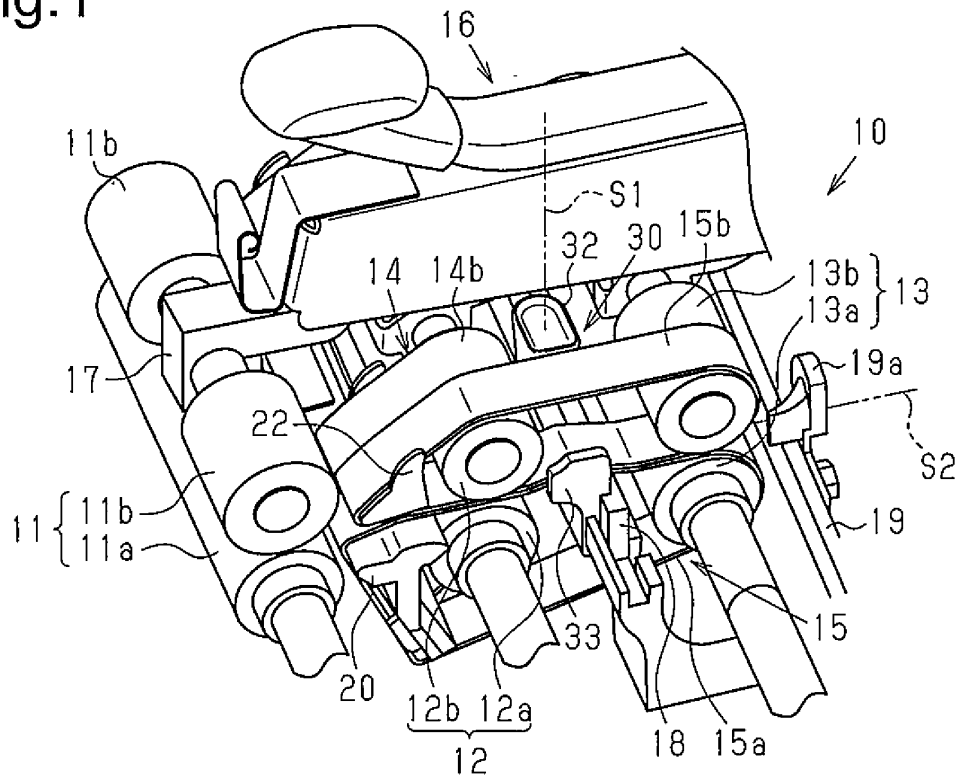
la revendication 1, **caractérisé par** la barre de tension (20) qui est positionnée entre le rouleau avant (11) et le rouleau central (12), dans lequel :

la partie d'ajustement de pression de contact (51f, 61f) est positionnée sur une surface de la barre de tension (20) où s'étend le manchon inférieur arrière (15a).

7. Dispositif d'étirage (10) pour un métier à filer selon la revendication 1, **caractérisé en ce que** :

le manchon supérieur arrière (15b) s'étend autour du rouleau supérieur arrière (13b) passant par une circonférence du rouleau supérieur central (12b) ; et
la partie d'ajustement de pression de contact (71) est positionnée sur une surface circonférentielle du rouleau supérieur central (12b) dans une position chevauchée par le manchon supérieur arrière (15b).

Fig.1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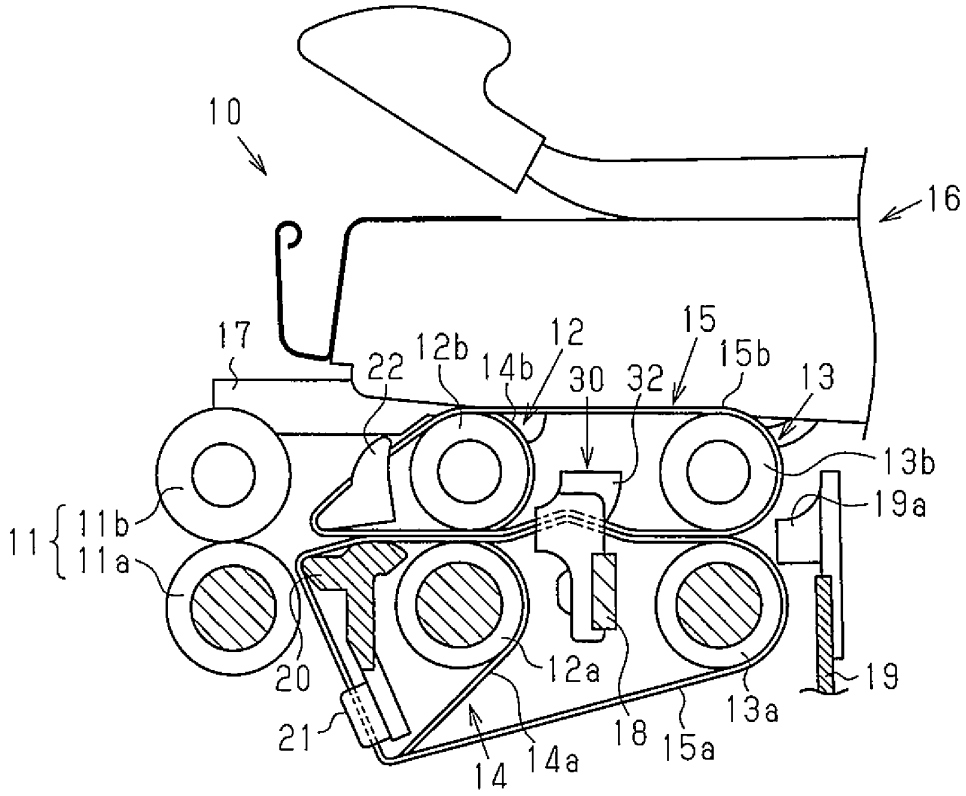
11b
10
S1
32
30
15b
14
14b
13b
13a
13
17
19a
22
S2
11
11b
11a
19
15
33
20
12b
12a
12
18
15a

Fig.2


10
16
17
22
12b
14b
12
30
32
15
15b
13
13b
19a
11
11b
11a
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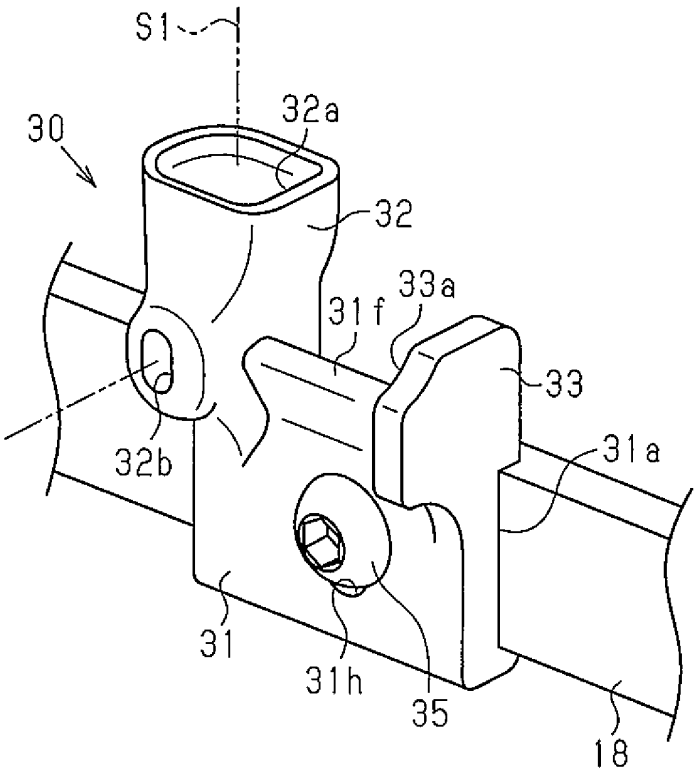
19
21
14a
18
13a
15a
14

Fig.3


S1
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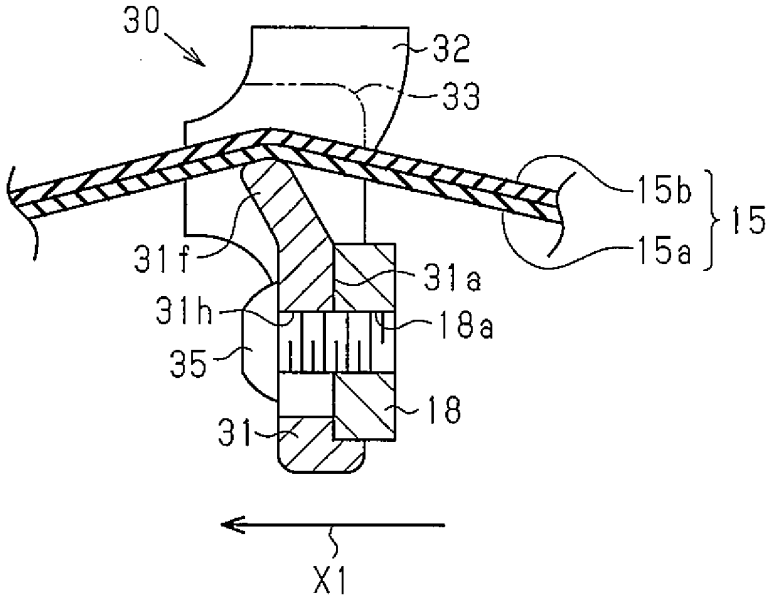
32a
32
33a
31f
33
31a
32b
31
31h
35
18

Fig.4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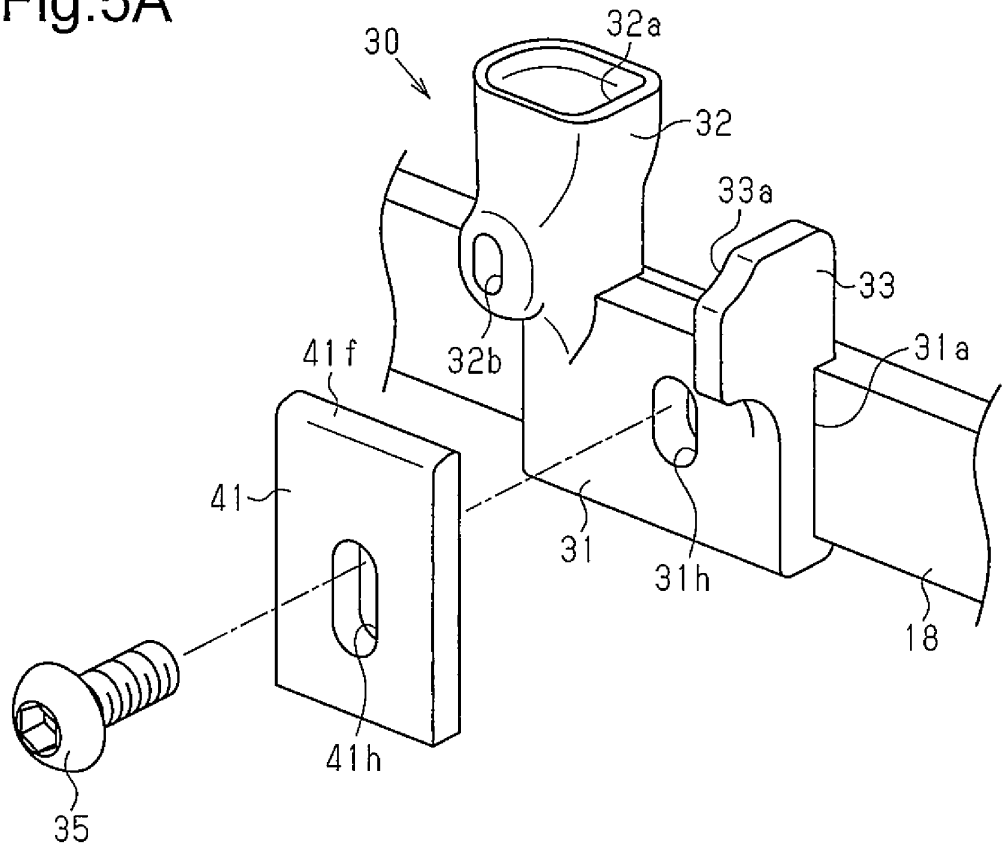
32
33
15b
15
15a
31f
31a
31h
18a
35
18
31
X1

Fig.5A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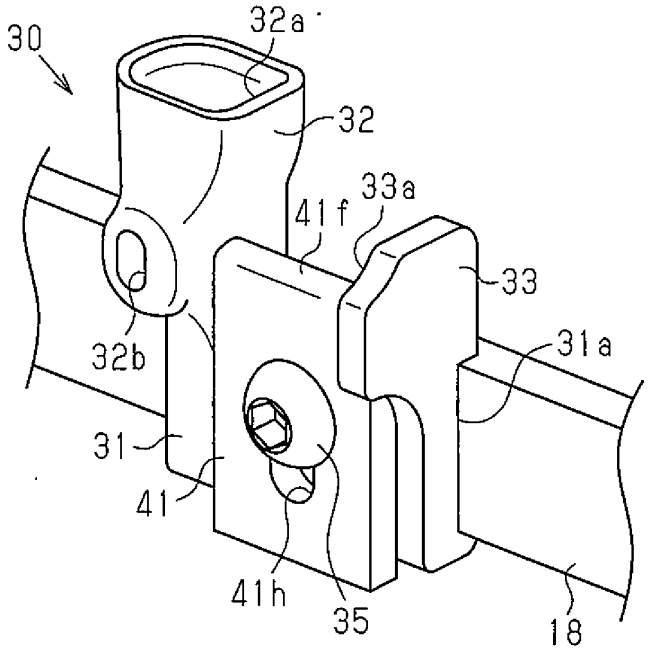
32a
32
33a
33
31a
32b
41f
41
31
31h
18
41h
35

Fig.5B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32a
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33a
41f
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31a
32b
31
41
41h
35
18

Fig.6

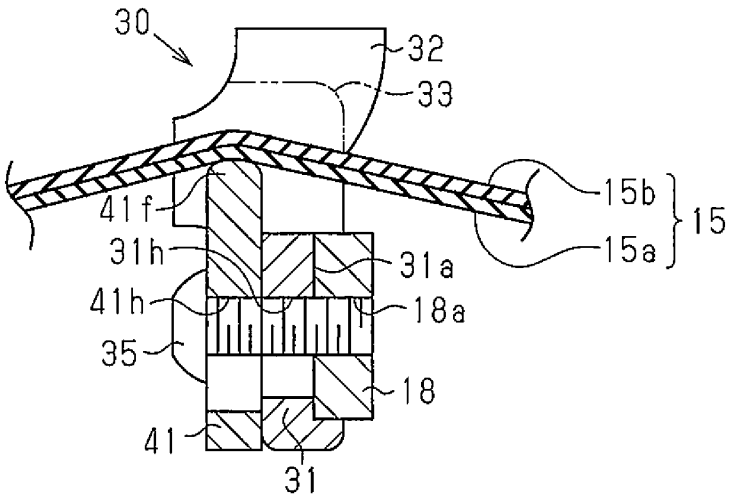


Fig.7

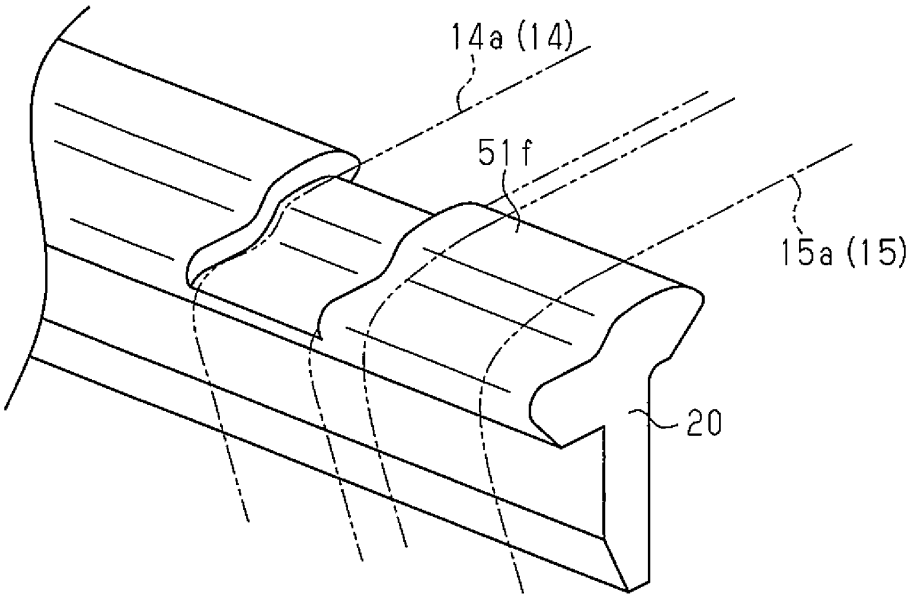


Fig.8

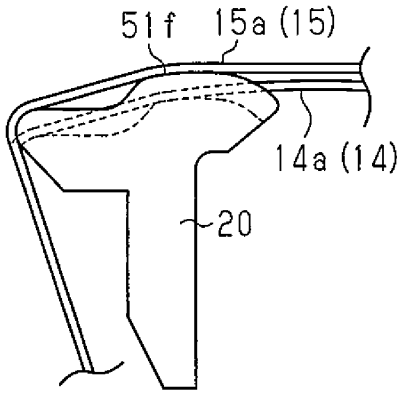


Fig.9

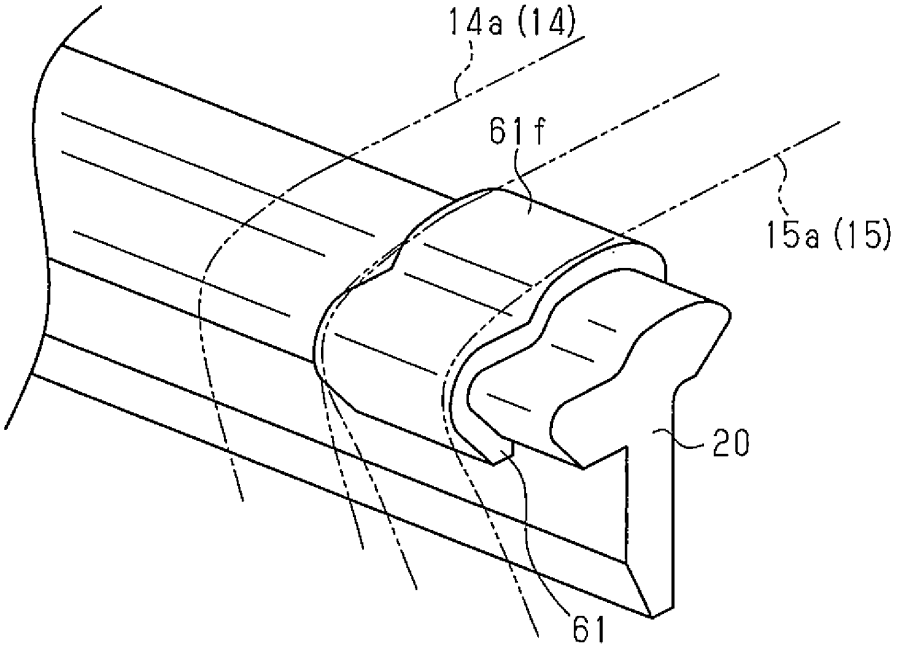


Fig.10

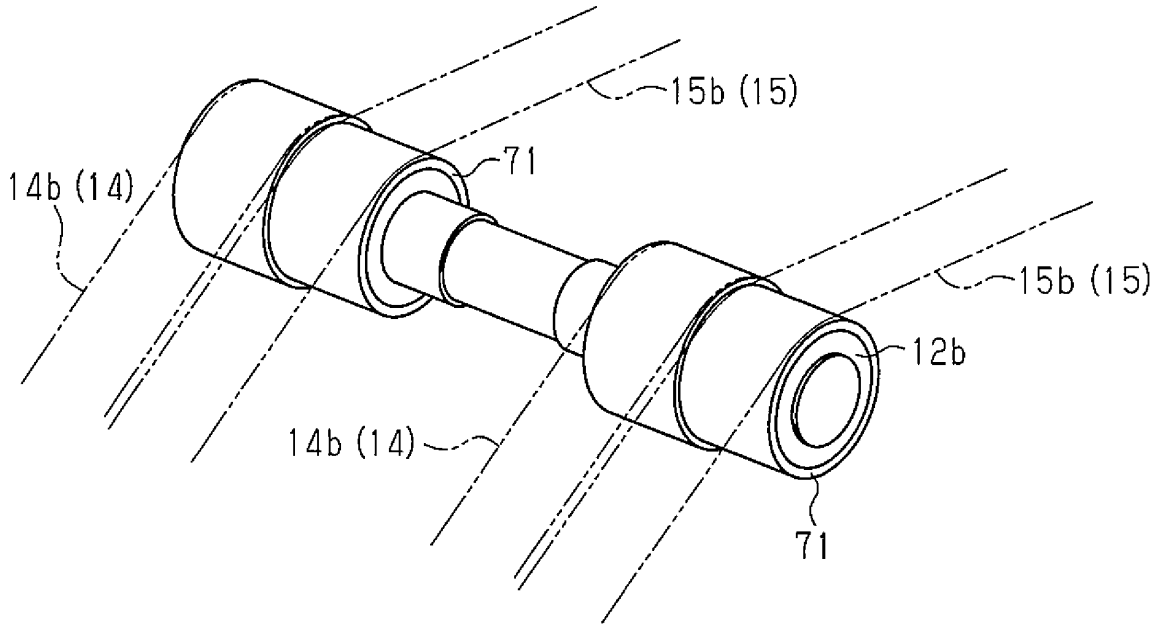


Fig.11A

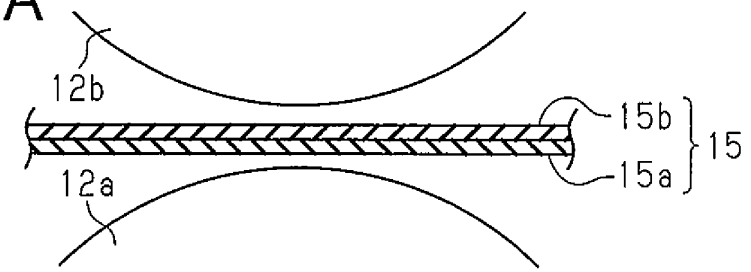


Fig.11B

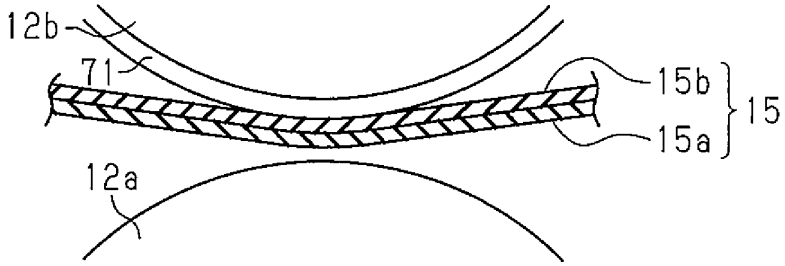


Fig.12

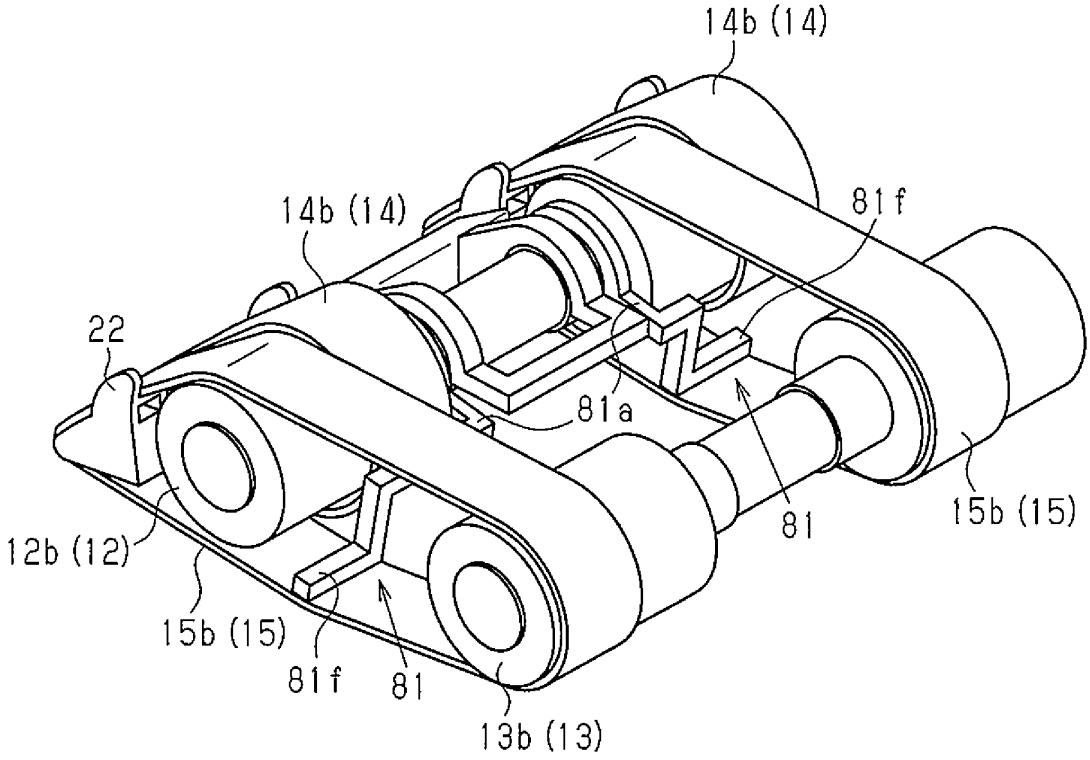
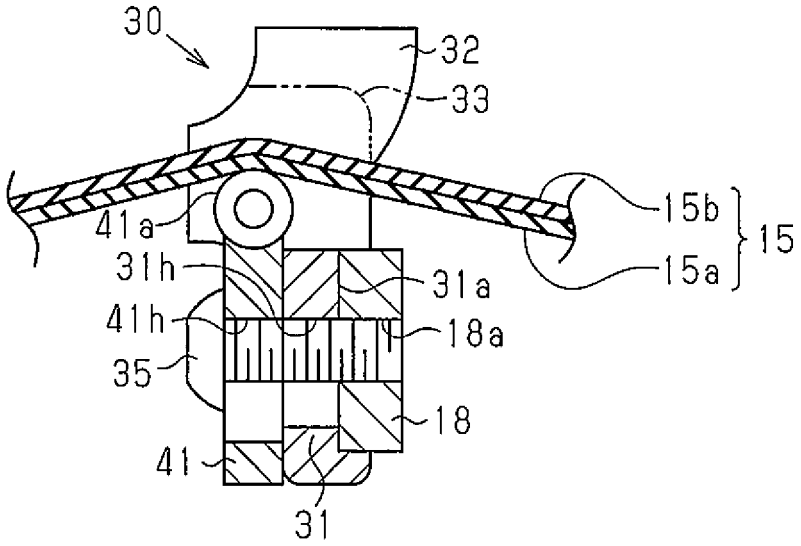


Fig.13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32
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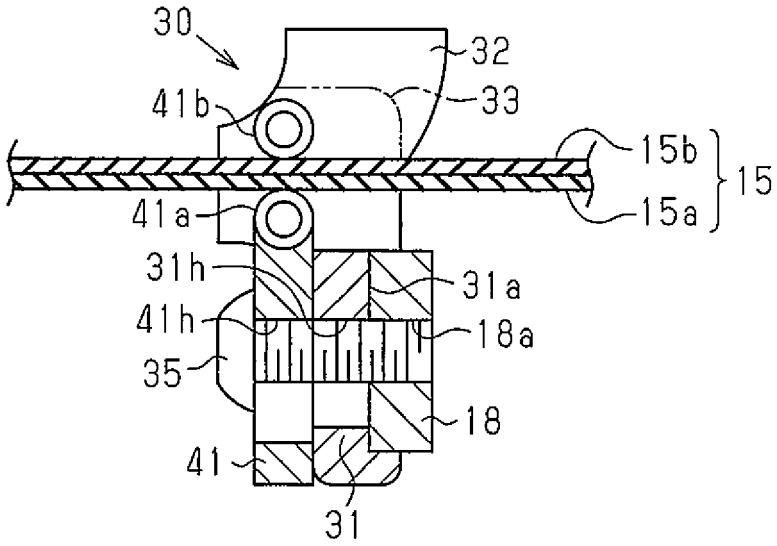
15b
15
15a
41a
31h
31a
41h
18a
35
18
41
31

Fig.14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32
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15b
15
15a
41a
31h
31a
41h
18a
35
18
41
31

Fig.15A

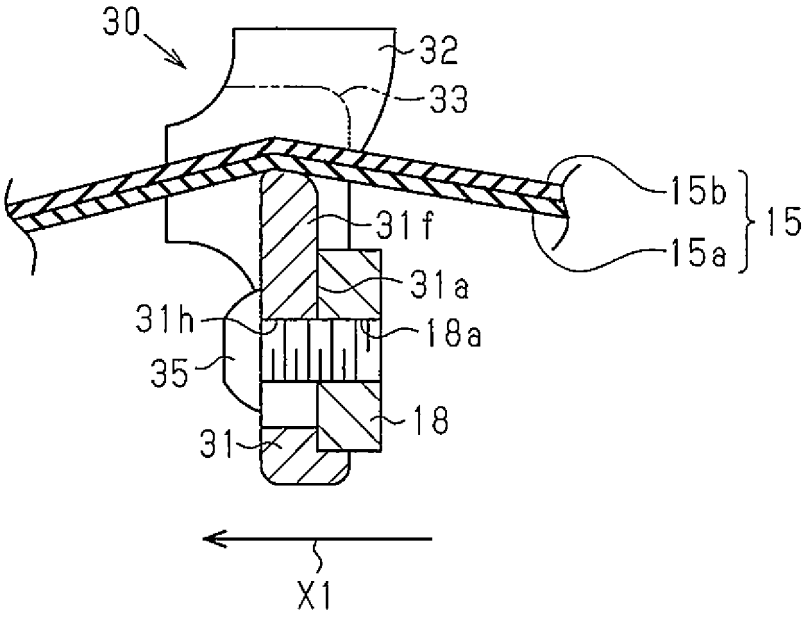


Fig.15B

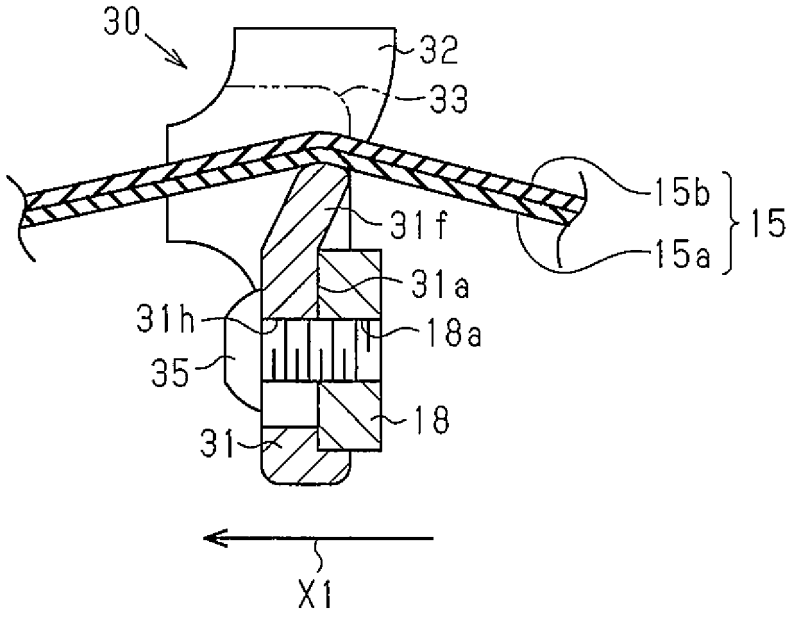
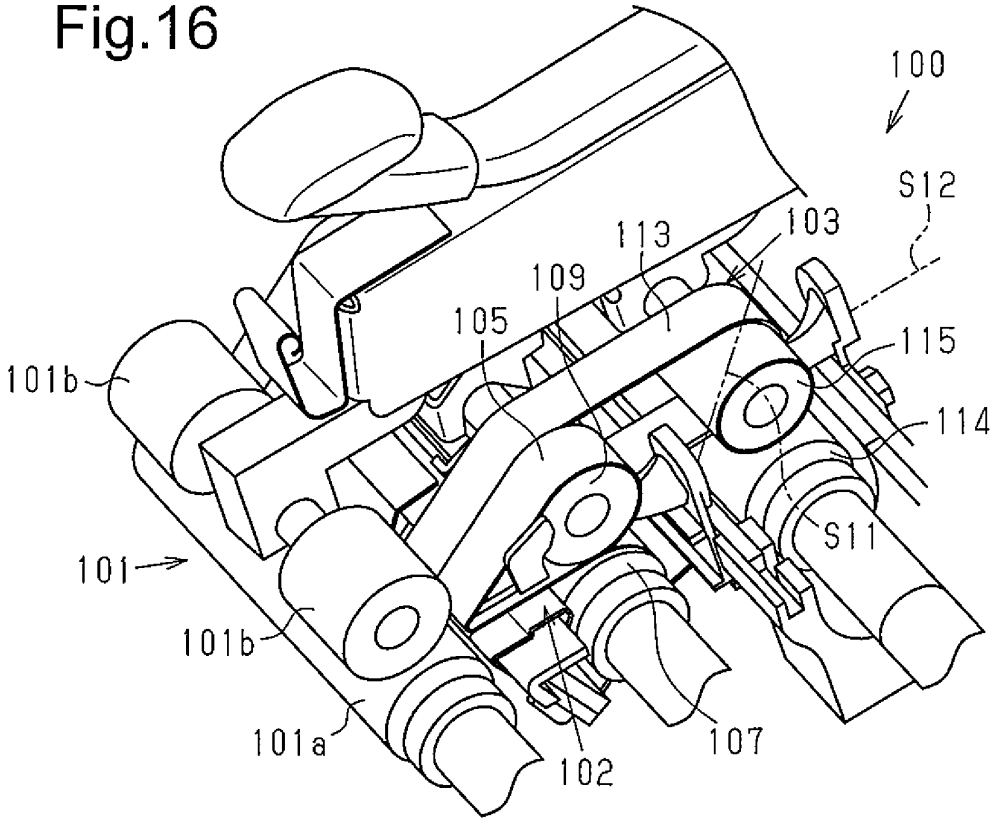


Fig.16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S12
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103
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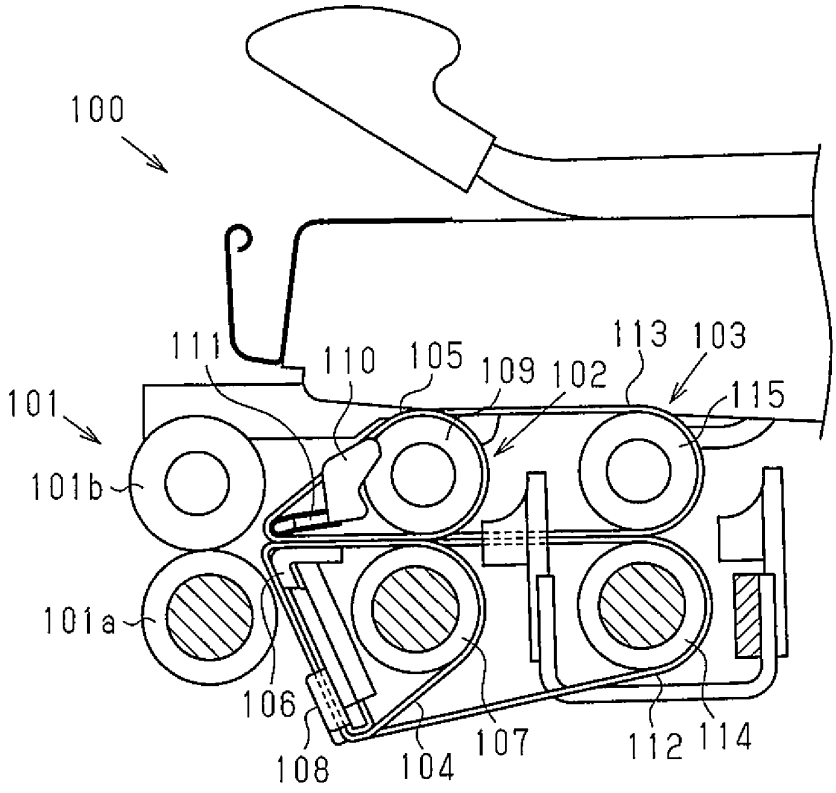
105
115
101b
114
S11
101
101b
101a
102
107

Fig.17


100
111
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105
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102
113
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115
101
101b
101a
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104
107
112
114

REFERENCES CITED IN THE DESCRIPTION

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