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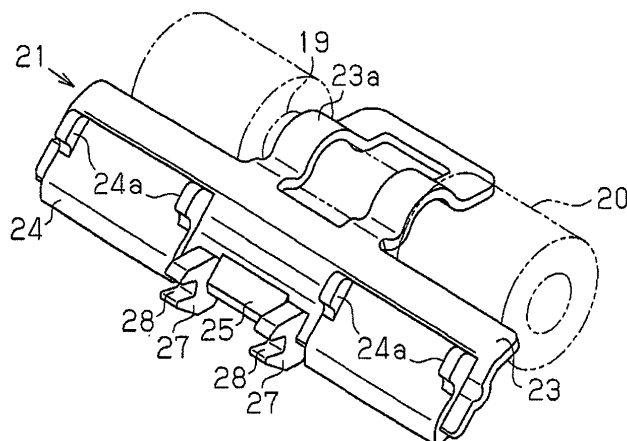
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(54) **Apron cradle for spinning frames**

(57) An apron cradle for a spinning frame of a double-spindle type apron draft device attached to a weighting arm (16). A support shaft (19) is supported by the weighting arm (16). A main cradle body (23) is supported by the support shaft (19) and supports top aprons (22). Bottom aprons (15) respectively correspond to the top aprons (22). A tensor bar (13) supports the bottom aprons (15) and is arranged facing toward the main cradle body

(23). A shaft (26) arranged near a distal end of the main cradle body (23) supports adjusters (27, 27) laterally outward from the weighting arm (16). Each adjuster (27, 27) includes contact surfaces (27a, 27b, 27c, 27d) contactable with the tensor bar (13) so that a tensor interval between the apron cradle and tensor bar (13) is adjustable to vary a gap between distal portions of the top and bottom aprons.

Fig.2



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an apron cradle for spinning frames, and more particularly, to an apron cradle used in a double-spindle type apron draft device attached to a weighting arm.

[0002] A typical ring fine spinning frame includes an apron draft device arranged between a front roller and a back roller. Roving are held and drafted between a top apron and a bottom apron. Once assembled, the bottom apron is always held at the same predetermined position. However, the top apron is often arranged at a position spaced from the bottom apron when changing the spinning conditions or during maintenance. Furthermore, to facilitate maintenance, a draft device often employs a structure in which two top rollers, each including a top apron, is supported by a weighting arm in correspondence with two spindles. The top rollers may each be arranged at a draft position, in which the top rollers come into contact with the corresponding bottom rollers, and a standby position, in which the top rollers are spaced from the bottom rollers.

[0003] In such a draft device, the open amount between the distal ends of the top and bottom aprons must be adjusted in accordance with the yarn number count or fiber type. Thus, the interval between the apron cradle and tensor bar (hereafter referred to as tensor interval) must be adjusted. To adjust the tensor interval at the left and right sides, a distance clip is attached to the distal portion of an apron cradle. The distance clip is attached to the apron cradle in a state in which the pressure applied by the weighting arm is cancelled.

[0004] The distance clip is formed to correspond with one tensor interval. Thus, plural types of distance clips for different spinning conditions must always be prepared and stored. This causes difficulties in the management of the distance clips and increases manufacturing costs. To solve this problem, Japanese Laid-Open Patent Publication No. 11-302930 proposes a distance clip that is applicable to a plurality of tensor intervals. When attaching the distance clip to the distal portion of an apron cradle, the positional relationship of the front and rear sides of the distance clip is varied so that the distance clip is applicable to two tensor intervals.

[0005] Japanese Laid-Open Patent Publication No. 3-113025 describes a method for adjusting apron nip pressure in a draft device. In this method, referring to Figs. 6A and 6B, an apron pressing member 52 is arranged on the distal portion of an apron tensioner 51. Left and right adjustment screws 53 are inserted through the apron pressing member 52 and extended to the surface of a tensor bar 54. The adjustment screws 53 vary the pressure produced between the apron pressing member 52 and the tensor bar 54.

[0006] In the structure of Japanese Laid-Open Patent Publication No. 11-302930 in which the tensor interval is

adjusted with the distance clip, the pressure applied by the weighting arm must be cancelled when adjusting the tensor interval. However, when cancelling the pressure applied by the weighting arm, after completing adjustment of the tensor interval, yarns break when restarting the spinning frame. This results in the need for tying yarns in each spindle.

[0007] In the method described in Japanese Laid-Open Patent Publication No. 3-113025, the pressure applied by the weighting arm does not have to be cancelled when adjusting the tensor interval. Thus, the problem with the distance clip does not occur. However, in the method described in Japanese Laid-Open Patent Publication No. 3-113025, the adjustment screws 53 adjust the tensor interval in a continuous and stepless manner. Thus, it is difficult to uniformly adjust the left and right tensor intervals. Further, there is a tendency for the tensor intervals to differ between spindles. The tensor interval does not necessarily have to be varied whenever the spinning conditions are changed. For example, the same tensor interval may be used for yarns of which diameters are within a certain range. Thus, even if a spinning yarn has a different diameter, there may be no need for the tensor interval to be adjustable in a stepless manner.

SUMMARY OF THE INVENTION

[0008] It is an object of the present invention to provide an apron cradle for a spinning frame that easily and uniformly adjusts left and right tensor intervals in an apron draft device without cancelling the pressure applied by a weighting arm.

[0009] To achieve the above object, one aspect of the present invention provides an apron cradle for a spinning frame used in a double-spindle type apron draft device attached to a weighting arm. The apron cradle includes a support shaft, a main cradle body, two top aprons, two bottom aprons, a tensor bar, a shaft, and two adjustors. The support shaft is supported by the weighting arm. The main cradle body is supported by the support shaft. The two top aprons are supported by the main cradle body. The two bottom aprons are respectively correspond to the two top aprons. The tensor bar supports the two bottom aprons and is arranged facing toward the main cradle body. The shaft is arranged near a distal end of the main cradle body. The two adjustors are supported by the shaft at an eccentric position and arranged laterally outward from the weighting arm. Each of the adjustors includes a plurality of contact surfaces, each contactable with the tensor bar so that a tensor interval defined between the apron cradle and the tensor bar is adjustable in order to vary a gap in plural steps between a distal portion of the top aprons and a distal portion of the bottom aprons.

[0010] Other aspects and advantages of the present 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

[0011] The invention, together with objects and advantages 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 side view showing a preferred embodiment of a draft device according to the present invention; Fig. 2 is a schematic perspective view of an apron cradle shown in Fig. 1;

Fig. 3A is a schematic diagram of the apron cradle shown in Fig. 1 taken from a diagonally upward position;

Fig. 3B is a schematic cross-sectional view showing the relationship between an adjustor and a tensor bar;

Fig. 4 is a schematic cross-sectional view showing the relationship between the adjustor and an operation tool;

Figs. 5A and 5B are schematic cross-sectional views showing adjustors in further embodiments;

Fig. 6A is a schematic perspective view showing the prior art; and

Fig. 6B is a schematic partial perspective view showing the prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] A preferred embodiment of a double-spindle type apron draft device for a fine spinning frame according to the present invention will now be discussed with reference to Figs. 1 to 4.

[0013] Referring to Fig. 1, a roller stand 11 supports a front bottom roller 12. A tensor bar 13 and a middle bottom roller 14 are arranged at the rear of the front bottom roller 12. Bottom aprons 15 run between the tensor bar 13 and the middle bottom roller 14.

[0014] A weighting arm 16 is arranged above the bottom rollers 12 and 14. The weighting arm 16 has a distal end that supports front top rollers 17. A support arm 18 is fixed to the weighting arm 16 at the rear of the front top rollers 17. The support arm 18 has a distal end that supports the axially middle part of a support shaft 19 in a rotatable manner. Middle top rollers 20 are supported at the two ends of the support shaft 19 so as to be integrally rotatable with each other. The support shaft 19 supports an apron cradle 21. A top apron 22 runs between each of the middle top rollers 20 and the apron cradle 21.

[0015] As shown in Figs. 2 and 3A, the apron cradle 21 includes a T-shaped main cradle body 23. Referring to Figs. 1 and 2, the main cradle body 23 includes an arcuate portion 23a and a plate spring 23b. The arcuate portion 23a is formed near the basal end of the main cradle body 23 and is in contact with the peripheral sur-

face of the support shaft 19. The plate spring 23b (Figs. 1 and 3A) is fixed to the central part of the main cradle body 23 and is in contact with the support arm 18 so as to urge the top apron 22 toward the bottom aprons 15 with the main cradle body 23. The main cradle body 23 has a distal end. Left and right apron guides 24 are fixed to the main cradle body 23 near the distal end. The top aprons 22 run between the middle top rollers 20 and the apron guides 24. The apron guides 24 each include stoppers 24a, which are spaced apart by a distance that is substantially the same as the width of the corresponding top apron 22 to restrict lateral movement of the top apron 22. The left and right aprons 22 are supported at symmetrical positions with respect to the weighting arm 16.

[0016] A support 25 is arranged at the middle of the distal end of the main cradle body 23. The support 25 supports a shaft 26 in a rotatable manner. The shaft 26 has two ends projecting from the support 25 and located between the left and right top aprons 22. An adjustor 27 is fixed to each of the two ends of the shaft 26 to adjust the tensor interval. The adjustors 27 are rotated integrally with the shaft 26. Although not particularly limited, the adjustors 27 are formed from metal, resin, or fiber reinforced resin.

[0017] As shown in Fig. 3B, the adjustors 27 are each shaped to be generally octagonal when viewed from the side. One of the eight side surfaces of each adjustor 27 includes a groove 28. The adjustor 27 has four other side surfaces respectively defining contact surfaces 27a, 27b, 27c, and 27d, which come into contact with the tensor bar 13 and adjust the tensor interval. The adjustors 27 are supported by the shaft 26 laterally outward from the weighting arm 16 and between the left and right top aprons 22, which are supported by the main cradle body 23. The adjustors 27 are each fixed to the shaft 26 at an eccentric position so that the gap between the tensor bar 13 and the main cradle body 23, or the tensor interval, differs depending on which one of the contact surfaces 27a, 27b, 27c, and 27d is in contact with the tensor bar 13. That is, the adjustors 27 are each supported by the shaft 26 so that the distance from the center of the shaft 26 differs between the contact surfaces 27a, 27b, 27c, and 27d. Accordingly, the adjustors 27 come into contact with the tensor bar 13 so that the tensor interval is adjustable in plural steps.

[0018] In the preferred embodiment, the adjustors 27 are each formed so that the tensor interval is largest when the tensor bar 13 is in contact with the contact surface 27a, second largest when in contact with the contact surface 27b, third largest when in contact with the contact surface 27c, and fourth largest when in contact with the contact surface 27d. To facilitate rotation, the corners of the adjustors 27 are chamfered. Further, even if spinning yarns have different diameters, the same tensor interval may be used if the diameters of the spinning yarns are within a constant range. Thus, the tensor interval does not have to be adjustable in a stepless manner.

[0019] The adjustors 27 each include a colored portion

to indicate which one of the contact surfaces 27a, 27b, 27c, and 27d is in contact with the tensor bar 13. Four of the adjustor side surfaces that would be located at a predetermined position, which an operator may easily view, when the contact surfaces 27a, 27b, 27c, and 27d are in contact with the tensor bar 13 are colored with different colors to define the colored portion.

[0020] The operation of the apron draft device will now be discussed. In a state in which the pressure applied by the weighting arm 16 is cancelled, the apron cradle 21 holds the top aprons 22 in a state spaced apart from the bottom aprons 15. When the weighting arm 16 is arranged at a pressure application position (spinning position) at which it presses each top roller toward the bottom rollers, the top aprons 22 comes into contact with the bottom aprons 15.

[0021] Rotation of the middle bottom roller 14 rotates the bottom aprons 15. Friction between the top aprons 22 and the bottom aprons 15 rotate the top aprons 22 synchronously with the bottom aprons 15. This conveys fiber bundles (not shown) on the bottom aprons 15. The moving portion of each top apron 22 located at the upper side is guided by the stoppers 24a of the corresponding apron guide 24. Thus, the top apron 22 rotates at a predetermined position in a state in which lateral movement is restricted.

[0022] The fiber bundles conveyed by the bottom aprons 15 and the top aprons 22 are held between the middle bottom roller 14 and the middle top rollers 20. In this state, the fiber bundles are stretched due to the difference of the rotation speed of the two front rollers 12 and 17 from the rotation speed of the aprons 15 and 22. The open amount between the distal ends of the bottom aprons 15 and the top aprons 22 must be adjusted in accordance with the yarn number count or fiber type. Thus, the tensor interval is adjusted to a suitable value that is in correspondence with the spinning conditions.

[0023] To adjust the tensor interval, the adjustors 27 are rotated so that the one of the contact surfaces 27a to 27d corresponding to the required tensor interval comes into contact with the tensor bar 13. As shown in Fig. 4, the adjustors 27 are rotated by inserting an operation tool 30, such as the distal end of a slotted screwdriver, into the groove 28. When moving the operation tool 30 in a state in which its distal end is inserted into the groove 28, the left and right adjustors 27 are rotated integrally with the shaft 26. For example, to rotate the adjustors 27 from the state of Fig. 4 until the contact surfaces 27a come into contact with the tensor bar 13, the operation tool 30 is pivoted in the counterclockwise direction as viewed in Fig. 4. To rotate the adjustors 27 until the contact surfaces 27c or 27d come into contact with the tensor bar 13, the operation tool 30 is pivoted in the clockwise direction as viewed in Fig. 4. The adjustors 27 are rotated until the contact surfaces that obtain the tensor interval suitable for the spinning conditions come into contact with the tensor bar 13. When rotating the adjustors 27, the operator checks whether the colored

surface corresponding to the required tensor interval can be seen at the predetermined position. This enables the operator to obtain the required tensor interval. When the adjustors 27 are rotated until the required colored surface can be seen at the predetermined position in each spindle, the adjustments are completed.

[0024] The preferred embodiment has the advantages described below.

(1) The apron cradle 21 includes the main cradle body 23 supported by the support shaft 19, which is supported by the weighting arm 16. The shaft 26 located near the distal end of the main cradle body 23 supports the left and right adjustors 27. The adjustors 27 come into contact with the tensor bar 13 laterally outward from the weighting arm 16 and enable the gap between the distal portions of the top aprons 22 and the distal portions of the bottom aprons 15 to be adjusted in plural steps. The tensor interval is adjusted by rotating the left and right adjustors 27 without cancelling the pressure applied by the weighting arm 16. Accordingly, the tensor interval of the apron draft device at the left and right sides is easily and uniformly adjusted without cancelling the pressure applied by the weighting arm 16.

(2) The left and right adjustors 27 are fixed to the shaft 26 in an integrally rotatable manner. Accordingly, rotation of one of the adjustors 27 simultaneously rotates the other adjustor 27 together with the shaft 26. This reduces the tasks for adjusting the tensor interval by one half compared to when the two adjustors 27 are independently rotatable.

(3) The left and right adjustors 27 are arranged between the left and right top aprons 22, which are supported by the main cradle body 23. Accordingly, in comparison with when the left and right adjustors 27 are arranged outward from the top aprons, the bending moment acting on the main cradle body 23 is reduced. That is, the bending moment acting on the main cradle body 23 is prevented from increasing.

(4) Each adjustor 27 includes the groove 28, which functions as an operation portion. In a state in which the end of the operation tool 30 (e.g., screwdriver) is engaged with the groove 28, the adjustor 27 may easily be rotated by applying force to the operation tool 30.

(5) Each adjustor 27 includes the colored portion, which indicates which one of the contact surfaces 27a, 27b, 27c, and 27d is in contact with the tensor bar 13. Four of the adjustor side surfaces that would be located at a predetermined position, which an operator may easily view, when the contact surfaces 27a, 27b, 27c, and 27d are in contact with the tensor

bar 13 are colored with different colors to define the colored portion. When adjusting the tensor interval, the adjustors 27 are rotated until the surface having the color corresponding to the required tensor interval is arranged at the predetermined position, which can easily be seen by the operator. This allows all of the adjustors 27 to be arranged in a state corresponding to the required tensor interval.

[0025] 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 spirit or scope of the invention. Particularly, it should be understood that the present invention may be embodied in the following forms.

[0026] The left and right adjustors 27 do not have to be integrally rotatable with the shaft 26 and may be supported by the shaft 26 to be independently rotatable. In this case, the support 25 of the main cradle body 23 does not have to rotatably support the shaft 26, which extends through the support 25. Further, the shaft 26 does not have to be a single shaft commonly shared by the left and right adjustors 27. More specifically, separate coaxial shafts may be used in lieu of the shaft 26. This increases freedom for the configuration of the tensor interval adjustment compared to when the left and right adjustors 27 are integrally rotatable.

[0027] The adjustors 27 are not limited to a structure that enables adjustment of the tensor interval in four steps and is only required to enable adjustment of the tensor interval in plural steps. That is, the adjustors 27 may be formed to enable adjustment of the tensor interval in three steps or less or five steps or more. It is however preferable that the adjustors 27 be adjustable in three or more steps.

[0028] The adjustors 27 do not need to have an octagonal shape when viewed from the side. The adjustors 27 may have any number of surfaces that come into contact with the tensor bar 13 to enable adjustment of the tensor interval in plural steps. For example, the adjustors 27 may each be a polygon having seven sides or less or a polygon having nine sides or more. Further, the adjustors 27 do not have to be polygonal. For example, as shown in Fig. 5A, the surfaces of the adjustors 27 other than the contact surfaces 27a to 27d may be curved.

[0029] The operation portion used to rotate each adjustor 27 does not have to be the groove 28. For example, a hole may be formed to receive one end of an operation member (operation tool 30) that rotates the adjustor 27. Further, a projection may be formed in lieu of the groove 28. In this case, an operation member capable of holding the projection or an operation member having a recess engageable with the projection is used to rotate the adjustor 27.

[0030] The operation portion of the polygonal adjustor 27 does not have to be formed on just one surface other than the contact surfaces 27a to 27d and may be formed on a plurality of surfaces. In this case, in comparison to when forming the operation portion on only one surface,

the adjustor 27 is easier to rotate. Further, the operation portions do not all have to be formed by the grooves 28, holes, or projections. For example, as shown in Fig. 5B, a groove 28 may be formed on a surface other than the contact surfaces 27a to 27d, and a hole 31 may be formed in the contact surface 27b. Furthermore, an operation portion may be formed in the side surface of each of the adjustors 27.

[0031] The operation tool 30 may include a plurality of engagement portions that are simultaneously engageable with the grooves 28, holes, or projections. For example, an operation tool 30 including a plurality of engagement portions, which are arranged in a comb-like manner and spaced apart in accordance with the distance between the adjustors 27, may be used to simultaneously adjust the tensor interval with a plurality of the adjustors 27. In this case, the number of adjustment step can be reduced.

[0032] The colored portion of each adjustor 27 may be eliminated.

[0033] Instead of fixing the apron guides 24 to the main cradle body 23, the stoppers 24a may be arranged on the upper surface of the main cradle body 23.

[0034] The apron cradle of the preferred embodiment is not limited to the draft device of a fine spinning frame and may be applied to the draft device of a roving frame or a tying frame.

[0035] An attachment, which is detachably attached to the main cradle body 23, may be used to hold the support shaft 26 on the main cradle body 23.

[0036] 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 and equivalence of the appended claims.

[0037] An apron cradle for a spinning frame of a double-spindle type apron draft device attached to a weighting arm (16). A support shaft (19) is supported by the weighting arm (16). A main cradle body (23) is supported by the support shaft (19) and supports top aprons (22). Bottom aprons (15) respectively correspond to the top aprons (22). A tensor bar (13) supports the bottom aprons (15) and is arranged facing toward the main cradle body (23). A shaft (26) arranged near a distal end of the main cradle body (23) supports adjustors (27, 27) laterally outward from the weighting arm (16). Each adjustor (27, 27) includes contact surfaces (27a, 27b, 27c, 27d) contactable with the tensor bar (13) so that a tensor interval between the apron cradle and tensor bar (13) is adjustable to vary a gap between distal portions of the top and bottom aprons.

Claims

1. An apron cradle for a spinning frame used in a double-spindle type apron draft device attached to a weighting arm (16), the apron cradle comprising:

a support shaft (19) supported by the weighting arm (16);
 a main cradle body (23) supported by the support shaft (19);
 two top aprons (22) supported by the main cradle body (23);
 two bottom aprons (15) respectively corresponding to the two top aprons (22); and
 a tensor bar (13) which supports the two bottom aprons (15) and which is arranged facing toward the main cradle body (23), being **characterized by:**

a shaft (26) arranged near a distal end of the main cradle body (23); and
 two adjustors (27, 27) supported by the shaft (26) at an eccentric position and arranged laterally outward from the weighting arm (16), each of the adjustors (27, 27) including a plurality of contact surfaces (27a, 27b, 27c, 27d), each contactable with the tensor bar (13) so that a tensor interval defined between the apron cradle and the tensor bar (13) is adjustable in order to vary a gap in plural steps between a distal portion of the top aprons (22) and a distal portion of the bottom aprons (15).

2. The apron cradle according to claim 1, being **characterized in that** each of the adjustors (27, 27) is supported by the shaft (26) so that the distance from the center of the shaft (26) differs between the plurality of contact surfaces (27a, 27b, 27c, 27d).
3. The apron cradle according to claim 1 or 2, being **characterized in that** the two adjustors (27, 27) are fixed to the shaft (26) so as to be integrally rotatable with each other.
4. The apron cradle according to claim 1 or 2, being **characterized in that** the two adjustors (27, 27) are supported by the shaft so as to be rotatable independently from each other.
5. The apron cradle according to any one of claims 1 to 4, being **characterized in that** the two adjustors (27, 27) are arranged between the two top aprons supported by the main cradle body (23).
6. The apron cradle according to any one of claims 1 to 5, being **characterized in that** the adjustors (27, 27) each include a colored portion to indicate which one of the plurality of contact surfaces (27a, 27b, 27c, 27d) is in contact with the tensor bar.
7. The apron cradle according to any one of claims 1 to 6, being **characterized in that** the adjustors (27, 27) each include an operation portion (28, 31) used

Fig.1

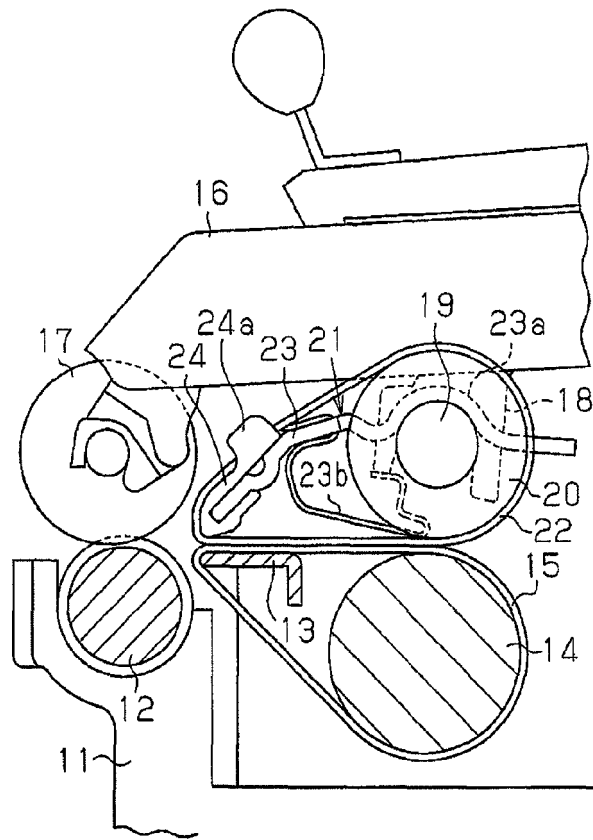


Fig.2

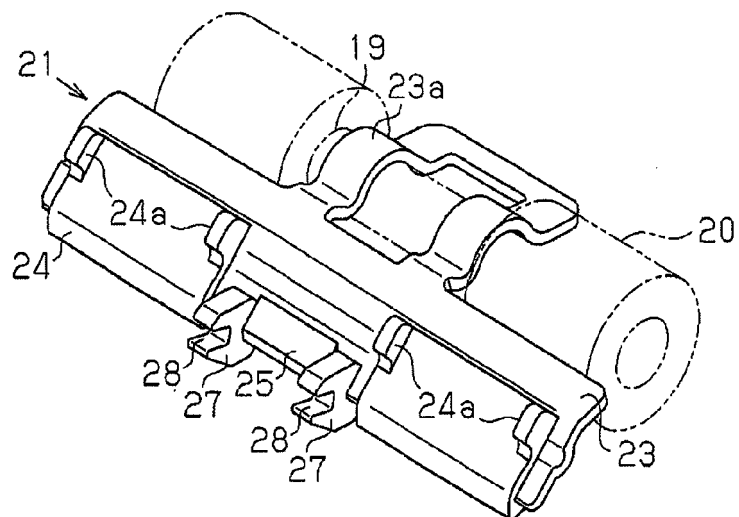


Fig.3A

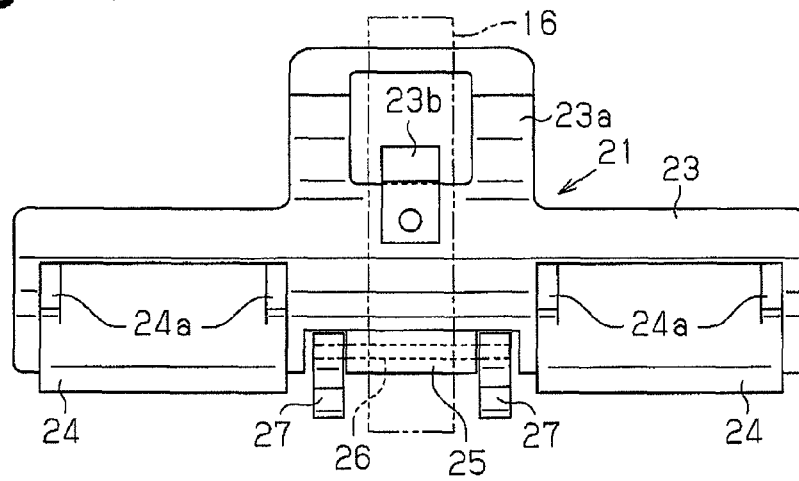


Fig.3B

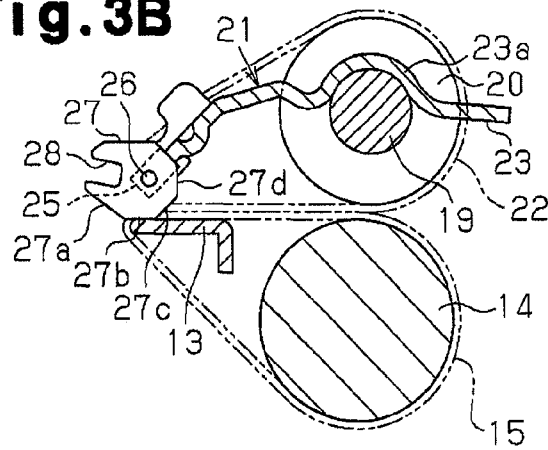


Fig.4

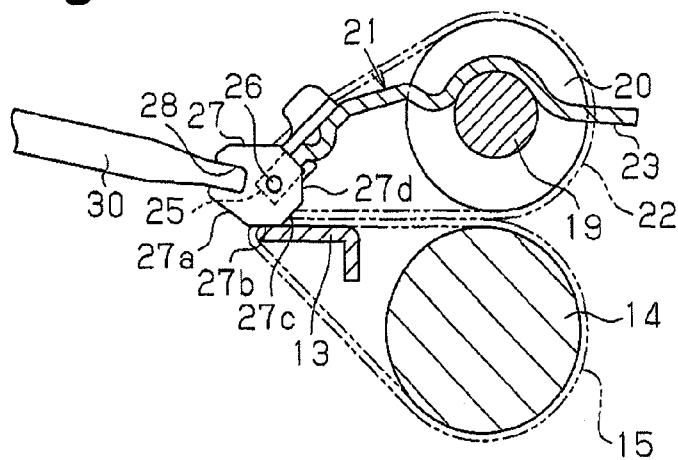


Fig.5A

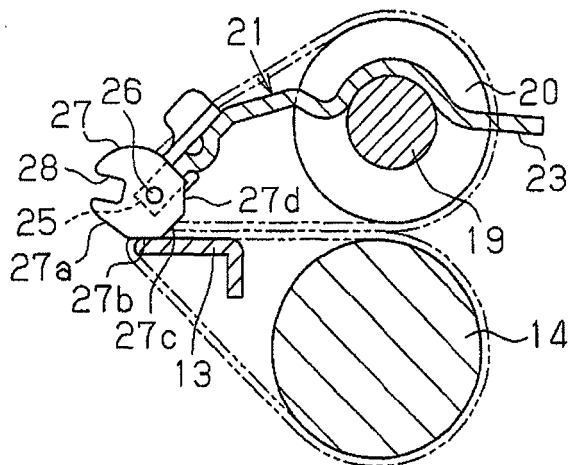


Fig.5B

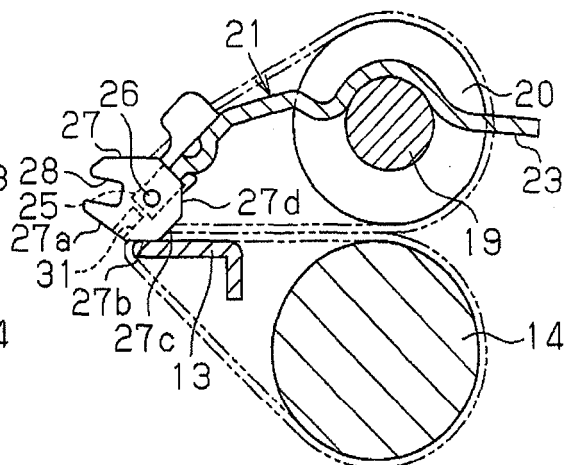


Fig.6A

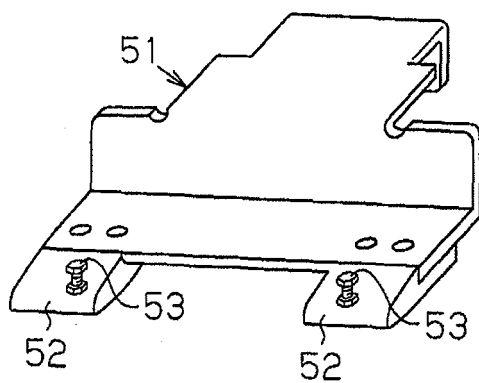
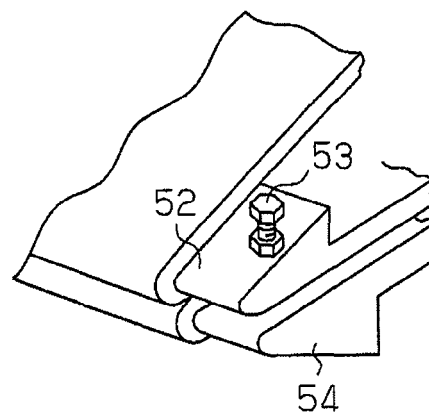


Fig.6B





EUROPEAN SEARCH REPORT

Application Number
EP 09 16 1642

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 16 1642

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