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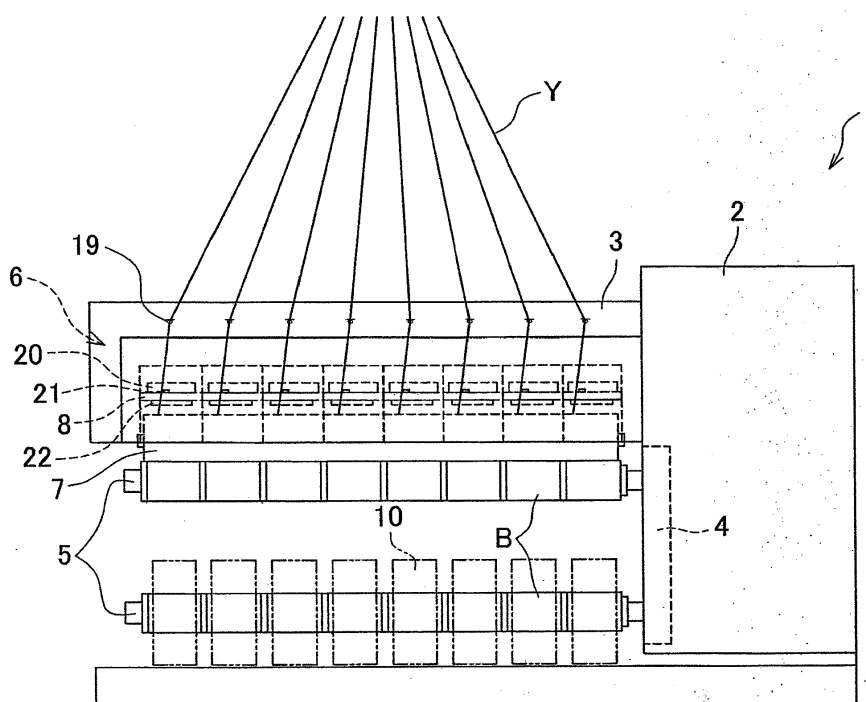
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(54) **YARN WINDING DEVICE**

(57) An objective is to provide a yarn winding device having shifter units (8) dividable into individual units, thereby making it possible to quickly detach and shift yarns and flexibly accommodate changes in the number of bobbins. The yarn winding device includes a plurality of shifter units (8) that detaches yarns Y from traverse

units (6) and shift the yarns Y to the outside of the traverse ranges of the corresponding traverse units (6), when the yarns Y are transferred from fully-wound packages (10) to empty bobbins. The shifter units (8) are arranged to be dividable into individual units.

FIG.1



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn winding device that winds a yarn onto a bobbin while traversing the yarn, so as to form a package.

[0002] A known yarn winding device forms a package by winding a yarn onto a bobbin while traversing the yarn by a traverse unit. Such a yarn winding device is provided with a shifter that detaches a traversed yarn from the traverse unit and shifts the same to the outside of the traversal range, in order to transfer the yarn from a fully-wound package to an empty bobbin.

[0003] For example, Patent Literature 1 (Japanese Patent No. 2991004 (Fig. 2)) recites a yarn winding device in which two bobbin holders to each of which a plurality of bobbins are serially attached in the axial directions are rotatably supported by a turret, and each bobbin holder is switched between a winding position and a retracted position by the rotation of the turret. This yarn winding device of Patent Literature 1 is provided with a shifter for transferring a yarn from a fully-wound package attached to the bobbin holder at the winding position to an empty bobbin attached to the bobbin holder at the retracted position, when the bobbin holders at the winding position and at the retracted position swap the positions.

[0004] The shifter of Patent Literature 1 includes: a plate-shaped yarn flip-up guide which is shared by all yarns and pushes the yarns traversed by wing guides of a wing-type traverse unit so as to detach the yarns from the respective guides; and a plurality of movable shifters that push and shift the yarns detached from the respective wing guides to the outside of the traversal ranges. The movable shifters are supported by a slidable component which is shared by all yarns. The yarn shifted to the outside of the traversal range by the movable shifter is trapped at a slit formed at an edge of the bobbin so as to be straight-wound, and then the movable shifter is returned so that the yarn is tail-wound onto the bobbin for yarn connection before returning to the traversal range. Thereafter, the traversal to the bobbins is resumed.

[0005] Now, when the number of bobbins attached to a single bobbin holder is increased in order to wind more yarns at once, the bobbin holder must be long in the axial directions, and therefore the plate-shaped yarn flip-up guide must be long, too. Because this increases the weight of the yarn flip-up guide, the inertia of the movement is increased and hence the movement of the guide becomes sluggish. Furthermore, as the number of the movable shifters is also increased, the slidable component which supports and slides the many movable shifters must also be long in the same manner as the yarn flip-up guide. This causes the movement of the movable shifters to be sluggish. As the movement of the yarn flip-up guide and the movement of the slidable component become sluggish, it takes a long time to transfer the

yarns, with the result that lots of yarns are wasted. In the meanwhile, when, for example, the number of bobbins attached to a single bobbin holder (i.e., the number of yarns to be wound) is increased or decreased due to model change or the like, the existing yarn flip-up guide and slidable component are unlikely to be reusable and must be newly designed.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is therefore to provide a yarn winding device having shifter units dividable into individual units, thereby making it possible to quickly detach and shift yarns and flexibly accommodate changes in the number of bobbins.

[0007] A yarn winding device of the present invention includes: a winding spindle for winding yarns onto a plurality of bobbins, respectively, which are attached in series to the winding spindle along axial directions of the winding spindle; a plurality of traverse units for traversing the yarns wound onto the respective bobbins, in axial directions of the respective bobbins; and a plurality of shifter units for detaching the yarns from the traverse units and shifting the yarns to the outside of the traversal ranges of the corresponding traverse units, the shifter units being dividable into individual units.

[0008] In the yarn winding device of the present invention, the shifter units are arranged to be dividable into individual units. This makes it possible to restrain the size of each shifter unit to the minimum necessary for the yarn detaching and the yarn shifting, i.e., the shifter unit is downsized. Therefore the yarn detaching and the yarn shifting are quickly and stably carried out. Furthermore, the number of shifter units is easily increased or decreased, and flexible increase or decrease in the number of bobbins attached to the winding spindle (i.e., the number of yarns to be wound) is possible.

[0009] In addition to the above, preferably, the shifter units are provided in the respective traverse units and are dividable into individual units together with the traverse units.

[0010] According to this arrangement, because each shifter unit is small in size as described above, it is possible to provide this component in the traverse unit. It is therefore possible to improve the maintenance efficiency as the shifter units are detached together with the traverse units.

[0011] In the case above, preferably, the shifter units are detachable from the corresponding traverse units.

[0012] This further improves the maintenance efficiency of the shifter units.

[0013] In addition to the above, preferably, each of the shifter units includes: a slidable component that is slidable along the axial directions of the winding spindle; a yarn detaching component for detaching the yarn from the traverse unit in sync with the movement of the slidable component; and a yarn shifting component which is provided on the slidable component to contact the yarn de-

tached from the traverse unit by the yarn detaching component and shift the yarn to the outside of the traversal range in sync with the movement of the slidable component.

[0014] According to this arrangement, as the slidable component is slid, the yarn detaching component detaches the yarn from the traverse unit. Then the yarn shifting component shifts the yarn detached from the traverse unit to the outside of the traversal range.

[0015] In addition to the above, preferably, the yarn winding device further includes a driving unit for driving the shifter units, the slidable components being aligned along the axial directions of the winding spindle and connected to one another so as to correspond to the bobbins, and the driving unit being connected to one of the slidable components to move the one of the slidable components along the axial directions of the winding spindle in a sliding manner.

[0016] According to this arrangement, because the yarn detaching component and the yarn shifting component are moved in a synchronized manner by the movement of the slidable component by a single driving unit, the two operations, i.e., the detaching of the yarn traversed by the traverse unit and the movement of the detached yarn to the outside of the traversal range, are quickly carried out in a synchronized manner. Furthermore, as a single slidable component is moved in a sliding manner by a single driving unit, the other slidable components connected to the single slidable component are also moved in a sliding manner. As such, all shifter units move in the same manner. This reduces the number of required driving units and the costs thereof.

[0017] In addition to the above, preferably, the yarn shifting component includes a yarn shifting portion that shifts the yarn to the outside of the traversal range and a yarn returning portion that opposes the yarn shifting portion with a gap therebetween and returns the yarn to the traversal range.

[0018] According to this arrangement, it is possible to push the yarn by the yarn shifting portion to the outside of the traversal range. Furthermore, when the shifted yarn is returned to the traversal range, the speed of returning the yarn is always the same in sync with the movement of the yarn returning portion. This makes it possible to prevent the yarn from being loosen and stabilize the amount of the tail-wound yarn.

[0019] In addition to the above, preferably, the yarn shifting component moves between a one end portion of the traversal range and the outside of the one end portion of the traversal range in response to the movement of the slidable component and is positioned at the one end portion when the yarn is detached from the traverse unit, the yarn detaching component is an arm pivoted to be swingable with respect to the slidable component to intersect the movement trace of the traversed yarn, in sync with the movement of the slidable component, and swings, at least at the one end portion of the traversal range, between a retracted position where the yarn de-

taching component is separated from the yarn and a yarn detaching position where the yarn detaching component contacts the yarn, and when the slidable component is moved so that the yarn detaching component is at the yarn detaching position, the yarn traversed from the other end portion to the one end portion of the traversal range runs off from the movement trace and moves along the yarn detaching component, and is eventually retained between the yarn shifting portion and the yarn returning portion of the yarn shifting component.

[0020] This makes it possible to shorten the distance of the movement of the yarn shifting component when the yarn shifting component shifts the yarn. Furthermore, the yarn traversed from the other end portion to the one end portion of the traversal range is shifted along the arm-shaped yarn detaching component, is retained between the yarn shifting portion and the yarn returning portion of the yarn shifting component, and is detached from the traverse unit. As such, because the yarn detaching is performed by using the traverse unit, it is possible to shorten the swinging distance of the yarn detaching component when detaching the yarn.

[0021] The arrangement above makes it possible to restrain the size of each shifter unit to the minimum necessary for the yarn detaching and the yarn shifting, i.e., the shifter unit is downsized. Therefore the yarn detaching and the yarn shifting are quickly and stably carried out. Furthermore, the number of shifter units is easily increased or decreased, and flexible increase or decrease in the number of bobbins attached to the winding spindle (i.e., the number of yarns to be wound) is possible.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a side view of a yarn winding device of an embodiment.

Fig. 2 is a front view of the yarn winding device of the present embodiment.

Fig. 3 is a perspective view of the traverse units and the shifter units.

Fig. 4 is a plan view of the shifter unit.

Fig. 5 is a plan view of a bobbin on which a yarn is wound.

Fig. 6 illustrates how the traversed yarn is detached and shifted.

Fig. 7 illustrates how the shifted yarn is returned to the traversal range.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Now, an embodiment of the present invention will be described. As shown in Fig. 1, the yarn winding device 1 successively receives yarns Y from an unillustrated spinning machine above. The yarn winding device 1 winds the yarns Y supplied from the spinning machine

onto respective bobbins B so as to form a plurality of packages 10.

[0024] As shown in Fig. 1 and Fig. 2, the yarn winding device 1 includes components such as: a main body frame 2; an elevation frame 3 attached to the main body frame 2 to be vertically movable; a disc-shaped turret 4 rotatably attached to the main body frame 2; two bobbin holders 5 (winding axes) each of which is supported by the turret 4 at one end and to each of which a plurality of bobbins B are attached; traverse units 6 which traverse the yarns Y wound onto the bobbins B; a contact roller 7 which is able to contact the bobbins B attached to the bobbin holder 5; and shifter units 8 each of which shifts the yarn Y traversed by the traverse unit 6 to the outside of the traversal range.

[0025] The turret 4 is disc-shaped and rotatably attached to the main body frame 2. To two points on the turret 4 that are symmetrical to each other about the axis 4a that is the rotation center of the turret 4, one ends of the two bobbin holders 5 are attached, respectively. The two bobbin holders 5 are rotatable and protrude from the turret 4. The two bobbin holders 5 rotate together in line with the rotation of the turret 4. To each bobbin holder 5, a plurality of bobbins B are serially attached along the axial directions of the bobbin holder 5.

[0026] The turret 4 is rotated about the axis 4a by a rotation motor 31. As the turret 4 is rotated, each of the two bobbin holders 5 moves between a winding position P1 where the bobbins B or the packages 10 contact the contact roller 7 to allow the yarn Y to be wound onto the bobbin B and a standby position P2 which is below the winding position P1 and is point-symmetrical to the winding position P1 about the axis 4a of the turret 4. As the yarn Y is wound onto the bobbin B attached to the bobbin holder 5 at the winding position P1 and a fully-wound package 10 is formed, this bobbin holder 5 at the winding position P1 and the bobbin holder 5 at the standby position P2 change the positions.

[0027] Each of the two bobbin holders 5 supported by the turret 4 is rotated by a rotation motor 32. As the bobbin holder 5 at the winding position P1 rotates, the yarns Y are wound onto the respective bobbins B attached to this bobbin holder 5.

[0028] The elevation frame 3 is a long frame extending along the axial directions of the bobbin holder 5, and is supported by the main body frame 2 at its longitudinal base end. The elevation frame 3 is connected to the rod of an unillustrated cylinder fixed to the main body frame 2. As the cylinder drives, the elevation frame 3 moves in vertical directions with respect to the main body frame 2 (i.e., in the directions moving close to and away from the bobbin holder 5).

[0029] Fig. 3 is a perspective view of the traverse units and the shifter units. As shown in Fig. 1 to Fig. 3, the traverse unit 6 is a so-called wing-type traverse unit 6 provided on the elevation frame 3, and includes components such as a fulcrum guide 19, two wing guides 21, a traverse guide 22, and a traverse motor 33 for rotating

the two wing guides 21. The fulcrum guide 19 is provided in the vicinity of the upper end portion of the elevation frame 3 to allow the yarn Y supplied from the spinning machine to be threaded thereon. The fulcrum guide 19 functions as a fulcrum of the traversal of the yarn Y.

[0030] The two wing guides 21 are housed in a traversal cassette 20 (see Fig. 3) and are on the downstream of the fulcrum guide 19 in the running direction of the yarn Y. The wing guides 21 are wing-shaped guides that are rotated in opposite directions about the same axis by the traverse motor 33. After the yarn Y is moved to one side in the axial directions of the bobbin B by one of the wing guides 21, the yarn Y is transferred to the other one of the wing guides 21 at an end position (an edge of the winding target range of the bobbin B), and the yarn Y is moved to the other side in the axial directions of the bobbin B by the other one of the wing guides 21. As this operation is repeated, the yarn Y passing through the fulcrum guide 19 is guided to the contact roller 7 while being traversed in the axial directions (traversing directions) of the bobbin B, with the fulcrum guide 19 functioning as the fulcrum.

[0031] The traverse guide 22 is provided immediately below the traversal cassette 20 and connected to the traversal cassette 20 by screws 59. The traverse guide 22 is arc-shaped in profile, and the arc-shaped profile protrudes forward as compared to the traversal cassette 20, when viewed from the front. The yarn Y slides on the profile of this traverse guide 22 when traversed by the wing guide 21.

[0032] The traverse units 6 are arranged so that units constituted by the traversal cassette 20 housing the two wing guides 21 and the traverse guide 22 connected to the traversal cassette 20 are dividable into individual units for respective bobbins (each of which units is the minimum unit for winding a single yarn Y), and therefore each traverse unit 6 is individually removable from the elevation frame 3.

[0033] The elevation frame 3 rotatably supports the contact roller 7 via two supporting portions 11, and is vertically movable with respect to the main body frame 2.

[0034] The contact roller 7 is supported by the two supporting portions 11 of the elevation frame 3 to be in parallel to the bobbin holder 5. The contact roller 7 is able to contact either the bobbins B attached to the bobbin holder 5 at the winding position P1 or the outer circumferences of the packages 10 formed by winding the yarns Y onto the bobbins B. When the yarn is wound onto the bobbin B, the contact roller 7 is rotated by the rotation of the bobbin holder 5 while applying a predetermined contact pressure to the package 10, so as to adjust the shape of the package 10. The elevation frame 3 and the contact roller 7 are moved by an unillustrated cylinder in the direction (downward direction) in which the components move close to the bobbins B at the winding position P1 or in the direction (upward direction) in which the components move away from the bobbins B. As such, the elevation frame 3 and the contact roller 7 change their

positions relative to the main body frame 2.

[0035] Now, the shifter unit 8 will be described. Fig. 4 is a plan view of the shifter unit. Fig. 5 is a plan view of the bobbin on which the yarn is wound. In Fig. 4, the traversal cassette 20, the screws 59, and the supporting member 58 which is a part of the shifter unit 8 are illustrated by two-dot chain lines. The shifter unit 8 detaches the yarn Y traversed along the traverse guide 22 from the wing guide 21 and shifts the yarn Y to the outside of the traversal range, at the time of later-described bobbin change.

[0036] As shown in Fig. 3 and Fig. 4, the shifter unit 8 includes a supporting member 58 sandwiched between the traversal cassette 20 and the traverse guide 22, a slidable component 51 which is supported by the supporting member 58 to be slidable along the axial directions of the bobbin holder 5, a yarn detaching arm 52 that swings in response to the movement of the slidable component 51, and a yarn holding component 53 provided on the slidable component 51.

[0037] The bobbin change means that, when the yarns Y are wound onto the bobbins B attached to the bobbin holder 5 at the winding position P1 and fully-wound packages 10 are formed, the turret 4 rotates to change the positions of the two bobbin holders 5 and the yarns Y wound on the packages 10 attached to the bobbin holder 5 having been moved to the standby position P2 are transferred to the empty bobbins B attached to the bobbin holder 5 having been moved to the winding position P1. More specifically, the yarn Y wound on the package 10 while being traversed is detached from the wing guide 21 and shifted to the outside of the traversal range. The yarn Y is guided to a slit 18 at an end portion of the bobbin B shown in Fig. 5 and is trapped at the slit 18, and straight winding 60 is formed. Thereafter, the yarn Y is shifted back to the traversal range and the yarn Y for yarn connection, which is called spiral tail winding 61, is wound onto a part between the slit 18 and an end portion of the traversal range of the bobbin B, and then the traversal is resumed.

[0038] The supporting member 58 is sandwiched between the traversal cassette 20 and the traverse guide 22 and is fixed at this position by the screws 59 by which the traverse guide 22 is connected to the traversal cassette 20.

[0039] The slidable component 51 is L-shaped and is on the back side of the running yarn Y when viewed from the front. This slidable component 51 includes a main body portion 54 extending along the axial directions of the bobbin holder 5 and a supporting portion 55 extending from one end portion of the main body portion 54 toward the front. The main body portion 54 is supported by the supporting member 58 to be slidable with respect to the supporting member 58 along the axial directions of the bobbin holder 5. The main body portion 54 has a notch 54a at one end and a fitting portion 54b at the other end. To the fitting portion 54b the notch 54a is fittable. The main body portion 54 further has, at a substantial center

in the axial directions of the bobbin holder 5, a concave portion 54c which is concave when viewed from the front side and is triangular when viewed along the running direction of the yarn Y.

[0040] The yarn detaching arm 52 is, in the same manner as the supporting member 58, detachably fixed between the traversal cassette 20 and the traverse guide 22, by an unillustrated screw. The yarn detaching arm 52 is capable of swinging about an axis around a base end portion 52a such that the leading end side of the arm 52 crosses the running path of the yarn Y, i.e., such that the arm 52 protrudes forward as compared to the traverse guide 22. The yarn detaching arm 52 is curved inward toward the leading end. The yarn detaching arm 52 is biased toward the back side by a torsion spring 56 provided at the base end portion 52a. Further, when the slidable component 51 is at the retracted position shown in Fig. 4, the side face of the corner 52b of the base end portion 52a contacts the side face of the concave portion 54c of the main body portion 54 of the slidable component 51, and hence the yarn detaching arm 52 is positioned not to be able to contact the yarn Y traversed by the traverse unit 6, i.e., positioned on the back side as compared to the traverse guide 22.

[0041] The yarn holding component 53 includes a holding portion 57. The holding portion 57 is made up of a yarn shifting portion 57a and a yarn returning portion 57b that are connected to the supporting portion 55 of the slidable component 51 so as to be positionally fine-adjustable in the axial directions of the bobbin holder 5 and in the directions orthogonal to the axial directions. The yarn shifting portion 57a and the yarn returning portion 57b are two plate members opposing each other in the axial directions of the bobbin holder 5 with a gap not narrower than the diameter of the yarn Y being formed therebetween. The holding portion 57 is capable of sandwiching and holding the yarn Y in the axial directions of the bobbin holder 5, by means of the yarn shifting portion 57a and the yarn returning portion 57b. The yarn shifting portion 57a and the yarn returning portion 57b are positioned not to overlap the traverse guide 22 when viewed along the running direction of the yarn Y, i.e., not to be able to contact the traversed yarn Y, when the slidable component 51 is at the retracted position shown in Fig. 4. The corner of each of the yarn shifting portion 57a and the yarn returning portion 57b, which corner does not face the other portion, is chamfered to facilitate the sliding of the yarn Y.

[0042] When the slidable component 51 is at the retracted position, the yarn Y traversed by the wing guide 21 of the traverse unit 6 does not contact the shifter unit 8.

[0043] The slidable components 51 of the respective shifter units 8 are aligned along the axial directions of the bobbin holder 5, and neighboring two slidable components 51 are connected with each other such that the notch 54a of one component is fitted to the fitting portion 54b of the other component. The slidable components 51 on the axial one end side of the bobbin holder 5 (i.e.,

left side in Fig. 3) are connected to the rod of the cylinder 40 (see Fig. 3) via unillustrated brackets, and all slidable component 51 slide along the axial directions of the bobbin holder 5 at the same stroke, in response to the movement of the cylinder 40. Because all slidable components 51 conduct the same operation, the yarn detaching arms 52 and the yarn holding components 53 also conduct the same operations, respectively. In short, all shifter units 8 conduct the same operation.

[0044] As described above, the shifter units 8 are arranged to be dividable into individual units for respective bobbins, and each shifter unit 8 is removable from the traversal cassette 20 by loosening the screw 59.

[0045] Now, the following will describe the operation of the traverse unit 6 and the shifter unit 8 when the above-described bobbin change is carried out for the reason that the formation of fully-wound packages 10 is completed by winding the yarns Y onto the bobbins B attached to the bobbin holder 5 at the winding position P1. It is noted that the description explains the bobbin change for one bobbin B by one shifter unit 8, because, for the remaining bobbins B all shifter units 8 operate at the same timing as described above.

[0046] Described first are the operations of the traverse unit 6 and the shifter unit 8 for detaching and shifting the traversed yarn Y, and described second is the operation of the shifter unit 8 for returning the shifted yarn to the traversal range. Fig. 6 illustrates the detaching and shifting of the traversed yarn. Fig. 7 illustrates the return of the shifted yarn to the traversal range. In Fig. 6 and Fig. 7, the upper view shows the shifter unit from above whereas the lower view shows the shifter unit from the front.

[0047] As shown in Fig. 6(a), while the yarn Y is traversed within the traversal width L and wound onto the bobbin B, the slidable component 51 is at the retracted position. On this account, the yarn detaching arm 52 and the yarn holding component 53 are positioned not to be able to contact the traversed yarn Y. To transfer the yarn Y to an empty bobbin B, while the yarn Y is moved to an axial one end of the bobbin holder 5 (i.e., one end in the traversal range) toward the yarn holding component 53 by the wing guide 21, as shown in Fig. 6(b), the cylinder 40 moves the slidable component 51 in the direction of the arrow A from the retracted position to the yarn detaching position which is on the one end side in the axial directions of the bobbin holder 5, where the yarn holding component 53 is provided. As a result, the yarn detaching arm 52 swings and hence the corner 52b is pushed away from the concave portion 54c of the main body portion 54, and consequently the corner 52b stops when contacting the profile 54d of the main body portion 54. The yarn holding component 53 moves to the one end of the traversal range. When viewed in the running direction of the yarn Y, the leading end side of the yarn detaching arm 52 when dividing the yarn detaching arm 52 at its substantial center protrudes from the traverse guide 22 and overlaps the yarn holding component 53.

[0048] In this state, after the movement of the cylinder 40 is stopped so that the movements of the slidable component 51, the yarn detaching arm 52, and the yarn holding component 53 are stopped, as shown in Fig. 6(c), the yarn Y is continuously moved toward one end of the traversal range by the wing guide 21. As a result, on the leading end side of the yarn detaching arm 52 when dividing the yarn detaching arm 52 at its substantial center, this yarn Y moves while contacting the arc-shaped profile of the yarn detaching arm 52, and moves along the chamfered profile of the yarn shifting portion 57a of the yarn holding component 53, and then, as shown in Fig. 6(d), the yarn Y enters the gap between the yarn shifting portion 57a and the yarn returning portion 57b and is kept at this position, at one end of the traversal range.

[0049] Thereafter, as the cylinder 40 moves, the slidable component 51 is moved from the yarn detaching position to the yarn shifting position which is further close to the one end. As a result, the yarn Y retained by the yarn holding component 53 is pushed by the yarn shifting portion 57a and shifted to the outside of the traversal range. Note that, a tension is imparted to the yarn Y retained by the yarn holding component 53 in a direction of pushing the yarn Y away from the gap between the yarn shifting portion 57a and the yarn returning portion 57b toward the traversal range, but this movement by the tension is restrained by the contact with the yarn detaching arm 52. As such, the traversed yarn Y is detached from the wing guide 21 and shifted to the outside of the traversal range.

[0050] The shifted yarn Y is wound onto the slit 18 of the bobbin B in the manner of straight winding, and is transferred to this bobbin from the fully-wound package 10. Thereafter, as the slidable component 51 is returned from the yarn shifting position shown in Fig. 7(a) to the retracted position, the yarn Y moves toward the traversal range together with the yarn holding component 53. Furthermore, the yarn detaching arm 52 returns to the position on the back side of the traverse guide 22 where the arm 52 does not overlap the yarn holding component 53, when viewed in the running direction of the yarn Y. As a result, as shown in Fig. 7(b), the yarn Y having been retained by the yarn holding component 53 and having not been allowed to return to the traversal range on account of the yarn detaching arm 52 is pushed by the yarn returning portion 57b and released from the gap between the yarn shifting portion 57a and the yarn returning portion 57b by the tension, with the result that the yarn Y returns to the traversal range. At this time, the tail winding is formed between the slit 18 of the bobbin B and one end side of the traversal width. In this regard, the amount of the yarn wound in the manner of tail winding is determined based on the moving speed of the slidable component 51. After the yarn Y returns to the traversal range, the traversal by the wing guide 21 of the traverse unit 6 is resumed.

[0051] The yarn winding device 1 of the present embodiment is arranged so that the shifter units 8 are divi-

dable into individual units. This makes it possible to restrain the size of each shifter unit 8 to the minimum necessary for the yarn detaching and the yarn shifting, i.e., the shifter unit 8 is downsized. Therefore the yarn detaching and the yarn shifting are quickly and stably carried out. Furthermore, since each unit is removable and replaceable, the maintenance efficiency is improved. Furthermore, the number of the shifter units 8 can be easily and flexibly increased or decreased in accordance with changes in the number of bobbins B attached to the bobbin holder 5 (i.e., the number of yarns Y to be wound) in response to model change or the like.

[0052] In addition to the above, because each shifter unit 8 is small in size, it is possible to provide the shifter unit 8 in the traverse unit 6 and to arrange the shifter unit 8 to be removable together with the traverse unit 6. Furthermore, the shifter unit 8 may be removable from the traverse unit 6. This further improves the maintenance efficiency of the shifter unit 8.

[0053] In addition to the above, because the yarn detaching arm 52 and the yarn holding component 53 are moved in response to the movement of the slidable component 51 by one cylinder 40, the two operations, i.e., the detaching of the yarn Y traversed by the wing guide 21 and the shifting of the detached yarn Y to the outside of the traversal range, are quickly carried out in a mechanically synchronized manner. At this stage, furthermore, as one slidable component 51 is moved in a sliding manner by a single cylinder 40, the other slidable components 51 connected to the one slidable component 51 are also moved in a sliding manner, with the result that all shifter units 8 move in the same manner. This reduces the number of required cylinders 40 and the costs thereof.

[0054] In addition to the above, because the holding portion 57 of the yarn holding component 53 sandwiches the yarn Y in the traversing directions, it is possible to push the yarn Y by the yarn shifting portion 57a of the yarn holding component 53 to the outside of the traversal range. Furthermore, when the shifted yarn Y is returned to the traversal range, the speed of returning the yarn Y is always the same because the yarn Y is pushed by the yarn returning portion 57b of the yarn holding component 53 in sync with the movement of the yarn returning portion 57b. This makes it possible to prevent the yarn Y from being loosen and stabilize the amount of the tail-wound yarn.

[0055] The yarn holding component 53 retains the yarn Y at one end portion of the traversal range and moves to the outside of the one end portion in response to the movement of the slidable component 51. The yarn holding component 53 shifts the yarn in this way. This makes it possible to shorten the distance of the movement of the yarn holding component 53 when the yarn holding component 53 shifts the yarn. Furthermore, because the yarn detaching is carried out by using the traverse unit 6, it is possible to reduce the swinging range of the yarn detaching arm 52 at the time of the yarn detaching. As such, the time required for yarn detaching and yarn shift-

ing is shortened by reducing the moving distances of the yarn holding component 53 and the yarn detaching arm 52. Furthermore, because the bending angle of the yarn Y is reduced, it is possible to restrain the yarn Y from becoming slack.

[0056] In addition to the above, when the torsion spring 56 is detached, the yarn detaching arm 52 having been biased toward the back side becomes able to extensively swing forward, thereby making it possible to remove a foreign matter trapped inside and check the abrasion status of each component.

[0057] Now, various modifications of the present embodiment will now be described. It is noted that the same components as in the embodiment are denoted by the same reference numerals as in the embodiment, respectively, and the description thereof will be omitted.

[0058] According to the present embodiment, the slidable components 51 of the respective shifter units 8 are connected and are moved by a single cylinder 40 in a sliding manner and in sync with each other. Alternatively, each of the slidable components 51 is provided with a cylinder and each slidable component 51 is individually moved in a sliding manner.

[0059] In addition to the above, while in the present embodiment the shifter unit 8 is detachably attached to the traversal cassette 20, the shifter unit 8 may be attached to any parts such as the elevation frame 3, as long as the yarn detaching and the yarn shifting are possible.

[0060] In addition to the above, while in the present embodiment the yarn detaching arms 52 and the yarn holding components 53 are moved in response to the movement of the slidable components 51 by a single cylinder 40, a driving unit such as a cylinder may be provided for each of these components to individually move each component.

[0061] In addition to the above, while in the present embodiment the yarn Y is sandwiched between the yarn shifting portion 57a and the yarn returning portion 57b, the yarn returning portion 57b that pushes the yarn Y when returning the yarn Y to the traversal range may not be provided. Even in such a case, after the yarn shifting portion 57a approaches the traversal range, the yarn Y having left the yarn shifting portion 57a approaches the traversal range on account of a tension.

[0062] In addition to the above, in the present embodiment the detaching of the yarn is carried out by utilizing the traversal by the traverse unit 6. Alternatively, the yarn detaching arm 52 is pushed to the front side as compared to the movable range of the wing guide 21, the pushed yarn Y is retained by the yarn holding component 53, and this yarn holding component 53 is moved to the outside of the traversal range.

[0063] In addition to the above, while in the present embodiment the present invention is used in the shifter unit that detaches the yarn from the wing-type traverse unit and shifts the yarn, the present invention may be used in other types of traverse units, e.g., cam-drum-

type, belt-type, and arm-type traverse units, on condition that the traverse unit reciprocates the guide in the traversal directions. A cam-drum-type traverse unit is an apparatus that reciprocates a traverse guide in the traversal directions along a cam groove spirally formed on the circumference of a cam axis by rotating the cam axis by a drive motor. A belt-type traverse unit reciprocates an endless belt with a guide in the traversal directions by a drive motor. An arm-type traverse unit reciprocates an arm member having a guide at the leading end in the traversal directions by a drive motor.

[0064] The features of all embodiments and all dependent claims can be combined with each other as long as they do not contradict each other.

[0065] The following items describe further preferred embodiments of the invention:

1. A yarn winding device comprising:

a winding spindle for winding yarns onto a plurality of bobbins, respectively, which are attached in series to the winding spindle along axial directions of the winding spindle;
a plurality of traverse units for traversing the yarns wound onto the respective bobbins, in axial directions of the respective bobbins; and
a plurality of shifter units for detaching the yarns from the traverse units and shifting the yarns to the outside of the traversal ranges of the corresponding traverse units,

the shifter units being dividable into individual units.

2. The yarn winding device according to 1, wherein, the shifter units are provided in the respective traverse units and are dividable into individual units together with the traverse units.

3. The yarn winding device according to 2, wherein, the shifter units are detachable from the corresponding traverse units.

4. The yarn winding device according to any one of 1 to 3, wherein, each of the shifter units includes:

a slidable component that is slidable along the axial directions of the winding spindle;
a yarn detaching component for detaching the yarn from the traverse unit in sync with the movement of the slidable component; and
a yarn shifting component which is provided on the slidable component to contact the yarn detached from the traverse unit by the yarn detaching component and shifts the yarn to the outside of the traversal range in sync with the movement of the slidable component.

5. The yarn winding device according to 4, further comprising:

a driving unit for driving the shifter units,

the slidable components being aligned along the axial directions of the winding spindle and connected to one another so as to correspond to the bobbins, and
the driving unit being connected to one of the slidable components to move the one of the slidable components along the axial directions of the winding spindle in a sliding manner.

6. The yarn winding device according to 5, wherein, the yarn shifting component includes a yarn shifting portion that shifts the yarn to the outside of the traversal range and a yarn returning portion that opposes the yarn shifting portion with a gap therebetween and returns the yarn to the traversal range.

7. The yarn winding device according to 6, wherein, the yarn shifting component moves between a one end portion of the traversal range and the outside of the one end portion of the traversal range in response to the movement of the slidable component and is positioned at the one end portion when the yarn is detached from the traverse unit,
the yarn detaching component is an arm pivoted to be swingable with respect to the slidable component to intersect the movement trace of the traversed yarn, in sync with the movement of the slidable component, and swings, at least at the one end portion of the traversal range, between a retracted position where the yarn detaching component is separated from the yarn and a yarn detaching position where the yarn detaching component contacts the yarn, and
when the slidable component is moved so that the yarn detaching component is at the yarn detaching position, the yarn traversed from the other end portion to the one end portion of the traversal range runs off from the movement trace and moves along the yarn detaching component, and is eventually retained between the yarn shifting portion and the yarn returning portion of the yarn shifting component.

Claims

1. A yarn winding device (1) comprising:

a winding spindle (5) for winding yarns (Y) onto a plurality of bobbins (B), respectively, which are attached in series to the winding spindle (5) along axial directions of the winding spindle (5); and
a plurality of traverse units (6) for traversing the

yarns (Y) wound onto the respective bobbins (B), in axial directions of the respective bobbins (B); **characterized by** comprising a plurality of shifter units (8) for detaching the yarns (Y) from the traverse units (6) and shifting the yarns (Y) to the outside of the traversal ranges of the corresponding traverse units (6) wherein,

the shifter units (8) are attached to the respective traverse units (6) and are dividable into individual units together with the traverse units (6).

2. The yarn winding device (1) according to claim 1, wherein, the shifter units (8) are detachable from the corresponding traverse units (6).
3. The yarn winding device (1) according to any one of claims 1 or 2, wherein, each of the shifter units (8) includes:

a slidable component (51) that is slidable along the axial directions of the winding spindle (5);
 a yarn detaching component (52) for detaching the yarn (Y) from the traverse unit (6) in sync with the movement of the slidable component (51); and
 a yarn shifting component (57) which is provided on the slidable component (51) to contact the yarn (Y) detached from the traverse unit (6) by the yarn detaching component (52) and shifts the yarn (Y) to the outside of the traversal range in sync with the movement of the slidable component (51).

4. The yarn winding device (1) according to claim 3, further comprising:

a driving unit for driving the shifter units,

the slidable components (51) being aligned along the axial directions of the winding spindle (5) and connected to one another so as to correspond to the bobbins (B), and
 the driving unit being connected to one of the slidable components (51) to move the one of the slidable components (51) along the axial directions of the winding spindle (5) in a sliding manner.

5. The yarn winding device (1) according to claim 4, wherein, the yarn shifting component (57) includes a yarn shifting portion (57a) that shifts the yarn (Y) to the outside of the traversal range and a yarn returning portion (57b) that opposes the yarn shifting portion (57a) with a gap therebetween and returns the yarn to the traversal range.

6. The yarn winding device (1) according to claim 5, wherein, the yarn shifting component (57) moves between a one end portion of the traversal range and the outside of the one end portion of the traversal range in response to the movement of the slidable component (51) and is positioned at the one end portion when the yarn (Y) is detached from the traverse unit (6), the yarn detaching component (52) is an arm pivoted to be swingable with respect to the slidable component (51) to intersect the movement trace of the traversed yarn, in sync with the movement of the slidable component (51), and swings, at least at the one end portion of the traversal range, between a retracted position where the yarn detaching component (52) is separated from the yarn (Y) and a yarn detaching position where the yarn detaching component (52) contacts the yarn, and when the slidable component (51) is moved so that the yarn detaching component (52) is at the yarn detaching position, the yarn traversed from the other end portion to the one end portion of the traversal range runs off from the movement trace and moves along the yarn detaching component (52), and is eventually retained between the yarn shifting portion (57a) and the yarn returning portion (57b) of the yarn shifting component (57).

FIG.1

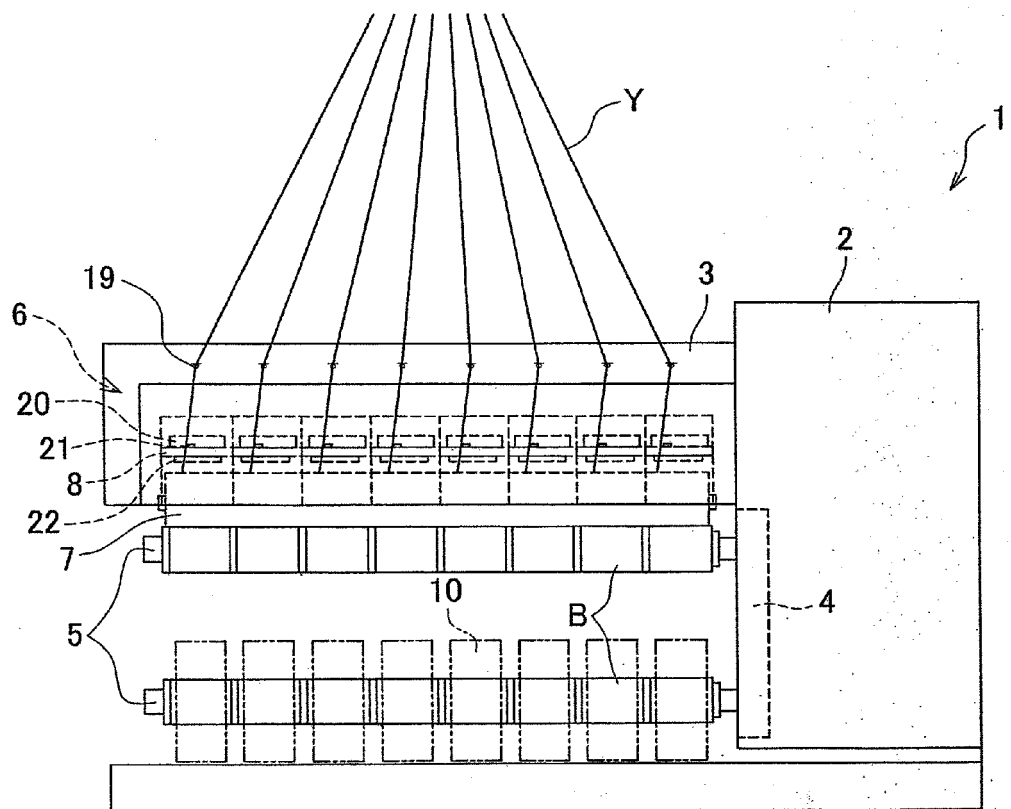


FIG.2

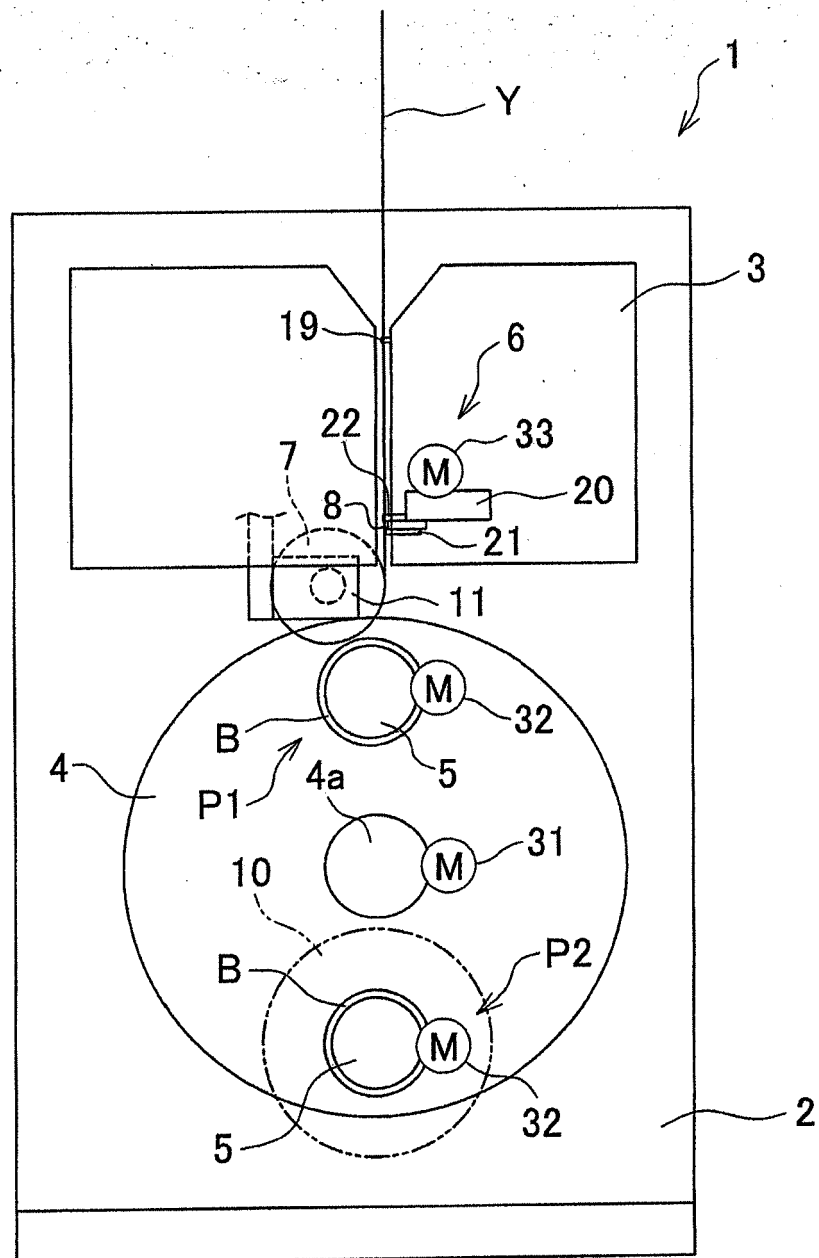


FIG.3

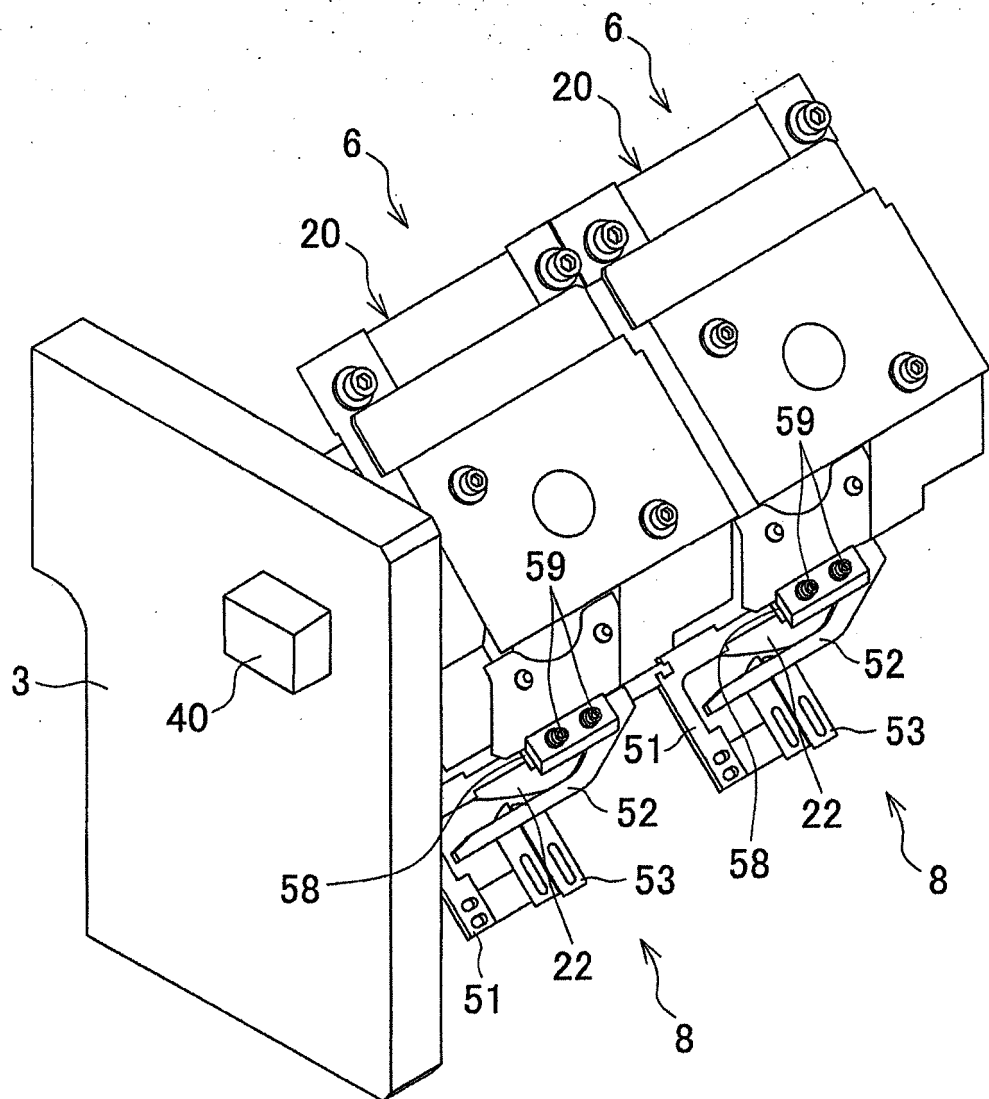


FIG.4

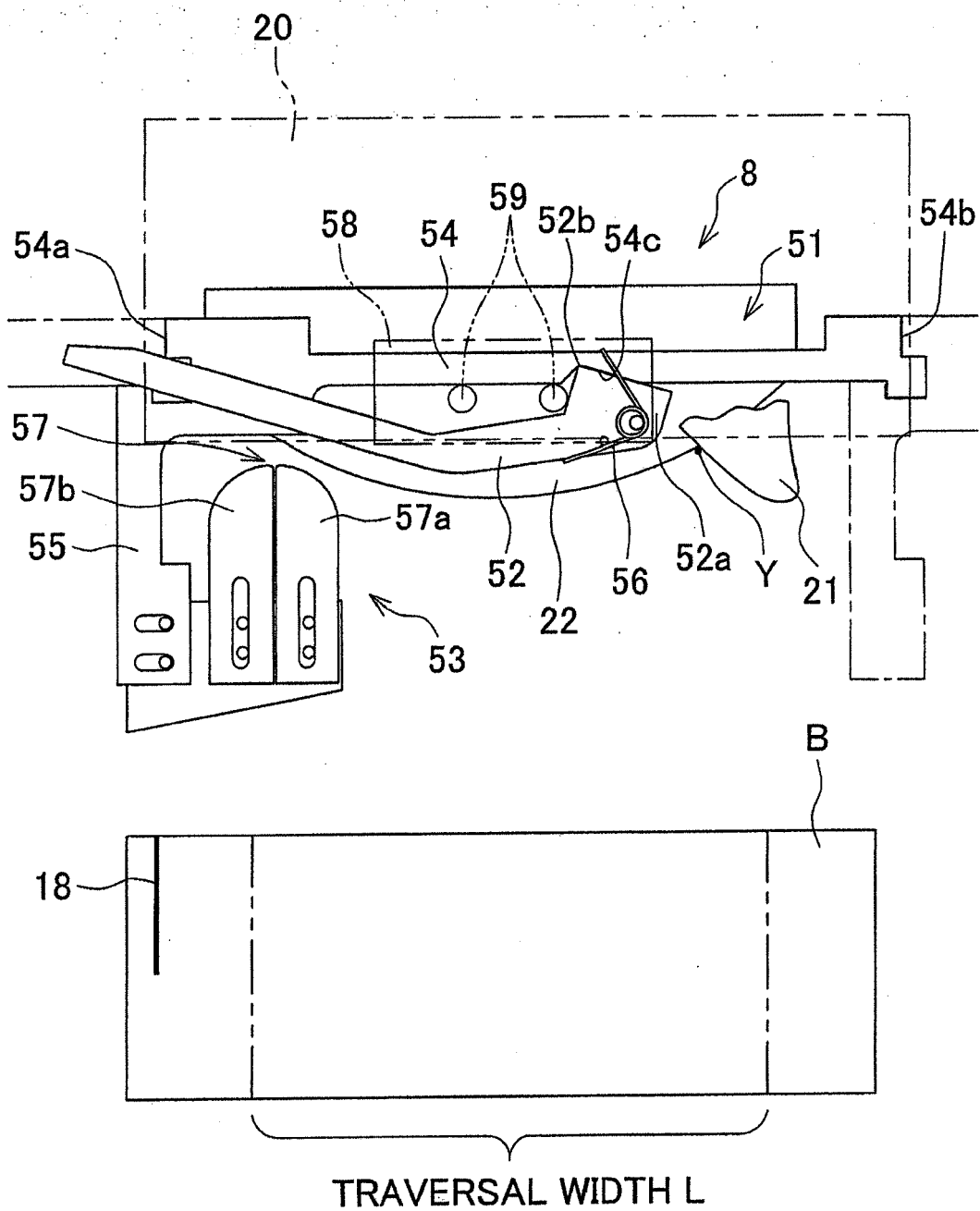


FIG.5

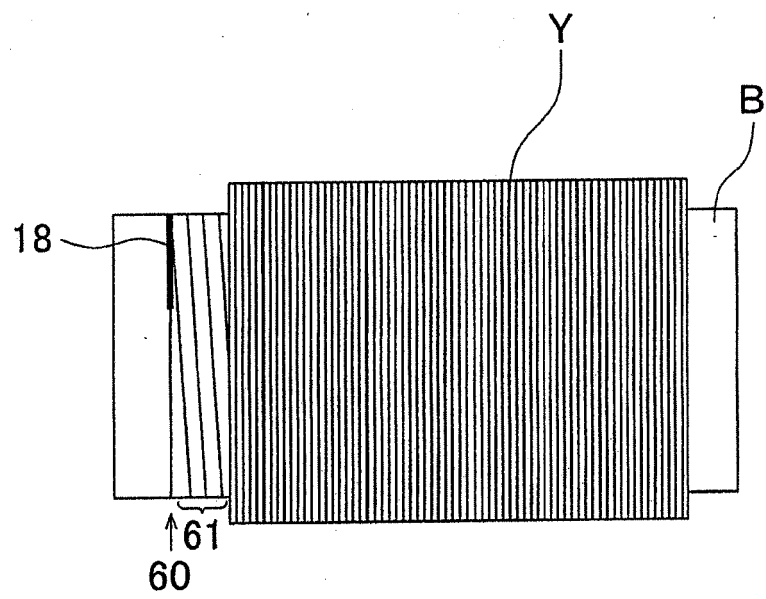


FIG.6(a)

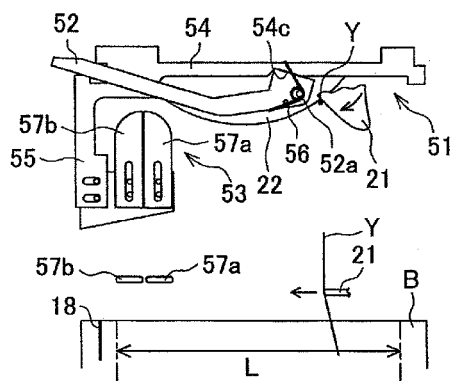


FIG.6(c)

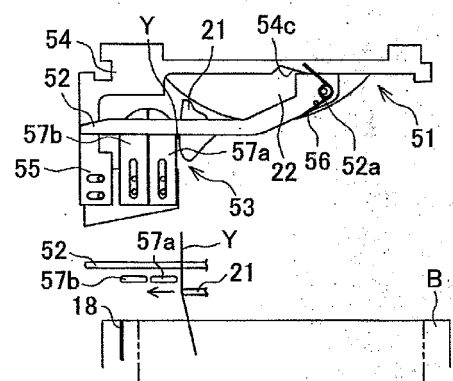


FIG.6(b)

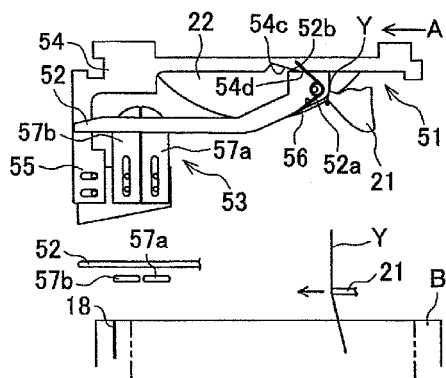


FIG.6(d)

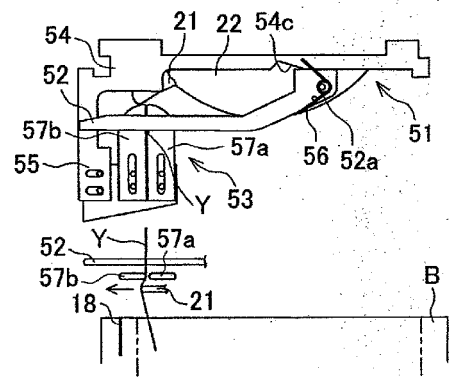


FIG.7(a)



EUROPEAN SEARCH REPORT

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			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 November 2016	Examiner Guisan, Thierry
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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