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(54) Take-up winder for an elastic yarn and its yarn-transferring method

(57) To provide a take-up winder for elastic yarn that can reliably transfer yarn using a simple structure, and that can remove unwanted yarn resulting from yarn-transferring without damaging a package.

A take-up winder for elastic yarn comprises bobbin holders 15, 16; a touch roller 3; a traversing device 4; a turret 2; and a yarn guide 7. The yarn guide 7 releases yarn Y wound around a package P from the winding width to reduce yarn tension in order to loosen the yarn Y. When the yarn guide 7, which is located at a yarn-transferring position M, is rotated to wind the yarn Y around an empty bobbin Be and contact is made, elastic yarn Y is reliably wound around the empty bobbin Be.

FIG. 2A

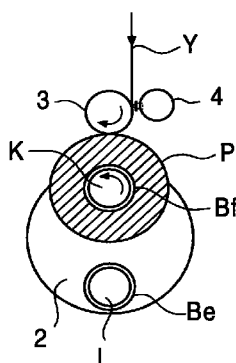
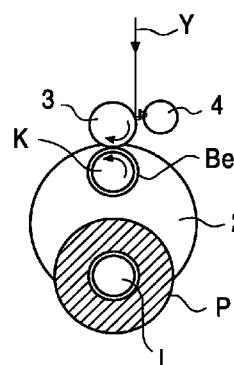


FIG. 2E



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Description

Field of the Invention

The present invention relates to take-up winder for an elastic yarn comprising bobbin holders, a touch roller, a traversing device, and a bobbin holder position-changing means, wherein when a package is fully wound, the positions of a bobbin holder with an empty bobbin and of a bobbin holder with the fully wound package are changed to transfer the yarn to the empty bobbin.

Background of the Invention

A conventional take-up winder for an elastic yarn of this kind is a turret type take-up winder that rotates a turret plate with two bobbin holders mounted thereon to change the positions of the bobbin holders, and that transfer the yarn to an empty bobbin when a package has been fully wound in order to continuously wind the yarn.

A take-up winder such as that shown in Figure 2C rotates and stops a turret 2 in such a way that an empty bobbin Be is located at a middle position M beyond the winding position K. A yarn guide 7 that is a yarn-winding means is moved in such a way that yarn Y makes a single round of the empty bobbin Be, and a fully wound package P is suddenly stopped to loosen the yarn Y in order to adhere elastic yarn Ya to the surface of the empty bobbin Be. The yarn Ya is wound around the surface of the empty bobbin Be and cut between the empty bobbin Be and the fully wound package P due to yarn tension caused by winding of the yarn Ya on the package P. The subsequent elastic yarn Y is wound to fix the end of the elastic yarn Y adhered to the empty bobbin Be. After the yarn-winding guide 7 has returned, the empty bobbin Be is returned to the winding position K and a traversing device 4 is used to start regular winding, as shown in Figure 2D and Figure 2E.

Figure 4 shows the yarn guide 7 that is a yarn-winding means and the position of the yarn Y that is wound around the empty bobbin Be and the fully wound package P, and the position of the yarn Y that is wound around the empty bobbin Be. When the yarn guide 7 is moved in the state shown in Figure 2C, the yarn Y, which is being traversed, is captured in a guide groove 9 consisting of two curved portions 10 provided in a guide bar 18 of the yarn guide 7. The yarn guide 7 is moved in such a way that yarn Y makes a single revolution of the outer circumference of the empty bobbin Be, and the fully wound package P is suddenly stopped to loosen the yarn Y in order to reliably and sufficiently contact the yarn on the downstream side with the yarn on the upstream side, thereby adhering the yarn to the surface of the empty bobbin Be. When the yarn Y is wound around the empty bobbin Be, the yarns, which have been contacted with each other, may be separated

to cause yarn-transferring to fail if the amount of contact between the yarns is small, because the yarns, which have been extended during winding, are contracted following contact unless the yarn tension is reduced to contract the yarns in order to sufficiently contact them with each other.

As described, the conventional take-up winder suddenly stops the fully wound package to loosen the yarn in order to adhere the elastic yarn to the surface of the empty bobbin, so it requires a braking apparatus for making a sudden stop in such a way as to assist in the winding around the empty bobbin.

In addition, a straight winding occurs on the surface of the fully wound package wherein unwanted yarn generated during yarn-transferring is wound around one section. The unwanted yarn, in this case, the straight winding, must be removed due to its different physical properties resulting from conditions, such as yarn tension, that differ from those in normal winding. However, since the elastic yarn is thin and very sticky, the end of the yarn (the winding end part of the elastic yarn) can not be found easily through the use of suction. Thus, instead of the end of the yarn, the straight winding has been removed by picking the corresponding yarn up with nails and pulling it out from the package. In this case, the nails may damage the surface of the package.

This invention is provided in view of the problems with the prior art, and its object is to provide an take-up winder for elastic yarn that can reliably transfer the yarn using a simple structure and that can easily remove the winding end part of the yarn from a package.

Summary of the Invention

To achieve this object, the invention includes a yarn-transferring means that releases yarn wound around a package from a winding width and transfers the yarn to an empty bobbin using a decrease in the yarn tension caused by the winding of the yarn around the bobbin end of a fully wound package that is winding at a different peripheral speed. Thus, the invention transfers the yarn fed from the surface of the package that is at a high rotational speed, to the bobbin end that is at a low rotational speed to reduce yarn tension in order to loosen the elastic yarn, thereby assisting the winding of the yarn around the empty bobbin.

According to the invention, the yarn-transferring means is also used as a yarn-winding means for winding elastic yarn around the empty bobbin. Thus, the yarn-transferring means not only removes the yarn from the winding width of the package but also acts as the yarn-winding means to directly wind the removed yarn around the empty bobbin.

According to the invention, the time after the yarn-transferring means has released the yarn fed to the fully wound package from the winding width until the yarn-winding means contacts the yarn on the downstream side of the empty bobbin with the yarn on the upstream

side thereof, is set at the amount of time required for a bunch winding to be formed at the end of the fully wound package. Thus, when the winding is transferred from the fully wound package to the empty bobbin, time is provided during which a bunch winding is formed at the bobbin end of the fully wound package before the yarn on the downstream side of the empty bobbin has contacted the yarn on the upstream side thereof to finish the yarn-transferring.

Detailed Description of the Drawings

Figure 1 is a front view of the integral part of a take-up winder according to the present embodiment.

Figure 2 shows yarn-transferring executed by the take-up winder according to the present embodiment.

Figure 3 shows a yarn guide, and a position of yarn that is wound around an empty bobbin and a fully wound package according to the present embodiment.

Figure 4 shows a yarn guide, a fully wound package, and the position of yarn wound around an empty bobbin according to the prior art.

Detailed Description of the preferred Embodiments

An embodiment of this invention is described below with reference to the drawings.

With reference to Figure 1, the basic structure of a take-up winder for the elastic yarn 5 is described.

The take-up winder 5 comprises an elevating frame 1 that can be elevated from and lowered into a machine frame 8, and a rotatable turret 2 that is a position-changing means for the bobbin holders.

A touch roller 3 and a traversing device 4 are each supported by the elevating frame 1, and the touch roller 3 constantly contacts the yarn layer of a bobbin at a winding position, which is described below, to rotationally drive the bobbin counterclockwise. The traversing device 4 includes a traversing guide 6 that engages yarn Y and moves back and forth within a traversing range in order to traverse the yarn Y. The yarn Y is continuously fed from a spinning machine (not shown in the drawing) at a predetermined travelling speed.

The turret 2 is driven around a rotating shaft 14 by a driving source such as an induction motor (not shown in the drawing). Several bobbins are installed in each of two bobbin holders 15, 16, and one of the bobbin holders 15 is located at a winding position K while the other holder 16 is located at a standby position L. To simplify the explanation, the bobbin on which a yarn layer is formed, that is, the bobbin with a package P, is referred to as Bf and an empty bobbin is referred to as Be.

A yarn guide 7 that is a yarn-winding means consists of an oscillating arm 17 borne by a shaft to the lower part of the machine frame 8 and a guide bar 18 attached to the tip of the oscillating arm 17. The oscillating arm 17 is provided on the side of the tips of the bobbin holders 15, 16 and extends the guide bar 18 from

that side to the side of the root of the bobbin holders 15, 16 in a cantilever manner.

A rotating shaft 19 of the oscillating arm 17 is provided in such a position that when the empty bobbin Be located at a yarn-transferring position is located at a middle position M shown in Figure 2C, the oscillating arm 17 can be rotated to cause the guide bar 18 to wind the yarn Y around the empty bobbin Be.

The yarn-transferring position is set at the middle position M between the winding position K and the standby position L in order to simplify the structure of the take-up winder by increasing the winding angle of the yarn Y relative to the empty bobbin Be to one-third or more of the total circumference to reduce the amount of rotation of the yarn guide 7, and allowing the yarn guide 7 to be simply rotated away from the rotational traces of the bobbin holders 15, 16.

The oscillating arm 17 is oscillated around the shaft 19 by a driving means such as a rotary actuator (not shown in the drawings), and the yarn guide 7 is moved between the standby position (in fact, at the standby position, the guide bar 18 is arranged so as to come off from the rotation locus of the fully wound package P) indicated by the solid line in Figure 1 and the operating position indicated by the chain double-dashed line. When the yarn guide 7 is moved counterclockwise from the standby position to the operating position, the yarn Ya on the downstream side is wound along the outer circumference of the empty bobbin Be, as shown in Figure 2C and the yarn guide 7 is rotated up to a position at which a guide groove 9 in the yarn guide 7, which is described below, fully contacts the yarn Yb fed from the upstream side. Thus, the yarn Ya in the guide groove 9 contacts the yarn Yb fed from the upstream side within the guide groove 9, which is also a member for restricting the movement of the yarn. The contacted yarns Ya and Yb, which are elastic and viscous, are wound around the empty bobbin Be when entwined with each other, while the yarn Ya is extended and cut.

The guide bar 18 is attached to the tip of the oscillating arm 17 and includes the guide groove 9 that is entered by the yarn Y as shown in Figure 3. The guide groove 9 consists of a curved portion 10 that guides the yarn Y along the curve and a notch portion 11 for restricting the yarn Y that is guided by the curved portion 10. The part of the groove in which the curved portion 10 and the notch portion 11 are combined together has a somewhat larger thickness than the yarn so as to reliably contact the yarn Ya with the yarn Yb. The curved portion 10 and the notch portion 11 are combined together at a position offset from the winding width (traversing range) of the package P. The yarn guide 7 acts not only as a winding-start yarn-winding means for winding the winding start part of the yarn Y around the end of the empty bobbin Be through the guide groove 9, but also as a yarn-transferring means for transferring the yarn Y from the surface of the yarn layer of the package P to the end of the bobbin Bf. This configuration

reduces the number of required parts and simplifies the structure of the take-up winder, and thus simplifies its control.

The yarn Ya, which has been transferred from the layer of the fully wound package P to the end of the bobbin Bf through the guide groove 9, is wound at the lower speed of the bobbin Bf instead of the higher speed of the yarn layer of the fully wound package P, thereby substantially and instantaneously reducing the yarn tension. The instantaneous decrease in yarn tension is used as an alternative to reliably and sufficiently contact the yarns Ya and Yb with each other in order to assist in the winding of the yarn around the empty bobbin Be.

The yarn Ya transferred from the fully wound package P to the end of the bobbin Bf has its tension reduced not only instantaneously but also continuously until yarn-transferring has been completed, followed by the cutting of the yarn. This is because the take-up winder controls the rotation of the bobbin holders to make the peripheral speed of the fully wound package P equal to that of the empty bobbin Be, thereby increasing the peripheral speed of the empty bobbin Be to higher than that of the bobbin Be of the fully wound package P. In other words, the empty bobbin Be provides the same function as a feed roller to reduce the tension of the yarn Ya located on the downstream side of the empty bobbin Be.

This means that the yarn can be reliably transferred some time after it has been transferred from the fully wound package P to the end of the bobbin Bf. That is, the yarn can be transferred by contacting the yarns Ya and Yb with each other after unwanted yarn resulting from yarn-transferring is reliably wound around one section of the end of the bobbin Bf many times to form a bunch winding 12. In the straight winding, the yarn is wound around one section of the package surface, whereas in the bunch winding 12, the winding end part of the yarn wound around the package P is located at the end of the bobbin Bf, thereby allowing the end of the yarn to be located and picked up easily and preventing the package surface from being damaged when the end is picked up by nails. This configuration also allows unwanted yarn resulting from yarn-transferring to be removed easily without damaging the package P.

A controller (not shown in the drawings) controls the rotational timing and speed of the driving means for the yarn guide 7, and of the drive source for the turret 2.

Next, a yarn-transferring method in the take-up winder for the elastic yarn 5 is described with reference to Figure 2.

In Figure 2A, when the package P becomes fully wound, the turret 2 is rotated counterclockwise beyond the position in Figure 2B that is the normal yarn-transferring position of the take-up winder 5. The rotation of the turret 2 is stopped when the empty bobbin Be reaches the position in Figure 2C that is the middle position M between the winding position K and the yarn-winding position L. At this point, the elastic yarn Y is

pressed against the surface of the empty bobbin Be and is moved while contacting (adhering to) approximately one-third or more of the total circumference of the empty bobbin Be. To simplify the explanation, the upstream side relative to the empty bobbin Be is referred to as Yb, while the downstream side relative to it is referred to as Ya. At the same time that the yarn Y contacts the empty bobbin Be, the peripheral speed of the empty bobbin Be is increased by 0 to 50% to decrease the tension on the side Ya.

The yarn Y continues to be traversed when the positions of the bobbin holders are changed. When the empty bobbin Be reaches the middle position M and the yarn guide 7 is rotated counterclockwise, the yarn Ya, which is being traversed, is captured in the guide groove 9. The yarn guide 7 is further rotated to move the yarn Ya from the surface of the fully wound package P to the end of the bobbin Bf along the curved portion 10, while capturing and guiding the yarn Yb on the upstream side. The yarn guide 7 is rotated until the yarn Ya contacts that yarn Yb.

When the yarn Ya is moved from the surface of the fully wound package P to the end of the bobbin Bf, the yarn tension is substantially reduced due to the difference in peripheral speed between the fully wound package P and the bobbin Bf. The decrease in yarn tension allows the yarn Y to be loosened with no need to suddenly stop the bobbin holder 15 at the side of the fully wound package P, causing the yarns Ya and Yb to be reliably and sufficiently contacted with each other within the guide groove 9. The yarn Ya is reliably entwined with the yarn Yb and is then extended and cut, and the yarn Y (yarn at the winding start part) is wound around the end of the empty bobbin Be to form a bunch winding of the winding start at the end of the empty bobbin Be.

Once the yarn Y has been wound around the empty bobbin Be and yarn-transferring has been completed, the yarn guide 7 is returned to its standby position and the turret 2 is rotated clockwise to move the empty bobbin Be to the winding position K as shown in Figure 2E in order to contact it with the touch roller 3 for regular winding. At this point, the rotation of the turret 2 may be stopped at the position shown in Figure 2D, and the package may be moved to the position shown in Figure 2E after its diameter has reached a specified value.

In this winding method, using the decrease in tension during yarn-transferring, the yarn guide 7 moves the yarn Y from the fully wound package P to the bobbin Bf through the guide groove 9 while catching the yarn Ya on the bobbin Bf, and is then rotated until the Ya contacts the yarn Yb. That is, this method loosens and reliably winds the yarn Ya around the empty bobbin Be using only the decrease in tension occurring when the yarn Y is transferred from the surface of the package P to the end of the bobbin Bf. However, this method does not always form a sufficient and required amount of bunch winding 12 (bunch winding of the winding end part) at the end of the bobbin Bf located at the side of

the package P. Thus, a method for reliably forming a bunch winding 12 is described below. This method is also effective in preventing the end of the yarn from being released during transport.

This method is the same as the above method until the yarn guide 7 is rotated counterclockwise after the empty bobbin Be has reached the middle position M, so the description of this part is omitted.

When the empty bobbin Be reaches the middle position M, the yarn guide 7 is rotated counterclockwise. The yarn guide 7 moves the yarn Ya from the surface of the fully wound package P to the end of the bobbin Bf through the guide groove 9 while capturing and guiding the yarn Yb on the upstream side, and is stopped rotating immediately before the yarn Ya contacts the yarn Yb. When the rotation of the yarn guide 7 is stopped, the yarn Ya (yarn at the winding end part) continues to be wound at one position on the bobbin Bf offset from the winding range, in order to form a bunch winding 12.

Once a sufficient and required amount of bunch winding 12 has been formed, the yarn guide 7 is rotated until the yarn Ya contacts the yarn Yb. Since the peripheral speed of the bobbin Bf for the package is lower than the travelling speed of the yarn, the peripheral speed of the empty bobbin Be is almost equal to this travelling speed, the rotational speed of the bobbin Bf differs from that of the empty bobbin Be, the tension of the yarn Ya remains at the reduced value, and the yarn Ya is loosened without the need to suddenly stop the bobbin holder 15 for the fully wound package P. Thus, the yarns Ya and Yb, which are both restricted within the guide groove 9, are reliably and sufficiently contacted with each other, and the yarn Ya is reliably entwined with the yarn Yb and is then extended and cut, causing the yarn Y to be wound around the empty bobbin Be.

Once the yarn Y has been wound around the empty bobbin Be and yarn-transferring has been completed, the empty bobbin Be is placed at the winding position K as in the above method. Thus, the description of this part is omitted. As described above, the yarn guide 7 also operates as a winding-end yarn-winding means for winding the winding end part of the yarn around the end of the fully wound bobbin.

This invention may be embodied as follows:

Although the present embodiment stops the rotation of the yarn guide 7 to reliably form the bunch winding 12, the speed at which the yarn guide 7 is rotated may be reduced to delay contact between the yarns Ya and Yb and the subsequent cutting of the yarn Ya, thereby allowing the bunch winding 12 to be reliably formed.

In addition, although the present embodiment uses the yarn guide 7 as both the yarn-transferring means for transferring the yarn Y from the package P to the bobbin Bf and the winding means for winding the yarn Ya around the empty bobbin Be at the yarn-transferring position, a yarn-transferring and a yarn-winding means may be separately provided and independently control-

led. Only the yarn-transferring means may be used without the yarn-winding means. That is, the yarn may be transferred by winding the yarn Ya on the downstream side around the empty bobbin Be using only the instantaneous decrease in tension caused by the transfer of the yarn Ya from the surface of the fully wound package P to the end of the bobbin Bf and the constant decrease in tension caused by the difference in peripheral speed between the full bobbin Bf and the empty bobbin Be.

In addition, although the present embodiment adapts the shape of the yarn guide 7 to move the yarn Y that is within the traversing range out of this range the yarn guide 7 may be shaped so as to restrain the yarn within the traversing range, as in the prior art, and to slide in parallel with the bobbin holders 15, 16 so that during yarn-transferring it restrains the yarn Y within the traversing range and then slides to transfer it to the bobbin Bf before winding it around the empty bobbin Be. In this case, the yarn-transferring and-winding means may be separately provided, or only the yarn-transferring means may be used.

In addition, although the present embodiment transfers the yarn by moving the empty bobbin Be to the middle position M between the winding position K and the standby position L, yarn-transferring may be executed at the winding position K instead of the middle position M.

To simply form a bunch winding for winding purposes, a take-up winder without a bobbin holder position-change means may be used.

Since this invention is configured as described above, it has the following effects:

The invention uses the difference in peripheral speed between the package and the bobbin of the fully wound package, so it does not require a large braking apparatus for sudden stopping of the fully wound package. Thus, even if a braking apparatus is provided, a small apparatus that can eventually stop the inertial rotation of the fully wound package may be used to provide a take-up winder that can reliably transfer the yarn using a simple structure.

According to the invention, the yarn-transferring means releases the yarn from the winding width of the package and the yarn-winding means directly winds the released yarn around the empty bobbin, thereby reducing the number of required parts, simplifying the structure of the take-up winder, and thus simplifying its control.

The invention winds the winding end part of the elastic yarn around the end of the bobbin instead of the yarn layer of the full bobbin, thereby enabling the winding end of the yarn to be located and picked up easily. In addition, unwanted yarn resulting from yarn-transferring can be reliably wound around the bobbin and removed without damaging the package. Consequently, this invention provides an take-up winder for elastic yarn that can remove unwanted yarn resulting from yarn-transferring without damaging the package.

Claims

1. A take-up winder for an elastic yarn comprising a bobbin around which the elastic yarn is wound; a traversing device for traversing the elastic yarn; two bobbin holders in which bobbins are installed; end a position-changing means for changing the positions of the two bobbin holders between the winding and standby positions, wherein the elastic yarn is wound around the bobbin in the bobbin holder located at the winding position while being traversed by the traversing device and wherein, when the bobbins are fully wound, the positions of the two bobbin holders are changed while the elastic yarn wound around the fully wound bobbin is transferred to the empty bobbin, characterized in that the winder includes a yarn-transferring means for transferring the elastic yarn wound around the fully wound bobbin to the empty bobbin by transferring the elastic yarn wound around the fully wound bobbin to the end of the bobbin to release the yarn from a winding width.

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2. A take-up winder for an elastic yarn according to claim 1 characterized in that the yarn-transferring means is also used as a winding-start yarn-winding means for winding the winding start part of the elastic yarn around the end of the empty bobbin.

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3. A take-up winder for an elastic yarn according to claim 1 or claim 2 characterized in that the time after the elastic yarn has been moved to the end of the fully wound bobbin and until the elastic yarn wound around the fully wound bobbin is transferred to the empty bobbin is set at the amount of time required to wind the winding end part of the elastic yarn around the end of the fully wound bobbin.

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4. A take-up winder for an elastic yarn comprising a bobbin around which the elastic yarn is wound; a traverse device for traversing the elastic yarn; and a bobbin holder in which the bobbin is installed, wherein the elastic yarn is wound around the bobbin in the bobbin holder located at the winding position while being traversed by the traversing device, characterized in that the winder includes a winding-end yarn-winding means for releasing the elastic yarn wound around the bobbin from a winding width, moving it to the end of the bobbin, and winding the winding end part of the elastic yarn wound around the bobbin, around the end of the bobbin.

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5. A yarn-transferring method for a take-up winder for an elastic yarn comprising a bobbin around which the elastic yarn is wound; a traversing device for traversing the elastic yarn; two bobbin holders in which bobbins are installed; and a positioning-changing means for changing the positions of the

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- two bobbin holders between the winding and standby positions, wherein the elastic yarn is wound around the bobbin in the bobbin holders located at the winding position while being traversed by the traversing device and wherein when the bobbin is fully wound, the positions of the two bobbin holders are changed while the elastic yarn wound around the fully wound bobbins is transferred to the empty bobbin, characterized in that the method moves the elastic yarn wound around the fully wound bobbin to the end of the bobbin in order to release it from the winding width and transfer the elastic yarn wound around the fully wound bobbin to the empty bobbin using a decrease in the yarn tension caused by the transfer of the elastic yarn from the yarn layer on the fully wound bobbin onto the bobbin.

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6. A yarn-transferring method for a take-up winder for an elastic yarn according to claim 5 characterized in that after the elastic yarn has been moved to the end of the fully wound bobbin, the elastic yarn on the downstream side of the empty bobbin is contacted with the elastic yarn on the upstream side of the empty yarn.

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7. A yarn-transferring method for a take-up winder for an elastic yarn according to claim 5 or claim 6 characterized in that after the elastic yarn has been moved to the end of the fully wound bobbin and before the elastic yarn wound around the fully wound bobbin is transferred to the empty bobbin, the winding end part of the elastic yarn is wound around the end of the fully wound bobbin.

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8. A yarn-transferring method for a take-up winder for an elastic yarn according to any one of Claims 5 to 7 characterized in that after the elastic yarn wound around the fully, wound bobbin has been transferred to the empty bobbin, the winding start part of the elastic yarn is wound around the end of the empty bobbin.

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FIG. 1

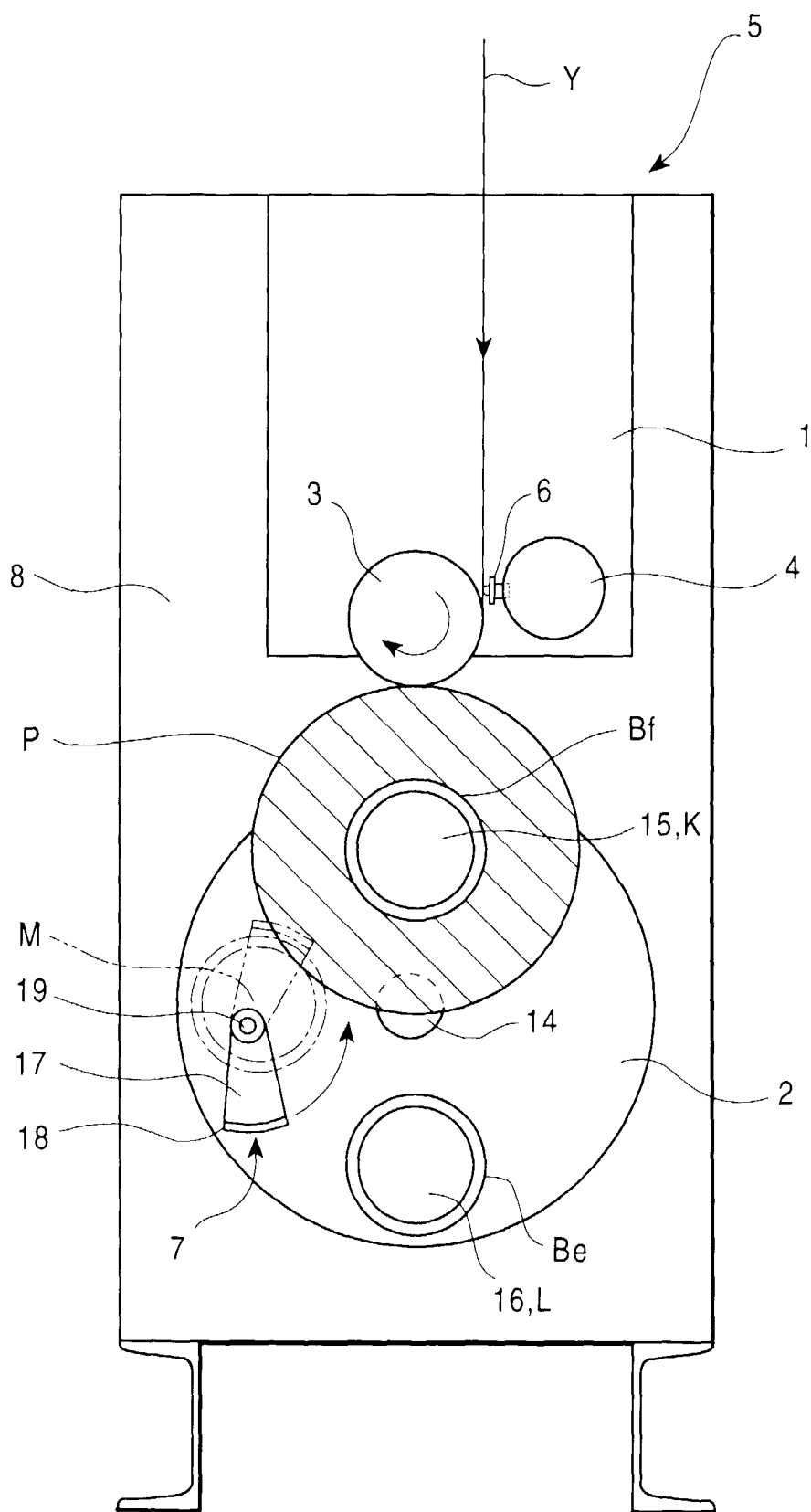


FIG. 2A

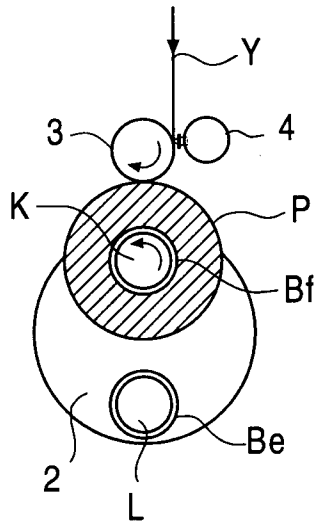


FIG. 2B

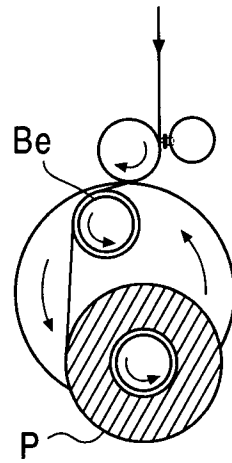


FIG. 2C

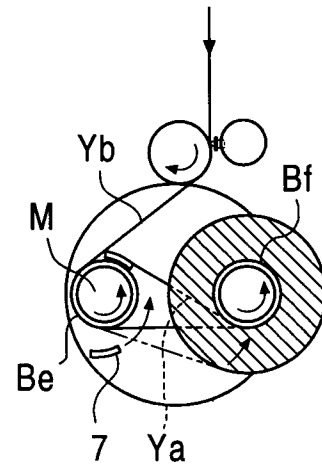


FIG. 2D

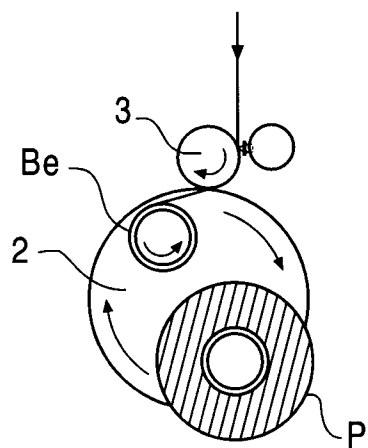


FIG. 2E

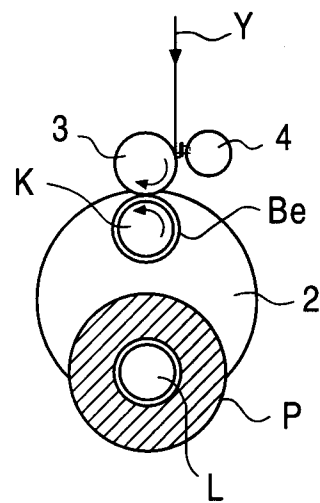


FIG. 3

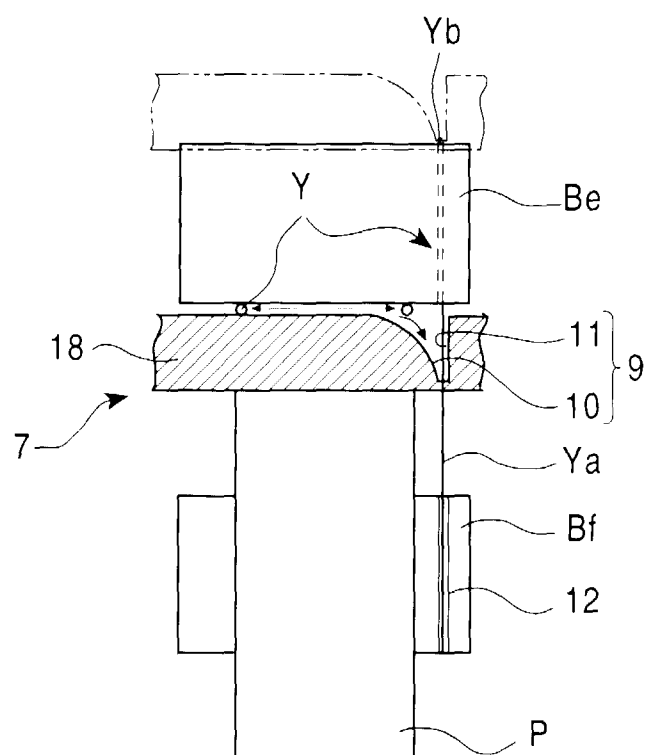
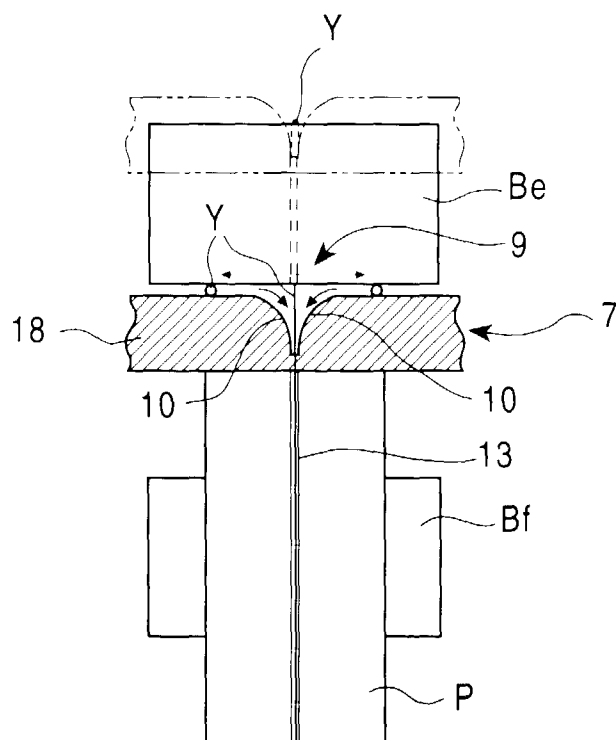


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 12 1182

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	US 4 867 385 A (E. LENK) * column 3, line 18 - column 4, line 3 * ---	1-8	B65H65/00 B65H67/048
Y	DE 44 14 180 A (MURATA KIKAI K.K.) * column 9, line 5 - column 10, line 12; figure 5 * ---	1-8	
A	US 4 210 293 A (G. FROMAGET) * column 3, line 54 - column 4, line 26 * * column 5, line 39 - line 63; figures 1,4 * ---	1,4,5	
A	EP 0 367 253 A (MASCHINENFABRIK RIETER AG) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		10 March 1998	D'Hulster, E
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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