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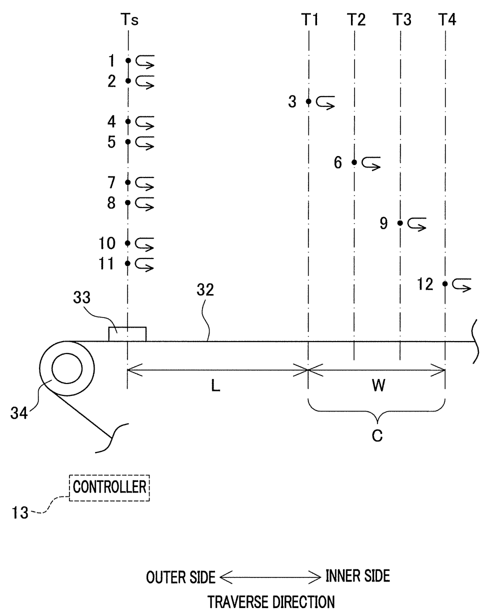
(54) YARN WINDER AND PACKAGE PRODUCTION METHOD

(57) The formation of a saddle bag is effectively avoided by creeping, and the occurrence of yarn stitching is prevented. A controller 13 configured to control a traverse guide 33 is able to perform normal control of reversing the traverse guide 33 at a predetermined regular position Ts and creeping control of reversing the traverse guide 33 at one of creeping positions T1 to T4 which are within a creeping region C that is distanced inward from the regular position Ts by a predetermined distance L. For each reciprocal movement of the traverse guide 33, the controller 13 is able to determine either the normal control or the creeping control is performed.

FIG.3



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Description

[Technical Field]

[0001] The present invention relates to a yarn winder and a method of producing a package, by which a package is produced by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded.

[Background Art]

[0002] For example, a yarn winder recited in each of Patent Literatures 1 and 2 is configured to produce a package by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded. In such a yarn winder, it is difficult to reverse the yarn at an acute angle by the traverse guide, when the winding speed is high or a free length (a part of the yarn between the traverse guide and the package) is long. As a result, an amount of the wound yarn is large at the both end portions of the package, and protrusions termed saddle bags are disadvantageously formed at the both end portions of the package. The formation of saddle bags is disadvantageous because it may cause problems such as ununiform package density, improper appearance, and inappropriate unwinding.

[0003] In Patent Literatures 1 and 2, in order to suppress the formation of saddle bags, "creeping" is performed so that the traverse guide is reversed at a position on the inner side of the regular position. To be more specific, the range of reciprocal movement of the traverse guide is changed by a cam mechanism so that the traverse guide is periodically reversed at a position on the inner side of the regular position. This arrangement makes it possible to reduce the amount of the yarn wound at the both end portions of the package and to suppress the formation of saddle bags.

[Citation List]

[Patent Literatures]

[0004]

[Patent Literature 1] Japanese Unexamined Patent Publication No. S61-145075
[Patent Literature 2] Japanese Unexamined Patent Publication No. S62-211274

[Summary of Invention]

[Technical Problem]

[0005] The cam mechanism recited in Patent Literatures 1 and 2 is configured to gradually increase and decrease the traverse width of the traverse guide when the creeping is performed. Because the traverse width is gradually increased and decreased, a considerable amount of the yarn is wound onto a range where the saddle bag is formed, with the result that the formation of a saddle bag cannot be effectively resolved. Furthermore, because a large number of layers of the yarn is formed in the creeping, a level difference tends to be formed on the surface of the package, and hence cobwebbing may occur when the traverse width returns to the regular width.

[0006] In consideration of the problems above, an object of the present invention is to effectively avoid the formation of a saddle bag by creeping and to prevent the occurrence of yarn stitching.

[Solution to Problem]

[0007] A yarn winder of the present invention produces a package by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded, the yarn winder comprising: a guide driving unit which is configured to reciprocally move the traverse guide in the traverse direction; and a controller which is configured to control the guide driving unit, wherein, the controller is able to perform: normal control of reversing the traverse guide at a predetermined regular position; and creeping control of reversing the traverse guide at at least one creeping position which is in a creeping region that is distanced inward from the regular position by a predetermined distance, and for each reciprocal movement of the traverse guide, the controller is able to determine either the normal control or the creeping control is performed.

[0008] A method of producing a package of the present invention, by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded, comprises: a normal step of reversing the traverse guide at a predetermined regular position; and a creeping step of reversing the traverse guide at a creeping position which is in a creeping region that is distanced inward from the regular position by a predetermined distance, wherein, for each reciprocal movement of the traverse guide, either the normal step or the creeping step is performed is determined.

[0009] In the present invention, in the creeping control or (or the creeping step), the traverse guide is reversed at the creeping position which is in the creeping region that is distanced inward from the regular position by a predetermined distance. In other words, in the creeping control (or the creeping step), the traverse width is not gradually increased and decreased but instantly narrowed and returned to the regular width. For this reason, when the distance is properly set, winding of the yarn Y in the range in which a saddle bag tends to be formed is suppressed, and hence the formation of a saddle bag is effectively avoided by the creeping control. Furthermore, according to the present invention, for each reciprocal movement of the traverse guide, either the normal control (normal step) or the creeping control (creeping step) is performed is determined. On this account, when the frequency of the execution of the creeping control (or the creeping step) is properly set, the number of layers formed in the creeping control (or the creeping step) is reduced and the formation of a level difference on the surface of the package is prevented. As a result, the occurrence of yarn stitching is prevented when the traverse width returns to the regular width.

[0010] The present invention is preferably arranged so that two or more creeping positions are set in the creeping region.

[0011] If the traverse guide is reversed at the same creeping position each time the creeping control is performed, a protrusion such as a saddle bag may be formed at around that creeping position. In this regard, according to the arrangement above, the traverse guide is reversed at plural reversal positions in the creeping control. It is therefore possible to avoid the formation of a protrusion.

[0012] The present invention is preferably arranged so that the distance is 10 mm or more and 30 mm or less.

[0013] Although depending on the winding conditions, a saddle bag tends to be formed within a range less than 10 mm from the end of the package. Therefore, by arranging the creeping region to be separated from the regular position by 10 mm or more, it is possible to further effectively avoid the formation of a saddle bag by the creeping control. Meanwhile, if the traverse guide is reversed at a position which is excessively distant inward from the regular position in the creeping control, the winding path of the yarn reversed at that position is significantly different from the winding path of the yarn reversed at the regular position, and this may cause an adverse effect on the appearance of the package. For this reason, the appearance of the package is maintained to be good when the distance is 30 mm or less.

[0014] The present invention is preferably arranged so that the width of the creeping region in the traverse direction is 5 mm or more and 20 mm or less.

[0015] If the creeping region is too narrow, the creeping positions cannot be sufficiently distanced from one another within the creeping region, with the result that a protrusion such as a saddle bag may be disadvantageously formed as a result of the creeping control. Therefore, by arranging the width of the creeping region to be 5 mm or more, it is possible to cause the creeping positions to be sufficiently distanced from one another, and to avoid the formation of a protrusion. Meanwhile, if the creeping region is too wide, the winding paths corresponding to the respective creeping positions are very different from one another, and this may cause an adverse effect on the appearance of the package. For this reason, the appearance of the package is maintained to be good when the width of the creeping region is 20 mm or less.

[0016] The present invention is preferably arranged such that the number of times of execution of the creeping control accounts for 10% or more and less than 50% of the total number of times of execution of the normal control and the creeping control.

[0017] When the number of times of execution of the creeping control is too small, the formation of a saddle bag may not be avoided. When the number of times of execution of the creeping control accounts for 10% or more of the total number of times of execution of the control, the formation of a saddle bag is further reliably avoided. Meanwhile, from the perspective of the appearance of the package, the number of times of execution of the normal control is preferably as large as possible. The appearance of the package is maintained to be good when the number of times of execution of the creeping control accounts for less than 50% of the total number, i.e., the number of times of execution of the normal control accounts for 50% or more of the total number.

[0018] The present invention is preferably arranged so that the normal control is executed immediately before or immediately after the creeping control.

[0019] In this way, the creeping control is not successively executed. It is therefore possible to further effectively prevent the formation of a level difference on the surface of the package due to the creeping control. As a result, the occurrence of yarn stitching is further reliably prevented when the traverse width returns to the regular width.

[0020] The present invention is preferably arranged so that the traverse guide is attached to a belt member that is driven by the guide driving unit.

[0021] When such a belt-type traverse unit is used, an influence of inertia is advantageously reduced because the belt member and the traverse guide are light in weight and the traverse guide is precisely reversed.

[Brief Description of Drawings]

[0022]

FIG. 1 is a schematic front view of a re-winder of an embodiment.

FIG. 2 shows an electric structure of the re-winder.

FIG. 3 is a schematic diagram of reversal positions of a traverse guide of the embodiment.

FIG. 4 is a schematic diagram of the movement of the traverse guide of the embodiment.

FIG. 5(a) shows known saddle bags formed on a package. FIG. 5(b) shows the shape of a package after creeping control of the embodiment is performed.

FIG. 6 is a schematic diagram of the movement of a traverse guide of a known apparatus.

[Description of Embodiments]

[0023] The following will describe an embodiment of the present invention with reference to figures. An up-down direction and a left-right direction shown in FIG. 1 will be used as an up-down direction and a left-right direction of a re-winder 1. A direction orthogonal to both the up-down direction and the left-right direction (i.e., a direction perpendicular to the plane of FIG. 1) is set as a front-rear direction. A direction in which a yarn Y runs will be referred to as a yarn running direction.

(Structure of Re-Winder)

[0024] To begin with, the structure of a re-winder 1 (yarn winder of the present invention) of the present embodiment will be described with reference to FIG. 1. FIG. 1 is a schematic front view of the re-winder 1. As shown in FIG. 1, the re-winder 1 includes members such as a yarn supplying unit 11, a winding unit 12, and a controller 13. The re-winder 1 is configured to unwind a yarn Y from a yarn supply package Ps supported by the yarn supplying unit 11, re-wind the yarn Y back to a winding bobbin Bw (a bobbin of the present invention) by the winding unit 12, so as to form a wound package Pw (a package of the present invention). To be more specific, the re-winder 1 is used for, for example, rewinding a yarn Y wound on a yarn supply package Ps in a more beautiful manner, and for forming a wound package Pw with desired density.

[0025] The yarn supplying unit 11 is, for example, attached to a front surface of a lower portion of a base 14 which vertically extends. The yarn supplying unit 11 is arranged to support the yarn supply package Ps which is formed by winding the yarn Y onto a yarn supplying bobbin Bs. The yarn supplying unit 11 is therefore able to supply the yarn Y.

[0026] The winding unit 12 is configured to form the wound package Pw by winding the yarn Y onto the winding bobbin Bw. The winding unit 12 is provided at an upper portion of the base 14. The winding unit 12 includes members such as a cradle arm 21, a winding motor 22, a traverse unit 23, and a contact roller 24.

[0027] The cradle arm 21 is, for example, supported by the base 14 to be swingable. The cradle arm 21 supports the winding bobbin Bw to be rotatable in such a way that, for example, the left-right direction is the axial direction of the winding bobbin Bw. At a leading end portion of the cradle arm 21, a bobbin holder (not illustrated) is rotatably attached to hold the winding bobbin Bw. The winding motor 22 is configured to rotationally drive the bobbin holder. The winding motor 22 is, for example, a typical AC motor in which the rotation number is variable. The winding motor 22 is therefore able to change the rotation speed of the winding bobbin Bw. The winding motor 22 is electrically connected to the controller 13 (see FIG. 2).

[0028] The traverse unit 23 is configured to traverse the yarn Y in the axial direction of the winding bobbin Bw (the left-right direction in the present embodiment). The traverse unit 23 is provided immediately upstream of the wound package Pw in the yarn running direction. The traverse unit 23 includes a traverse motor 31 (a guide driving unit of the present invention), an endless belt 32 (a belt member of the present invention), and a traverse guide 33.

[0029] The traverse motor 31 is, for example, a typical AC motor. The traverse motor 31 is configured to be able to rotate forward and backward, and is a driving source arranged so that the rotation number is variable. The traverse motor 31 is electrically connected to the controller 13 (see FIG. 2). The endless belt 32 is a belt member to which the traverse guide 33 is attached. The endless belt 32 is wound onto pulleys 34 and 35 which are separated from each other in the left-right direction and a driving pulley 36 connected to the rotational shaft of the traverse motor 31, and is substantially triangular in shape when wound onto the pulleys. The endless belt 32 is reciprocally driven by the traverse motor 31. The traverse guide 33 is attached to the endless belt 32 and is provided between the pulley 34 and the pulley 35 in the left-right direction. The traverse guide 33 linearly and reciprocally runs in the left-right direction as the endless belt 32 is reciprocally driven by the traverse motor 31 (see arrows in FIG. 1). As a result, the traverse guide 33 traverses the yarn Y in the left-right direction. Hereinafter, the left-right direction may be referred to as a traverse direction. In the traverse unit 23 arranged as described above, the length (traverse width) of the movable range of the traverse guide 33 during a winding operation of winding the yarn is changeable by controlling, for example, a timing to switch the rotational direction of the rotational shaft of the traverse motor 31.

[0030] The contact roller 24 makes contact with the surface of the wound package Pw to adjust the shape of the wound package Pw by applying a contact pressure to the surface. The contact roller 24 makes contact with the wound package Pw and is rotated by the rotation of the wound package Pw.

[0031] Between the yarn supplying unit 11 and the winding unit 12, a yarn guide 15, a guide roller 16, and a tension sensor 17 are provided in this order from the upstream to the downstream in the yarn running direction. The yarn guide 15 is provided, for example, on an extension of the central axis of the yarn supplying bobbin Bs, and guides the yarn Y unwound from the yarn supply package Ps to the downstream side in the yarn running direction. The guide roller 16 guides the yarn Y having been guided by the yarn guide 15 further to the downstream side in the yarn running direction. The guide roller 16 is provided on the front surface of the base 14 and above the yarn guide 15. The guide roller 16 is rotationally driven by a roller driving motor 18, for example. The roller driving motor 18 is, for example, a typical AC motor in which the rotation number is variable. The roller driving motor 18 is therefore able to change the rotation speed of the guide roller 16. The roller driving motor 18 is electrically connected to the controller 13 (see FIG. 2). In the present embodiment, the yarn Y is tensioned by a speed difference between the circumferential speed of the guide roller 16 and the circumferential speed of the wound package Pw.

[0032] The tension sensor 17 is provided between the wound package Pw and the guide roller 16 in the yarn running direction and is configured to detect the tension of the yarn Y. The tension sensor 17 is electrically connected to the controller 13 (see FIG. 2) and sends a result of detection of the tension to the controller 13.

[0033] The controller 13 includes members such as CPU, a ROM, and a RAM (storage unit 19). The storage unit 19 stores, for example, parameters such as an amount of the wound yarn Y, a winding speed, and the magnitude of tension applied to the yarn Y. The controller 13 controls components by using the CPU and a program stored in the ROM, based on the parameters stored in the RAM (storage unit 19), etc.

[0034] In the re-winder 1 arranged as described above, the yarn Y unwound from the yarn supply package Ps runs toward the downstream side in the yarn running direction. The running yarn Y is wound onto the rotating winding bobbin Bw while being traversed in the left-right direction (traverse direction) by the traverse guide 33.

(Creeping)

[0035] In the winding unit 12, when the winding speed is high (i.e., the rotation speed of the winding bobbin Bw is high) or a free length (i.e., a part of the yarn Y between the traverse guide 33 and the wound package Pw) is long, it is difficult to reverse the yarn Y at an acute angle by the traverse guide 33. As a result, an amount of the wound yarn Y is large at the both end portions of the wound package Pw, and protrusions termed saddle bags are disadvantageously formed at the both end portions of the wound package Pw. (A reference symbol M in FIG. 5(a) indicates a saddle bag.) The formation of saddle bags is disadvantageous because it may cause problems such as ununiform package density, improper appearance, and inappropriate unwinding.

[0036] In order to suppress the formation of saddle bags, as in the known cases, the range of reciprocal movement of the traverse guide is changed by a cam mechanism so that the traverse guide is periodically reversed at a position on the inner side of the regular position. This arrangement makes it possible to reduce the amount of the yarn wound at the both end portions of the package, so as to suppress the formation of saddle bags. The reversal of the traverse guide at a position on the inner side of the regular position is termed creeping.

[0037] FIG. 6 is a schematic diagram of the movement of a traverse guide of a known apparatus. As shown in FIG. 6, the above-described cam mechanism is configured to gradually increase and decrease the traverse width of the traverse guide when the creeping is performed. However, because the traverse width is gradually increased and decreased, a considerable amount of the yarn is wound onto a range where the saddle bag is formed, with the result that the formation of the saddle bag cannot be effectively resolved. Furthermore, because a large number of layers of the yarn is formed in the creeping, a level difference tends to be formed on the surface of the package, and hence yarn stitching may occur after the traverse width returns to the regular width.

[0038] In consideration of the problem above, in the present embodiment, formation of saddle bags and occurrence of yarn stitching are suppressed by appropriately controlling the traverse unit 23 (to be more specific, the traverse motor 31) by the controller 13. FIG. 3 is a schematic diagram of a reversal position of a traverse guide 33 of the present embodiment. FIG. 4 is a schematic diagram of the movement of the traverse guide 33 of the present embodiment. FIG. 3 shows reversal positions at a left end portion in the traverse direction. In this regard, as shown in FIG. 4, similar reversal positions are provided at a right end portion, too.

[0039] In the present embodiment, as shown in FIG. 3, as the reversal positions of the traverse guide 33, an regular position Ts and creeping positions T1 to T4 are set. The regular position Ts is a reversal position in normal winding in which no creeping is performed. Meanwhile, the creeping positions T1 to T4 are reversal positions that are set within a creeping region C which is provided on the inner side of the regular position Ts in the traverse direction. The distance L between the regular position Ts and the creeping region C is preferably set so that the creeping region C is on the inner side of the range of formation of a saddle bag. Because a saddle bag tends to be formed within a range less than 10 mm from the end of the wound package Pw, the distance L is set at 20 mm in the present embodiment, for example. In a region between the regular position Ts and the creeping region C, no reversal position of the traverse guide 33 is set. The traverse guide 33 is not reversed in this region.

[0040] Provided that the width of the creeping region C in the traverse direction is W, the creeping positions T1 to T4 are set as described below. The creeping position T1 is at the outer end of the creeping region C. The creeping position T2 is distanced inward from the creeping position T1 by W/3. The creeping position T3 is distanced inward from the creeping position T2 by W/3. The creeping position T4 is at the inner end of the creeping region C. In summary, the creeping positions T1 to T4 are provided at equal intervals. In the present embodiment, the width W of the creeping region C is set at 10 mm, for example.

[0041] In the present embodiment, the regular position Ts and the creeping positions T1 to T4 are set as described above, and then at which position among the regular position Ts and the creeping positions T1 to T4 the traverse guide 33 is reversed in each reciprocal movement of the traverse guide 33 is set. Such settings may be stored in the storage unit 19 by an operator using an unillustrated input unit. Hereinafter, control of reversing the traverse guide 33 at the regular position Ts will be referred to as normal control, whereas control of reversing the traverse guide 33 at one of the creeping positions T1 to T4 will be referred to as creeping control.

[0042] In the example shown in FIG. 3 and FIG. 4, twelve reciprocal movements of the traverse guide 33 are regarded as one cycle. Furthermore, reversal positions in the twelve reciprocal movements of the traverse guide 33 are set as a single pattern and the traverse guide 33 repeats the cycle in accordance with the set pattern. The numbers appended to points each indicating a reversal position in FIG. 3 and FIG. 4, such as 1, 2, 3, ... and 12, indicate the first reciprocal movement of the traverse guide 33, the second reciprocal movement thereof, the third reciprocal movement thereof, ... and the twelfth reciprocal movement thereof, in a cycle. The following will describe the control of the traverse guide 33 in a cycle.

[0043] In the first and second reciprocal movements of the traverse guide 33, the normal control is performed to reverse the traverse guide 33 at the regular position Ts. In the subsequent third reciprocal movement, the creeping control is performed to reverse the traverse guide 33 at the creeping position T1. Thereafter, a group of three times of execution of control is similarly repeated. However, the reversal position in the creeping control is differentiated between the groups. That is to say, the traverse guide 33 is reversed at the creeping position T2 in the sixth reciprocal movement, the traverse guide 33 is reversed at the creeping position T3 in the ninth reciprocal movement, and the traverse guide 33 is reversed at the creeping position T4 in the twelfth reciprocal movement.

[0044] In this way, in the creeping control of the present embodiment, the reversal position of the traverse guide 33 is not changed gradually toward the creeping region C but instantly changed to each of the creeping positions T1 to T4 in the creeping region C. On this account, in the creeping control, it is possible to maximally avoid the winding of the yarn Y in a region between the regular position Ts and the creeping region C, i.e., a region where a saddle bag tends to be formed, with the result that a wound package Pw in which formation of a saddle bag is suppressed is formed as shown in FIG. 5(b).

[0045] Furthermore, in the creeping control, the reversal position of the traverse guide 33 is instantly changed to one of the creeping positions T1 to T4, and hence the formation of a saddle bag is effectively suppressed with a small number of times of execution of the creeping control. It is therefore possible to increase the number of times of execution of the normal control. For example, in the present embodiment, when the traverse guide 33 performs three reciprocal movements, the normal control is performed in two reciprocal movements whereas the creeping control is performed in one reciprocal movement. Therefore the rate of the number of times of execution of the creeping control to the total number of times of execution of the control is 33%. In the known apparatus, the appearance of the package tends to be deteriorated because the time to execute the creeping tends to be long as shown in FIG. 6. Meanwhile, because in the present invention the number of times of execution of the creeping control is reduced whereas the number of times of execution of the normal control is increased, the appearance of the wound package Pw is maintained to be good.

(Advantageous Effects)

[0046] In the present embodiment, it is possible to determine which one of the following controls is performed: the normal control of reversing the traverse guide 33 at the regular position Ts in each reciprocal movement of the traverse guide 33; and the creeping control of reversing the traverse guide 33 at one of the creeping positions T1 to T4 which are within the creeping region C that is distanced inward from the regular position Ts by the distance L. In other words, in the creeping control, the traverse width is not gradually increased and decreased but instantly narrowed and returned to the regular width. For this reason, when the distance L is properly set, winding of the yarn Y in the range in which a saddle bag tends to be formed is suppressed, and hence the formation of a saddle bag is effectively avoided by the creeping control. Furthermore, when the frequency of the execution of the creeping control is properly set, the number of layers formed in the creeping control is reduced and the formation of a level difference on the surface of the package is prevented. As a result, the occurrence of yarn stitching is prevented when the traverse width returns to the regular width.

[0047] In the present embodiment, the creeping positions T1 to T4 are set within the creeping region C. If the traverse guide 33 is reversed at the same creeping position each time the creeping control is performed, a protrusion such as a saddle bag may be formed at around that creeping position. In this regard, according to the arrangement above, the traverse guide 33 is reversed at plural reversal positions in the creeping control. It is therefore possible to avoid the formation of a protrusion.

[0048] In the present embodiment, the distance L is set at 20 mm, i.e., is set to be 10 mm or longer and 30 mm or shorter. Although depending on the winding conditions, a saddle bag tends to be formed within a range less than 10 mm from the end of the wound package Pw. Therefore, by arranging the creeping region C to be separated from the regular position Ts by 10 mm or more, it is possible to further effectively avoid the formation of a saddle bag by the creeping control. Meanwhile, if the traverse guide 33 is reversed at a position which is excessively distant inward from the regular position Ts in the creeping control, the winding path of the guide reversed at that position is significantly different from the winding path of the guide reversed at the regular position Ts, and this may cause an adverse effect on the appearance of the wound package Pw. For this reason, the appearance of the wound package Pw is maintained to be good when the distance L is 30 mm or less.

[0049] In the present embodiment, the width of the creeping region C in the traverse direction is arranged to be 10 mm, i.e., 5 mm or more and 20 mm or less. If the creeping region C is too narrow, the creeping positions T1 to T4 cannot be sufficiently distanced from one another within the creeping region C, with the result that a protrusion such as a saddle bag may be disadvantageously formed as a result of the creeping control. Therefore, by arranging the width W of the creeping region C to be 5 mm or more, it is possible to cause the creeping positions T1 to T4 to be sufficiently distanced from one another, and to avoid the formation of a protrusion. Meanwhile, if the creeping region C is too wide, the winding paths corresponding to the respective creeping positions T1 to T4 are very different from one another, and this may cause an adverse effect on the appearance of the wound package Pw. Therefore, by arranging the width W of the creeping region C to be 20 mm or less, it is possible to maintain the appearance of the wound package Pw to be good.

[0050] In the present embodiment, the number of times of execution of the creeping control accounts for 33% of the total number of times of execution of the normal control and the creeping control, i.e., the number of times of execution of the creeping control accounts for 10% or more and less than 50% of the total number of times of execution of the normal control and the creeping control. When the number of times of execution of the creeping control is too small, the formation of a saddle bag may not be avoided. When the number of times of execution of the creeping control accounts for 10% or more of the total number of times of execution of the control, the formation of a saddle bag is further reliably avoided. Meanwhile, from the perspective of the appearance of the wound package Pw, the number of times of execution of the normal control is preferably as large as possible. The appearance of the wound package Pw is maintained to be good when the number of times of execution of the creeping control accounts for less than 50% of the total number, i.e., the number of times of execution of the normal control accounts for 50% or more of the total number.

[0051] In the present embodiment, the normal control is executed immediately before or immediately after the creeping control. In this way, the creeping control is not successively executed. It is therefore possible to further effectively prevent the formation of a level difference on the surface of the package due to the creeping control. As a result, the occurrence of yarn stitching is further reliably prevented when the traverse width returns to the regular width.

[0052] In the present embodiment, the traverse guide 33 is attached to the endless belt 32 (belt member) which is driven by the traverse motor 31 (guide driving unit). When such a belt-type traverse unit 23 is used, an influence of inertia is advantageously reduced because the endless belt 32 and the traverse guide 33 are light in weight and the traverse guide 33 is precisely reversed.

(Other embodiments)

[0053] The following will describe modifications of the above-described embodiment.

[0054] In the embodiment above, the four creeping positions T1 to T4 are provided at equal intervals. In this regard, in what way the creeping positions are set in the creeping region C may be suitably changed. For example, the number of the creeping positions may be only one, or plural creeping positions may be set at irregular intervals.

[0055] In the embodiment above, the distance L between the regular position Ts and the creeping region C is 10 mm or more and 30 mm or less. Alternatively, the distance L may be less than 10 mm, or may be more than 30 mm.

[0056] In the embodiment above, the width W of the creeping region C is arranged to be 5 mm or more and 20 mm or less. Alternatively, the width W of the creeping region C may be less than 5 mm, or may be more than 20 mm.

[0057] In the embodiment above, the number of times of execution of the creeping control accounts for 10% or more and less than 50% of the total number of times of execution of the control. Alternatively, the number of times of execution of the creeping control may account for less than 10% of the total number, or may account for 50% or more of the total number.

[0058] In the embodiment above, the reversal position of the traverse guide 33 is periodically changed as shown in FIG. 3. In this regard, in what way the reversal position of the traverse guide 33 is set in each reciprocal movement may be suitably changed. For example, the creeping control may be successively executed, or the reversal position of the traverse guide 33 may be randomly changed. In this connection, when the reversal position is randomly changed, the ratio of the number of times of execution of the creeping control to the total number of times of execution of the control is preferably set in advance.

[0059] The traverse unit 23 of the embodiment above is a so-called belt type in which the traverse guide 33 is attached to the endless belt 32. The traverse unit may be structured in a different manner. For example, as shown in Japanese Unexamined Patent Publication No. 2007-153554, a traverse guide may be attached to a leading end portion of an arm that is driven in a swinging manner. Alternatively, a traverse guide may be reciprocally driven by a linear motor.

[0060] While in the embodiment above the yarn winder of the present invention is applied to the re-winder 1, the present invention may be applied to a yarn winder of another type.

[Reference Signs List]

[0061]

1	re-winder (yarn winder)
13	controller
31	traverse motor (guide driving unit)
32	endless belt (belt member)
33	traverse guide
Y	yarn
Bw	winding bobbin (bobbin)
Pw	wound package (package)
Ts	regular position
T1 to T4	creeping positions
C	creeping region
L	distance
W	width of creeping region

Claims

1. A yarn winder producing a package by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded, the yarn winder comprising:

a guide driving unit which is configured to reciprocally move the traverse guide in the traverse direction; and
a controller which is configured to control the guide driving unit,
wherein,
the controller is able to perform:

normal control of reversing the traverse guide at a predetermined regular position; and
creeping control of reversing the traverse guide at at least one creeping position which is in a creeping region that is distanced inward from the regular position by a predetermined distance, and
for each reciprocal movement of the traverse guide, the controller is able to determine either the normal control or the creeping control is performed.

2. The yarn winder according to claim 1, wherein, two or more creeping positions are set in the creeping region.

3. The yarn winder according to claim 1 or 2, wherein, the distance is 10 mm or more and 30 mm or less.

4. The yarn winder according to any one of claims 1 to 3, wherein, the width of the creeping region in the traverse direction is 5 mm or more and 20 mm or less.

5. The yarn winder according to any one of claims 1 to 4, wherein, the number of times of execution of the creeping control accounts for 10% or more and less than 50% of the total number of times of execution of the normal control and the creeping control.

6. The yarn winder according to any one of claims 1 to 5, wherein, the normal control is executed immediately before or immediately after the creeping control.

7. The yarn winder according to any one of claims 1 to 6, wherein, the traverse guide is attached to a belt member that is driven by the guide driving unit.

8. A method of producing a package by winding a yarn onto a bobbin while reciprocally moving, in a predetermined traverse direction, a traverse guide to which the yarn is threaded, the method comprising:

a normal step of reversing the traverse guide at a predetermined regular position; and
a creeping step of reversing the traverse guide at a creeping position which is in a creeping region that is distanced inward from the regular position by a predetermined distance, wherein, for each reciprocal movement of the traverse guide, either the normal step or the creeping step is performed is determined.

FIG.1

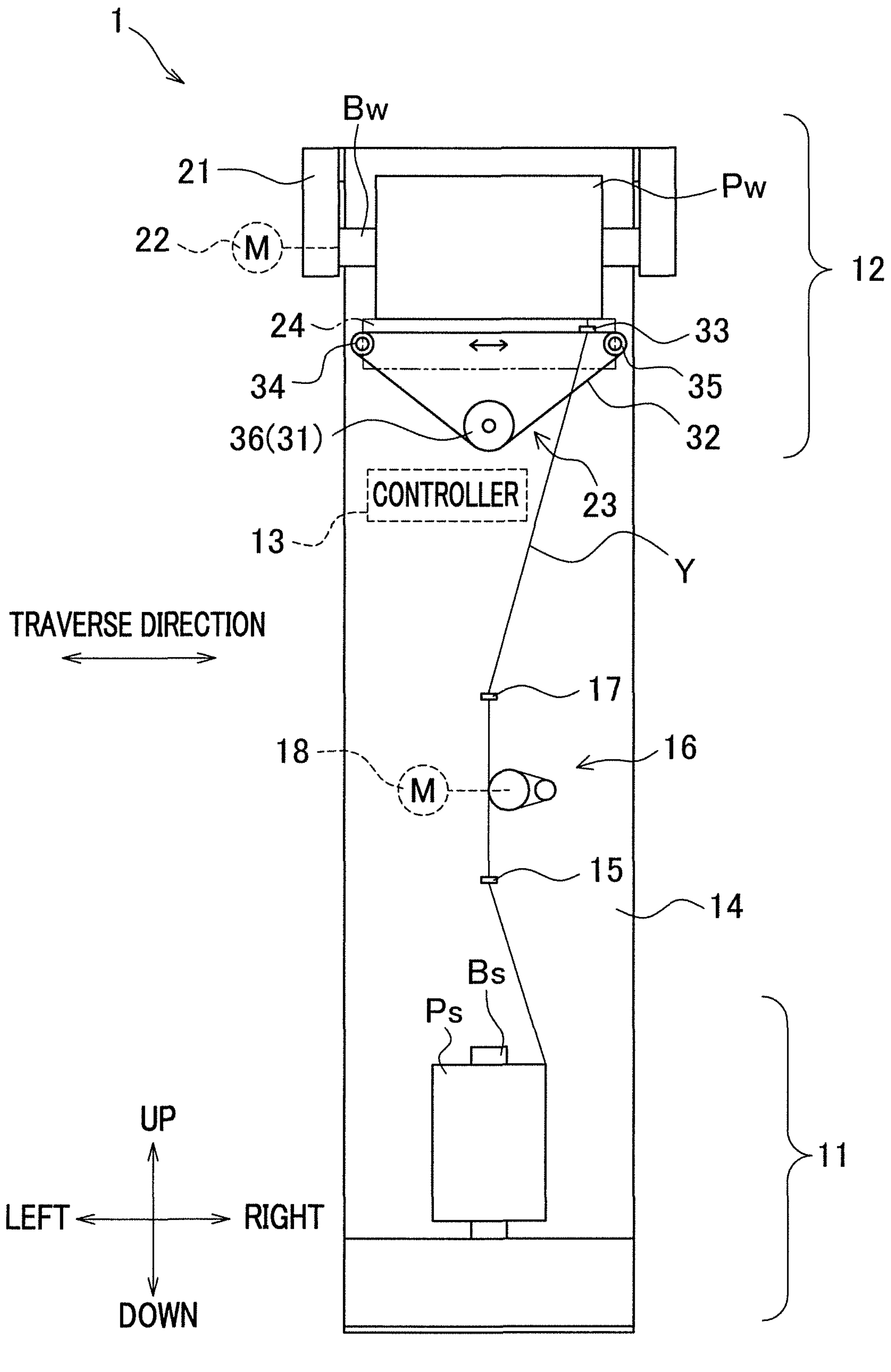

1
Bw
21
Pw
22
M
12
24
33
34
35
36(31)
32
CONTROLLER
23
13
Y
TRAVERSE DIRECTION
17
18
M
16
15
14
Bs
Ps
UP
11
LEFT
RIGHT
DOWN

FIG.2

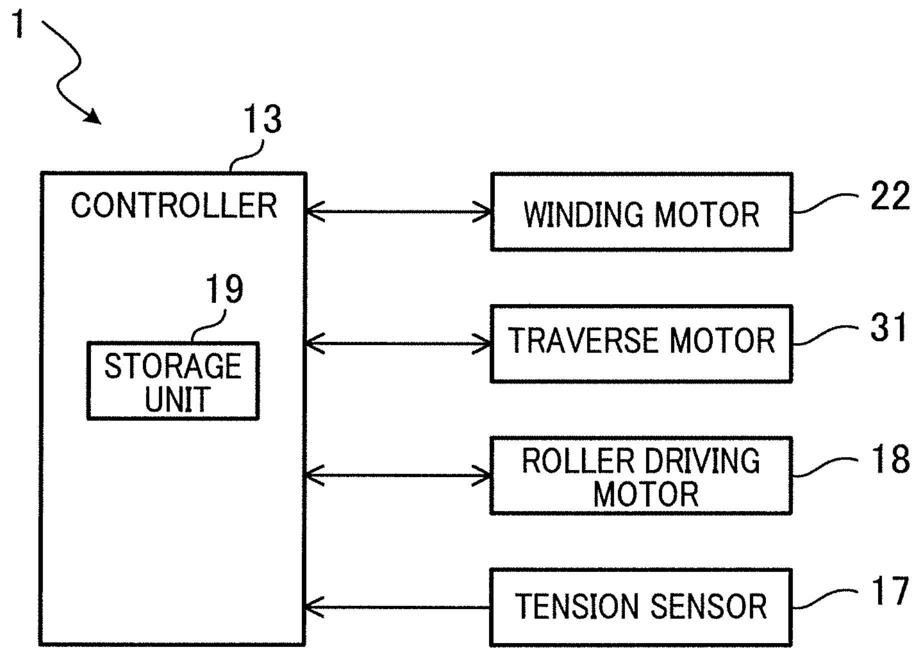

1
13
CONTROLLER
19
STORAGE UNIT
WINDING MOTOR
22
TRAVERSE MOTOR
31
ROLLER DRIVING MOTOR
18
TENSION SENSOR
17

FIG.3

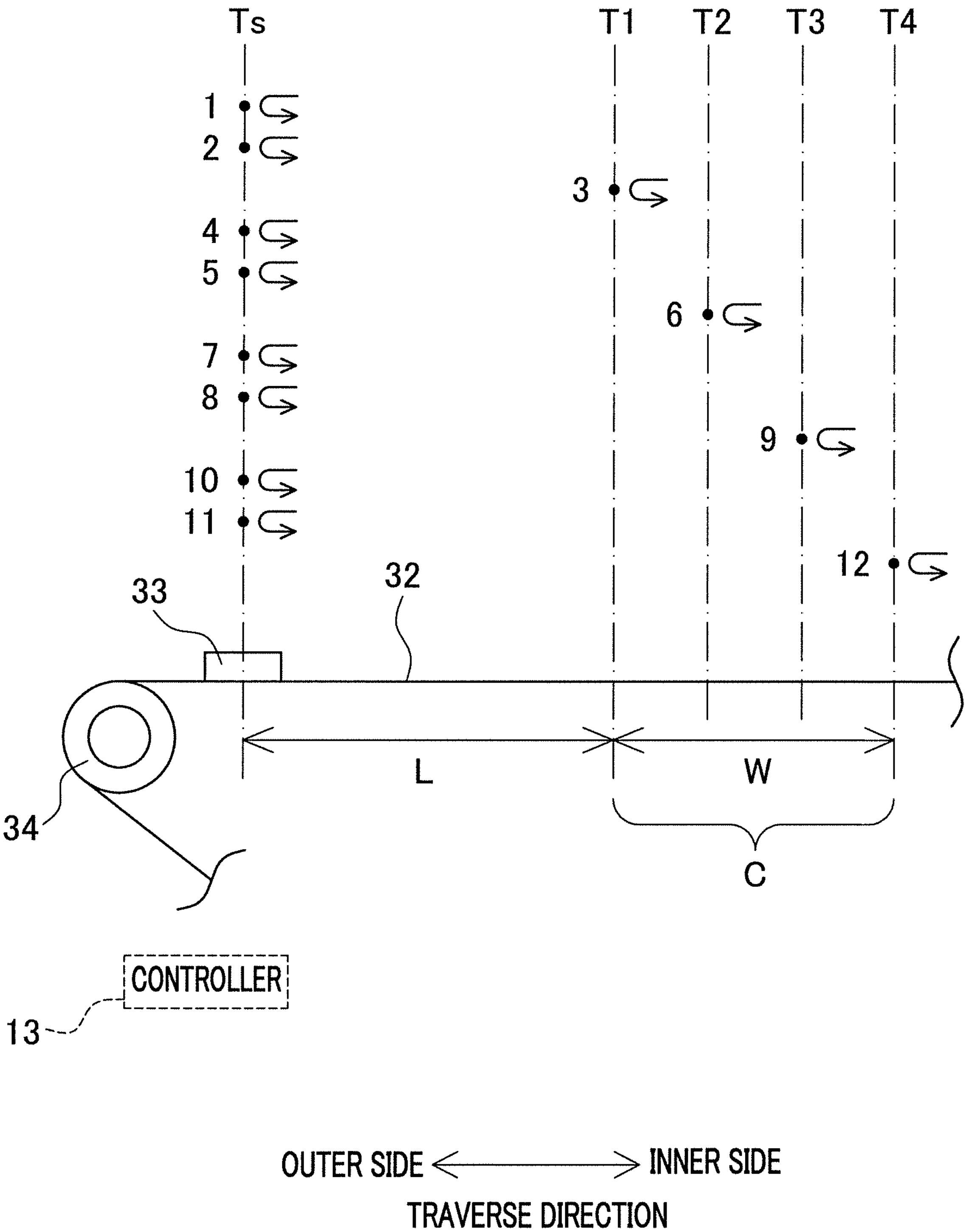

Ts
T1
T2
T3
T4
1
2
3
4
5
6
7
8
9
10
11
12
33
32
34
L
W
C
CONTROLLER
13
OUTER SIDE
INNER SIDE
TRAVERSE DIRECTION

FIG.4

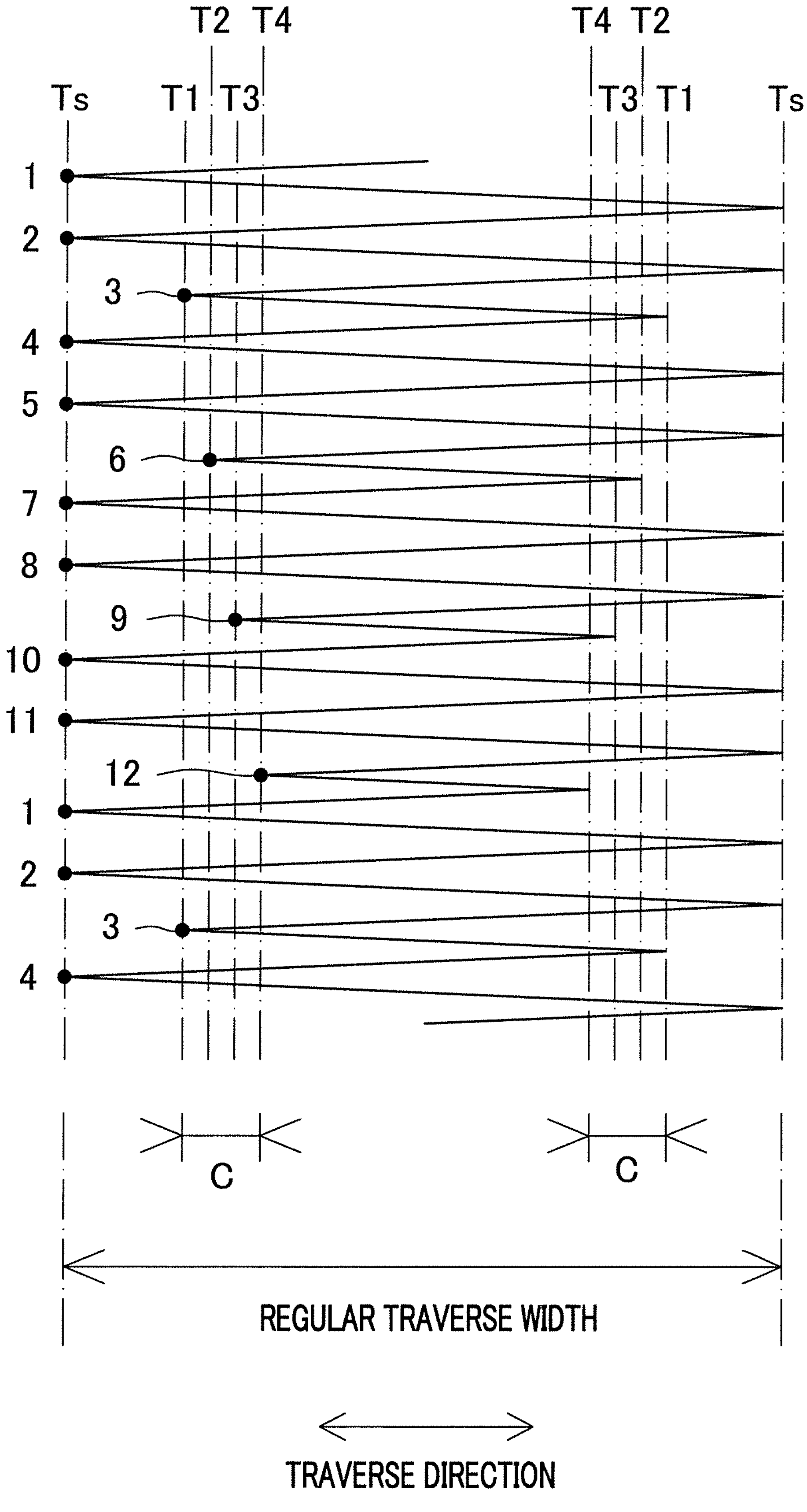

T2
T4
T4
T2
Ts
T1
T3
T3
T1
Ts
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
C
C
REGULAR TRAVERSE WIDTH
TRAVERSE DIRECTION

FIG.5

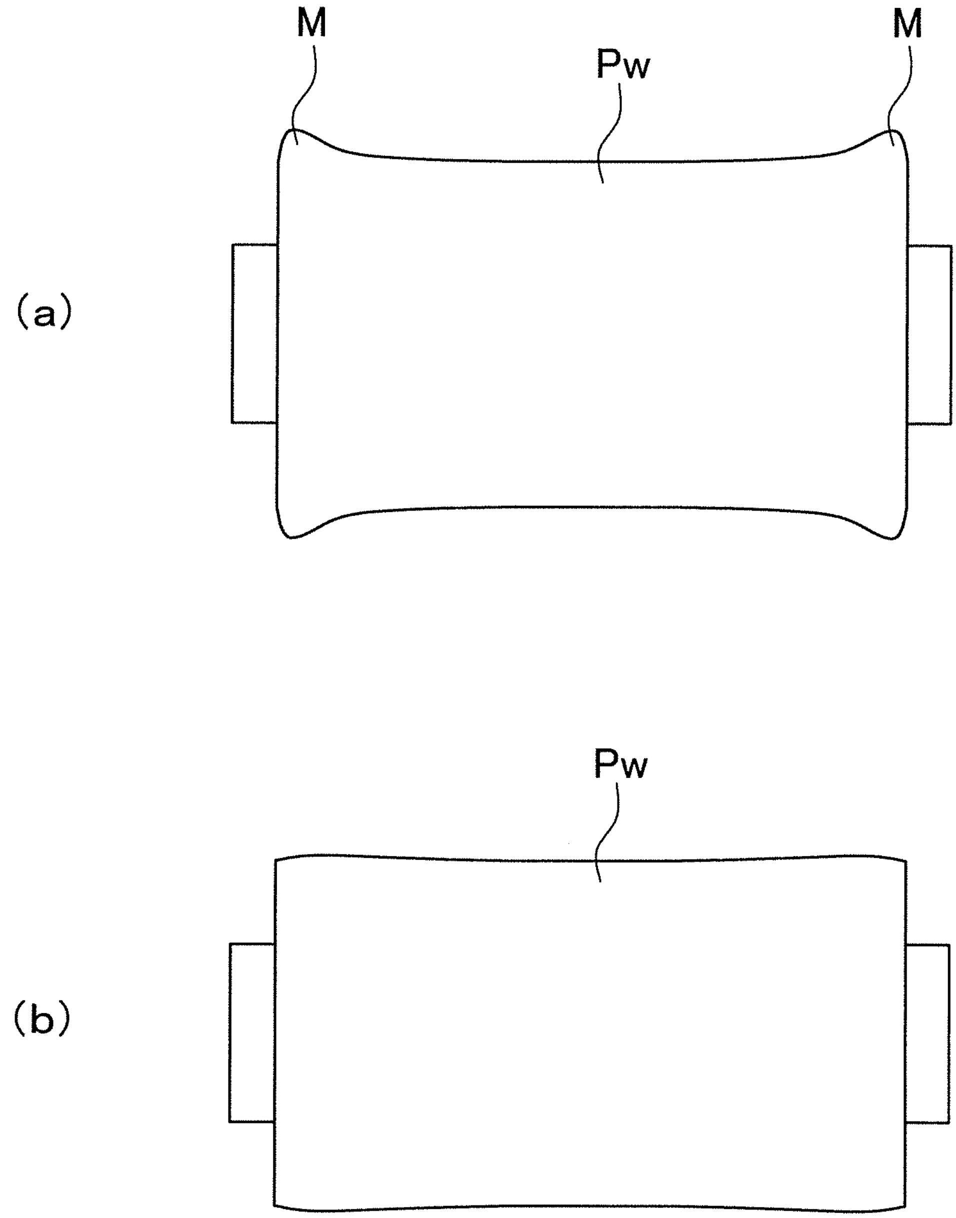
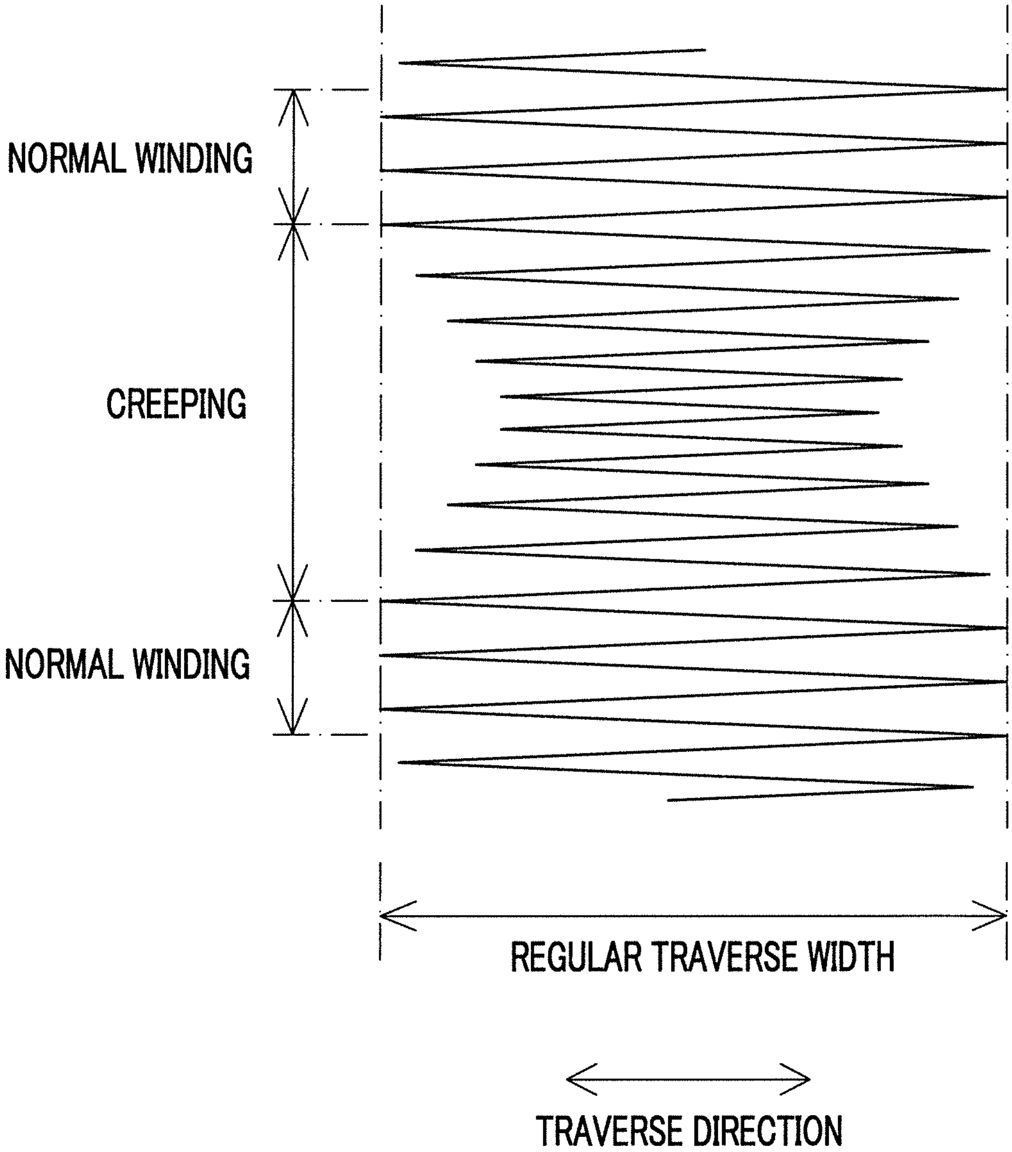


FIG.6


NORMAL WINDING
CREEPING
NORMAL WINDING
REGULAR TRAVERSE WIDTH
TRAVERSE DIRECTION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/032212

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. B65H54/38(2006.01)i, B65H54/02(2006.01)i, B65H57/28(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. B65H54/38, B65H54/02, B65H57/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2019
Registered utility model specifications of Japan	1996-2019
Published registered utility model applications of Japan	1994-2019

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004-250142 A (MURATA MACHINERY LTD.) 09 September 2004, paragraphs [0001], [0017], [0021], [0022], [0036]-[0047], fig. 1, 5-7 (Family: none)	1-8
A	JP 62-280169 A (MURATA MACHINERY LTD.) 05 December 1987 (Family: none)	1
A	JP 2016-128353 A (MURATA MACHINERY LTD.) 14 July 2016, & EP 3042872 A1 & CN 105775905 A	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02.10.2019	15.10.2019

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

- JP S61145075 A **[0004]**
- JP S62211274 A **[0004]**
- JP 2007153554 A **[0059]**