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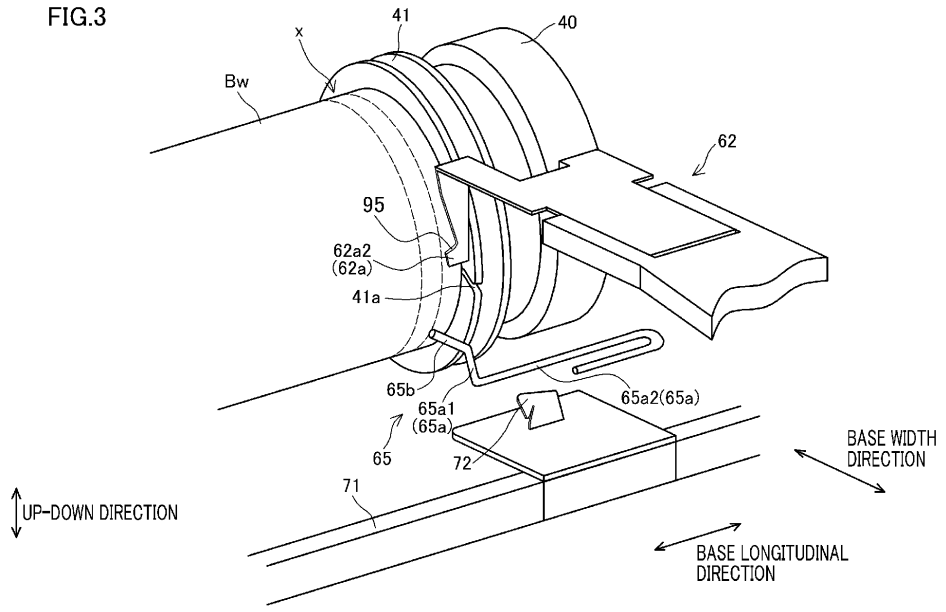
(54) YARN THREADING APPARATUS, FALSE-TWIST TEXTURING MACHINE, AND YARN THREADING METHOD

(57) Formation of straight winding on a bobbin is prevented when yarn threading onto the bobbin is performed. A yarn threading apparatus 60 includes: a yarn threading arm 62 having a yarn engagement portion 62a; and a bunch guide 65. A yarn Y is disengaged from the yarn engagement portion 62a on account of yarn threading to a hook 41a, when the yarn threading arm 62 is at a yarn threading position. The bunch guide 65 holds the yarn Y disengaged from the yarn engagement portion 62a to maintain the yarn Y at a bunch winding position x which is outside a traversal range of a bobbin Bw. A control unit 64 causes a traverse guide 72 to move between a predetermined position which and the traversal range r. The bunch guide 65 is structured to cause the yarn Y held thereby to be caught by the traverse guide 72 moving from the predetermined position into the traversal range r and to be detached from the bunch guide 65.

FIG.3



EP 4 242 152 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn threading apparatus configured to thread a yarn to a winding device, a false-twist texturing machine including the yarn threading apparatus, and a yarn threading method.

[0002] A winding device configured to form a package by winding a yarn onto a bobbin is structured such that a yarn is wound onto a bobbin sandwiched between and attached to paired bobbin holders that are attached to a cradle to be rotatable, while the yarn is traversed within a predetermined range by a traverse guide that reciprocally moves. In such a winding device, when a completed package is discharged, an empty bobbin on which no yarn is wound is set in the cradle. Onto the bobbin which is set in the cradle, a yarn is threaded the bobbin by the yarn threading apparatus.

[0003] Patent Literature 1 (Japanese Unexamined Patent Publication No. H10-194596) discloses a yarn threading apparatus which includes a yarn threading member (yarn threading arm of Patent Literature 1) that includes a yarn engagement portion with which a yarn engages and is rotatable between a yarn threading position where yarn threading to a hook (yarn threading portion of Patent Literature 1) formed on one of the paired bobbin holders is performed and a standby position. In this yarn threading apparatus, while the yarn threading member is moving from the standby position to the yarn threading position, the yarn sucked and held by a yarn holding member (sucking pipe of Patent Literature 1) is engaged with the yarn engagement portion. When the yarn threading member reaches the yarn threading position, the yarn engaged with the yarn engagement portion is hooked by the hook of the rotating bobbin holder. As the yarn is cut by a cutter attached to the cradle, the yarn holding member becomes no longer holds the yarn and the yarn threading to the hook is completed. The yarn threaded to the hook is bunch-wound onto a region outside the traversal range of the bobbin, while being kept engaged with the yarn engagement portion. The bunch winding is formed to make it possible to fetch a yarn end portion of the yarn, in order to connect yarn ends of yarns of packages with each other in a later process. When the bunch winding is completed, the yarn threading member moves to the standby position. While the yarn threading member is returning from the yarn threading position to the standby position, the yarn is disengaged from the yarn engagement portion in the traversal range. The yarn disengaged from the yarn engagement portion is caught by a traverse guide, and the yarn is traversed along the axial direction of the bobbin.

SUMMARY OF THE INVENTION

[0004] In the above-described yarn threading apparatus, the yarn threading member is arranged so that the yarn engagement portion rotates to pass through the vicinity of the center of the traversal range, and the yarn is disengaged from the yarn engagement portion at around the center. On this account, during a time period from the disengagement of the yarn from the yarn engagement portion to the catch of the yarn having reached the vicinity of the center of the traversal range by the reciprocating traverse guide, straight winding is disadvantageously formed as the yarn is wound onto the same part at around the center of the bobbin more than once. Such a straight winding formed on the bobbin obstructs unwinding of the yarn from the package.

[0005] An object of the present invention is to prevent the formation of straight winding on a bobbin when yarn threading onto the bobbin is performed.

[0006] A yarn threading apparatus of the present invention for threading a yarn to a bobbin that is mounted to be sandwiched between paired bobbin holders comprises: a yarn holding member which is configured to hold the yarn; a yarn hooking portion which is formed on one of the bobbin holders; a yarn threading member which includes a yarn engagement portion with which the yarn held by the yarn holding member is engaged and is movable between a yarn threading position where yarn threading to the yarn hooking portion is performed and a standby position; a traverse guide which is configured to reciprocally move along an axial direction of the bobbin holder to traverse the yarn wound onto the bobbin within a traversal range; and a control unit which is configured to control drive of the traverse guide, the yarn engagement portion being engaged with the yarn that is held by the yarn holding member while the yarn threading arm is moving from the standby position to the yarn threading position, and when the yarn threading arm is at the yarn threading position, the yarn being disengaged from the yarn engagement portion in accordance with the yarn threading to the yarn hooking portion, the yarn threading apparatus further comprising a bunch guide which holds the yarn threaded to the yarn hooking portion to be maintained in a bunch winding position that is outside the traversal range of the bobbin, the control unit causing the traverse guide to move between a predetermined position which is on the side opposite to the traversal range over the yarn that is held by the bunch guide and the traversal range, and the bunch guide causing the yarn held by the bunch guide to be caught by the traverse guide moving from the predetermined position to the traversal range and to be detached from the bunch guide.

[0007] According to the present invention, the yarn is disengaged from the yarn engagement portion in accordance with the yarn threading to the yarn hooking portion, and the yarn is held to be maintained at the bunch winding position of the bobbin by the bunch guide. The yarn held by the bunch guide is caught by the traverse guide moving from the predetermined position to the traversal range, with the result that the yarn is disengaged from the bunch guide. On this account, during a time period from the disengagement of the yarn from the yarn en-

gagement portion to the catch of the yarn by the traverse guide, the yarn does not exist in the traversal range and hence the formation of straight winding in the traversal range is avoided.

[0008] The yarn threading apparatus of the present invention is preferably arranged so that the control unit causes the traverse guide to be on standby at the predetermined position before the yarn threading to the yarn hooking portion, and when bunch winding is completed, the control unit moves the traverse guide at the predetermined position to the traversal range.

[0009] During a time period from the completion of the bunch winding to the traversal, the tension of winding the yarn is low as compared to cases where the yarn is traversed by the traverse guide. The longer the state of low tension of winding the yarn continues, the larger the looseness quantity of the yarn becomes, and it increases the risk of yarn breakage due to unintentional winding of the yarn onto the feed roller on the upstream in the yarn running direction of the winding device, the base, and so on. According to the present invention, after the completion of the bunch winding, the traverse guide that is on standby at the predetermined position in advance promptly catches the yarn and the traversal starts. It is therefore possible to shorten the time length of a state in which the traversal is not performed and the tension of winding the yarn is low. As a result, the looseness quantity of the yarn is reduced when the yarn is wound onto the bobbin.

[0010] The yarn threading apparatus of the present invention is preferably arranged so that the traverse guide is driven by a motor.

[0011] According to the present invention, because the traverse guide is driven by the motor, the time during which the bunch winding is performed can be easily controlled. It is therefore possible to further accurately adjust the amount of bunch winding.

[0012] The yarn threading apparatus of the present invention is preferably arranged so that the bunch guide has a holding portion that holds the yarn while restricting movement of the yarn into the traversal range and a guide portion that guides the yarn disengaged from the yarn engagement portion to the holding portion.

[0013] According to the present invention, the yarn disengaged from the yarn engagement portion can be guided to the holding portion by the guide portion. It is therefore possible to further reliably guide the yarn disengaged from the yarn engagement portion by the yarn hooking portion.

[0014] The yarn threading apparatus of the present invention is preferably arranged so that the guide portion is at least partially on the traversal range side of the yarn engagement portion of the yarn threading member at the yarn threading position.

[0015] According to the present invention, even if the yarn disengaged from the yarn engagement portion unfavorably moves to the traversal range side of the yarn engagement portion, it is possible to further reliably guide the yarn to the holding portion thanks to the guide portion.

[0016] The yarn threading apparatus of the present invention is preferably arranged so that the holding portion and the guide portion are integrally formed.

[0017] According to the present invention, because no gap exists between the holding portion and the guide portion, the yarn is smoothly guided from the guide portion to the holding portion without dropping off in halfway.

[0018] The yarn threading apparatus of the present invention is preferably arranged so that the guide portion is at least partially provided on a yarn path of the yarn threaded to the yarn hooking portion, which is upstream of the yarn hooking portion in a yarn running direction in which the yarn runs, and the bunch guide is provided on the bobbin holder side of the traverse guide in the yarn running direction.

[0019] Typically, the yarn supplied to the bobbin supported by the bobbin holder is guided to the traversing fulcrum guide that is on the upstream in the yarn running direction of the bobbin holder and is at around the center of the bobbin in the axial direction. On the other hand, the yarn engagement portion of the yarn threading member at the yarn threading position is provided in the vicinity of the yarn hooking portion. On this account, when yarn threading to the yarn hooking portion is performed, an oblique yarn path from a traversing fulcrum guide to the yarn hooking portion is formed. To cause the bunch guide to reliably hold the yarn disengaged from the yarn engagement portion, it is necessary to provide the guide portion of the bunch guide at least on the yarn path from the traversing fulcrum guide to the yarn hooking portion. In this connection, when the bunch guide is provided at a location distant from the bobbin holder in the yarn running direction, the bunch guide must be close to the center of the traversing fulcrum guide in the axial direction, and hence the bunch guide is provided on the traversal range side to be distant from the bunch winding position in the axial direction. With this arrangement, the yarn that is temporarily close to the traversal range when held by the bunch guide must be sent back to the bunch winding position, with the result that the width of the bunch winding may be widened. When the bunch winding is too wide, the yarn during the bunch winding may enter the traversal range. As such, when the bunch guide is provided on the traversal range side to be distant from the bunch winding position in the axial direction, it is difficult to maintain the yarn held by the bunch guide to be at the bunch winding position. According to the present invention, the guide portion is at least partially provided on a yarn path of the yarn threaded to the yarn hooking portion, which is upstream of the yarn hooking portion in the yarn running direction. The bunch guide is provided on the bobbin holder side of the traverse guide in the yarn running direction. On this account, the bunch guide can be provided at a location close to the bunch winding position in the axial direction, and hence the yarn can be reliably held to be maintained at the bunch winding position.

[0020] The yarn threading apparatus of the present in-

vention is preferably arranged so that the control unit causes the traverse guide to be on standby at the predetermined position before the yarn threading member starts to move from the standby position to the yarn threading position.

[0021] According to the present invention, the traverse guide is arranged to be on standby at the predetermined position in advance before the yarn threading member starts to move from the standby position to the yarn threading position. This arrangement makes it possible to avoid the yarn that is disengaged from the yarn threading member having reached the yarn threading position and is held by the bunch guide from making contact with the traverse guide that is moving from within the traversal range to the predetermined position. It is therefore possible to suppress the position where the bunch winding is performed for the bobbin from being deviated from the actual bunch winding position.

[0022] The yarn threading apparatus of the present invention is preferably arranged so that the yarn engagement portion includes a supporting portion that supports the yarn from below and is inclined downward, and when the yarn threading to the yarn hooking portion is performed, the yarn moves downward along the supporting portion and is disengaged.

[0023] According to the present invention, when downward force acts on the yarn on account of the yarn threading, the yarn moves along the supporting portion that is inclined downward, with the result that the yarn is disengaged from the yarn engagement portion. It is therefore possible to reliably disengage the yarn from the yarn engagement portion in accordance with the yarn threading, without requiring a complicated structure.

[0024] A false-twist texturing machine of the present invention comprises: a yarn supplying unit which is configured to supply a yarn; a processing unit which is configured to false-twist the yarn supplied from the yarn supplying unit; and a winding unit which is configured to wind the yarn false-twisted by the processing unit, the winding unit including: a winding device which is configured to form a package by winding the yarn onto a bobbin attached to a bobbin holder; and one of the yarn threading apparatuses described above.

[0025] According to the present invention, the yarn is disengaged from the yarn engagement portion in accordance with the yarn threading to the yarn hooking portion, and the yarn is held to be maintained at the bunch winding position of the bobbin by the bunch guide. The yarn held by the bunch guide is caught by the traverse guide moving from the predetermined position to the traversal range, with the result that the yarn is disengaged from the bunch guide. On this account, during a time period from the disengagement of the yarn from the yarn engagement portion to the catch of the yarn by the traverse guide, the yarn does not exist in the traversal range and hence the formation of straight winding in the traversal range is avoided.

[0026] A yarn threading method of the present invention for threading a yarn to a bobbin attached to a bobbin holder by using a yarn threading apparatus is arranged so that the yarn threading apparatus includes: a yarn holding member which is configured to hold the yarn; a yarn hooking portion which is formed on one of the bobbin holders; a yarn threading member which includes a yarn engagement portion with which the yarn held by the yarn holding member is engaged and is movable between a yarn threading position where yarn threading to the yarn hooking portion is performed and a standby position; a traverse guide which is configured to reciprocally move along an axial direction of the bobbin holder to traverse the yarn wound onto the bobbin within a traversal range; and a bunch guide which holds the yarn threaded to the yarn hooking portion to be maintained at a bunch winding position that is outside the traversal range of the bobbin, the yarn threading method comprises: a yarn engagement step of causing the yarn held by the yarn holding member to be engaged with the yarn engagement portion of the yarn threading member while the yarn threading member is being moved from the standby position to the yarn threading position; a yarn holding step of causing the bunch guide to hold the yarn, which is disengaged from the yarn engagement portion in accordance with the yarn threading of the yarn to the yarn hooking portion at the yarn threading position, to be maintained at the bunch winding position; a guide standby step of causing the traverse guide to be on standby at a predetermined position which is on the side opposite to the traversal range over the yarn that is held by the bunch guide; and a traversal step of moving the traverse guide at the predetermined position to the traversal range, and in the traversal step, the yarn held by the bunch guide is caught by the traverse guide moving from the predetermined position to the traversal range and being detached from the bunch guide.

[0027] According to the present invention, the yarn is disengaged from the yarn engagement portion in accordance with the yarn threading to the yarn hooking portion, and the yarn is held to be maintained at the bunch winding position of the bobbin by the bunch guide. The yarn held by the bunch guide is caught by the traverse guide moving from the predetermined position to the traversal range, with the result that the yarn is disengaged from the bunch guide. On this account, during a time period from the disengagement of the yarn from the yarn engagement portion to the catch of the yarn by the traverse guide, the yarn does not exist in the traversal range and hence the formation of straight winding in the traversal range is avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 is a schematic side view of a false-twist texturing machine related to an embodiment.

FIG. 2 is a schematic diagram of a winding unit.

FIG. 3 is a partial perspective view showing a yarn threading arm which is at around an end portion of a bobbin attached to a bobbin holder and is at a yarn threading position.

FIG. 4 is a partial front elevation showing the yarn threading arm which is at around the end portion of the bobbin attached to the bobbin holder and is at the yarn threading position, when viewed in a base width direction.

FIG. 5 is a schematic diagram of a winding unit when the yarn threading arm is at a standby position and a yarn is held by a yarn holding member.

FIG. 6 shows a situation of the winding unit when the yarn threading arm has been moved to the yarn threading position.

FIG. 7 is a partial perspective view of an end portion of a bobbin and its surroundings, showing a yarn engaged with a yarn engagement portion of the yarn threading arm when the yarn threading arm is at the yarn threading position.

FIG. 8 is a partial perspective view of the end portion of the bobbin and its surroundings, showing the yarn held by a bunch guide while bunch winding is being formed.

FIG. 9 is a partial perspective view of the end portion of the bobbin and its surroundings, showing the yarn caught by a traverse guide after the completion of the bunch winding.

FIG. 10 shows a yarn engagement portion of a modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] The following will describe an embodiment of the present invention with reference to figures.

(Overall Structure of False-Twist Texturing Machine 1)

[0030] FIG. 1 is a profile showing the overall structure of a false-twist texturing machine 1 of the present embodiment. Hereinafter, a vertical direction to the sheet of FIG. 1 is defined as a base longitudinal direction, and a left-right direction to the sheet is defined as a base width direction. A direction orthogonal to the base longitudinal direction and the base width direction is defined as the up-down direction (vertical direction) in which the gravity acts. These definitions of the directions will be suitably used hereinbelow.

[0031] The false-twist texturing machine 1 can perform false twisting of yarns Y made of, for example, synthetic fibers such as nylon (polyamide fibers). The false-twist texturing machine 1 includes a yarn supplying unit 2 for supplying the yarns Y, a processing unit 3 which performs the false twisting of the yarns Y supplied from the supplying unit 2, and a winding unit 4 which winds the yarns Y processed by the processing unit 3 onto bobbins Bw. The yarn supplying unit 2, the processing unit 3, and the winding unit 4 include structural elements, and the structural elements are provided to form plural lines in a base longitudinal direction orthogonal to a yarn running surface (surface orthogonal to the direction in which FIG. 1 is viewed) in which yarn paths are provided to extend to the winding unit 4 from the yarn supplying unit 2 via the processing unit 3.

[0032] The yarn supplying unit 2 includes a creel stand 7 retaining yarn supply packages Ps, and supplies the yarns Y to the processing unit 3. In the processing unit 3, the following members are provided in this order from the upstream in a yarn running direction: first feed rollers 11; a twist-stopping guide 12; a first heater 13; a cooler 14; a false-twisting device 15; second feed rollers 16; an interlacing device 17; third feed rollers 18; a second heater 19; and fourth feed rollers 20. The winding unit 4 winds the yarns Y for which the false winding has been performed at the processing unit 3 onto the bobbins Bw by winding devices 21, and forms wound packages Pw.

[0033] The draw texturing machine 1 includes a main base 8 and a winding base 9 which are placed to be spaced apart from each other in the base width direction. The main base 8 and the winding base 9 are provided to extend in a substantially same length in the base longitudinal direction, and placed to oppose each other. An upper part of the main base 8 is connected to an upper part of the winding base 9 by a supporting frame 10. Each device forming the processing unit 3 is mainly attached to the main base 8 or the supporting frame 10. The main base 8, the winding base 9, and the supporting frame 10 form a working space 22 in which an operator performs an operation such as the yarn threading to each device. The yarn paths are formed so that the yarns Y mainly run around the working space 22.

[0034] The false-twist texturing machine 1 includes units which are termed spans each of which includes a pair of the main base 8 and the winding base 9 placed to oppose each other. In one span, each device is placed so that the yarns Y running while being aligned in the base longitudinal direction can be false-twisted at the same time. For example, twelve winding devices 21 are provided for the winding base 9 in one span to form three stages and four rows. In the false-twist texturing machine 1, the spans are placed in a left-right symmetrical manner to the sheet, with a center line C of the base width direction of the main base 8 as a symmetry axis (main base 8 is shared between the left span and the right span), and the spans are aligned in the base longitudinal direction.

(Processing Unit)

[0035] The following will describe each element of the processing unit 3. Each first feed roller 11 sends the yarns Y supplied from the yarn supplying unit 2 to the first heater 13. The first feed rollers 11 are placed above the winding base 9 (as shown in FIG. 1). The first feed rollers 11 are aligned in the base longitudinal direction.

[0036] Each twist-stopping guide 12 prevents twisting

which has been applied to the yarn Y at the later-described false-twisting device 15 from being propagated to the upstream of each twist-stopping guide 12 in the yarn running direction. The twist-stopping guides 12 are placed downstream of the first feed rollers 11 in the yarn running direction, and placed upstream of the first heater 13 in the yarn running direction. The twist-stopping guides 12 are, for example, provided for the yarns Y supplied from the yarn supplying unit 2, respectively, and aligned in the base longitudinal direction.

[0037] Each first heater 13 heats the yarns Y sent from the first feed rollers 11, and are placed at the supporting frame 10 (as shown in FIG. 1). The first heaters 13 are provided for the yarns Y supplied from the yarn supplying unit 2, and aligned in the base longitudinal direction.

[0038] Each cooler 14 cools the yarns Y heated at each first heater 13. The coolers 14 are placed downstream of each first heater 13 in the yarn running direction, and placed upstream of the false-twisting devices 15 in the yarn running direction. The coolers 14 are provided for the yarns Y supplied by the yarn supplying unit 2, and aligned in the base longitudinal direction.

[0039] Each false-twisting device 15 is configured to twist the yarn Y. The false-twisting devices 15 are placed directly downstream of the coolers 14 in the yarn running direction. The false-twisting devices 15 are aligned in the base longitudinal direction. For example, twelve false-twisting devices 15 are provided in one span.

[0040] The second feed rollers 16 are rollers for sending the yarn Y twisted by the false-twisting device 15 toward the interlacing device 17. The second feed rollers 16 are provided on the downstream side in the yarn running direction of the false-twisting device 15 in the main base 8. The conveyance speed of conveying the yarn Y by the second feed rollers 16 is higher than the conveyance speed of conveying the yarn Y by the first feed rollers 11. The yarn Y is therefore drawn between the first feed rollers 11 and the second feed rollers 16.

[0041] The interlacing device 17 is configured to interlace the yarn Y by injecting air thereto. The interlacing device 17 is provided below the second feed rollers 16 in the main base 8.

[0042] The third feed rollers 18 are rollers for sending the yarn Y interlaced by the interlacing device 17 toward the second heater 19. The third feed roller 18 are provided below the interlacing device 17 in the main base 8. The conveyance speed of conveying the yarn Y by the third feed rollers 18 is lower than the conveyance speed of conveying the yarn Y by the second feed rollers 16. The yarn Y is therefore relaxed between the second feed rollers 16 and the third feed rollers 18.

[0043] The second heater 19 is a device for heating the yarns Y supplied from the third feed rollers 18. The second heater 19 is provided below the third feed rollers 18 in the main base 8. The second heater 19 extends along the up-down direction, and one second heater 19 is provided in one span.

[0044] The fourth feed rollers 20 are provided to feed the yarn Y thermally treated by the second heater 19 toward the winding device 21. The fourth feed rollers 20 are provided at a lower part of the winding base 9. The conveyance speed of conveying the yarn Y by the fourth feed rollers 20 is lower than the conveyance speed of conveying the yarn Y by the third feed rollers 18. The yarn Y is therefore relaxed between the third feed rollers 18 and the fourth feed rollers 20.

[0045] In the processing unit 3 arranged as described above, the yarn Y drawn between the first feed rollers 11 and the second feed rollers 16 is twisted by the false-twisting device 15. The twist formed by the false-twisting device 15 is propagated to the twist-stopping guide 12, but is not propagated to the upstream in the yarn running direction of the twist-stopping guide 12. The yarn Y which is twisted and drawn is heated at each first heater 13 and thermally set. After that, the yarn Y is cooled at each cooler 14. The yarn Y is untwisted at the downstream of the false-twisting device 15. However, each filament is maintained to be wavy in shape on account of the thermal setting described above. After being false-twisted by the false-twisting device 15, the yarn Y is interlaced by the interlacing device 17 while being relaxed between the second feed rollers 16 and the third feed rollers 18, ad then the yarn Y is guided to the downstream side in the yarn running direction. Furthermore, the yarn Y is thermally set at the second heater 19 while being relaxed between the third feed roller 18 and the fourth feed roller 20. Finally, the yarn Y sent from each fourth feed roller 20 is wound by each winding device 21, and forms each wound package Pw.

(Structure of Winding Unit 4)

[0046] The winding unit 4 includes plural winding devices 21. Each winding device 21 is configured to form a wound package Pw by winding a yarn Y sent from the fourth feed roller 20 onto a bobbin Bw. As shown in FIG. 2, the winding device 21 includes a pair of cradle arms 40, a contact roller 50, and a yarn threading apparatus 60.

[0047] The paired cradle arms 40 are arranged to be able to sandwich the bobbin Bw. To be more specific, each of the paired cradle arms 40 includes a bobbin holder 41 that holds the bobbin Bw to be rotatable. The ends of the bobbin Bw are rotatably supported by the cradle arms 40 through the bobbin holders 41. To put it differently, the bobbin Bw is mounted to be sandwiched between the paired bobbin holders 41. On the bobbin holder 41 on one side in the base longitudinal direction, a hook 41a (yarn hooking portion of the present invention) is formed to thread the yarn Y to the bobbin Bw (see FIG. 3 and FIG. 4). The cradle arm 40 on one side in the base longitudinal direction is provided with a cutter 40a that is positioned on the side opposite to the traverse guide 72 in the base width direction. In this connection, the one side in the base longitudinal direction is the side close to a yarn threading position of the later-described yarn threading arm 62, and is the right side in FIG. 2.

[0048] The contact roller 50 is rotationally driven in a constant direction while being in contact with the circumferential surface of the bobbin Bw or the wound packages Pw, and is therefore able to wind the yarn Y by rotating the bobbin Bw. This contact roller 50 is driven by a package driving motor (not illustrated). The contact rollers 50 of the winding devices 21 are driven together by the package driving motor that is commonly provided for plural spindles. Each contact roller 50 may be driven by a package driving motor provided for each spindle.

[0049] The yarn threading apparatus 60 is configured to thread the yarn Y to the bobbin Bw that is mounted to be sandwiched between the paired bobbin holders 41. The yarn threading apparatus 60 includes a yarn holding member 61, the above-described hook 41a, the yarn threading arm 62 (equivalent to a yarn threading member of the present invention), a traverse unit 63, a control unit 64, and a bunch guide 65.

[0050] As shown in FIG. 5, the yarn holding member 61 is configured to suck and hold the yarn Y sent from the fourth feed roller 20. The yarn holding member 61 is connected to a negative pressure source and is able to suck the yarn Y.

[0051] The yarn threading arm 62 includes a yarn engagement portion 62a with which the yarn Y sucked and held by the yarn holding member 61 is engaged. The yarn threading arm 62 is movable between a yarn threading position where yarn threading to the hook 41a is performed (i.e., the position of the yarn threading arm 62 in FIG. 6) and a standby position (i.e., the position of the yarn threading arm 62 in FIG. 2 and FIG. 5). The yarn threading arm 62 moves between the yarn threading position and the standby position by rotating about a rotational shaft 62b that extends along the up-down direction. The standby position is a position of the yarn threading arm 62 where the yarn threading arm 62 does not make contact with a part of the yarn Y between the fourth feed roller 20 and the yarn holding member 61 and where the yarn threading arm 62 does not make contact with the yarn Y traversed by the traverse guide 72. The yarn threading arm 62 is driven by an unillustrated yarn threading arm driving motor.

[0052] The yarn engagement portion 62a is formed at a leading end portion of the yarn threading arm 62. The yarn engagement portion 62a is arranged to be engaged with the yarn Y that is held by the yarn holding member 61 while the yarn threading arm 62 is moving from the standby position to the yarn threading position. When the yarn threading arm 62 is at the yarn threading position, the yarn Y is disengaged from the yarn engagement portion 62a on account of the yarn threading to the hook 41a. To be more specific, the yarn engagement portion 62a is provided with a first portion 62a1 and a second portion 62a2 as shown in FIG. 4. The first portion 62a1 and the second portion 62a2 of the yarn engagement portion 62a are portions with which the yarn Y held by the yarn holding member 61 is engaged while the yarn threading arm 62 is moving from the standby position to the yarn threading position. The second portion 62a2 of the yarn engagement portion 62a is a portion where the yarn Y is disengaged on account of the yarn threading to the hook 41a, when the yarn threading arm 62 is at the yarn threading position. To be more specific, a supporting portion 95 of the second portion 62a2, which supports the yarn Y from below, is tilted downward. As the yarn Y is moved downward by the downward force along the supporting portion 95 tilted downward, the yarn Y is disengaged from the second portion 62a2. When the yarn threading arm 62 is at the standby position, the first portion 62a1 is closer to the yarn Y sucked and held by the yarn holding member 61 than the second portion 62a2 is to the yarn Y. To put it differently, when the yarn threading arm 62 is at the yarn threading position, the second portion 62a2 is closer to the traversal range r than the first portion 62a1 is to the traversal range r.

[0053] The traverse unit 63 is configured to traverse the yarn Y wound onto the bobbin Bw, along the base longitudinal direction (axial direction of the bobbin holder 41) and within the traversal range r. To be more specific, this traverse unit 63 includes an endless timing belt 71 provided in the vicinity of the contact roller 50 and a traverse guide 72 fixed to the timing belt 71. The timing belt 71 is mounted over driven pulleys 81 and 82 provided at the both end portions in the traverse direction of the traverse guide 72 and a driving pulley 83 driven by a traverse guide drive motor 90. As the traverse guide drive motor 90 is driven, the traverse guide 72 is reciprocated within the predetermined traversal range r through the driving pulley 83 and the timing belt 71. In the present embodiment, the traverse guide 72 is able to catch the yarn Y when moving from one side (right side in FIG. 2) to the other side (left side in FIG. 2) in the base longitudinal direction, and is not able to catch the yarn Y when moving from the other side to the one side in the base longitudinal direction.

[0054] The false-twist texturing machine 1 of the present embodiment includes a traversing fulcrum guide 100 and a guide body 101 which are provided between the fourth feed roller 20 and the winding device 21. As shown in FIG. 2, the yarn Y fed by the fourth feed roller 20 is supplied to the winding device 21 while being guided by the traversing fulcrum guide 100 and the guide body 101, and the yarn Y is then wound onto the bobbin Bw while being traversed by the traverse guide 72.

[0055] The control unit 64 is configured to control the drive of the package driving motor (not illustrated), the yarn threading arm driving motor (not illustrated), and the traverse guide drive motor 90. The control unit 64 controls timings to drive the yarn threading arm driving motor (not illustrated) and the traverse guide drive motor 90 based on a signal sent from a rotation number detection sensor (not illustrated) that monitors the number of rotations of the bobbin holder 41. To be more specific, when the rotation number detection sensor detects that the number of rotations of the bobbin holder 41 reaches a target value, the control unit 64 starts the yarn threading by driving

the yarn threading arm driving motor and the traverse guide drive motor. The rotation number detection sensor includes, for example, a magnet attached to a part of the bobbin holder 41 and a magnetic sensor attached to the cradle arm 40. The rotation number detection sensor is configured to monitor the number of rotations of the bobbin holder 41 by detecting, by using the magnetic sensor, the cycle of magnetism generated by the magnet that rotates in accordance with the rotation of the bobbin holder 41. The control unit 64 may be commonly provided for all winding devices 21, or may be provided for each winding device 21. A control unit for controlling the drive of the package driving motor may be different from a control unit for controlling the drive of the yarn placement arm driving motor and the traverse guide drive motor 90.

[0056] The bunch guide 65 holds the yarn Y disengaged from the yarn engagement portion 62a to maintain the yarn Y at a bunch winding position x (see, e.g., FIG. 2) which is outside the traversal range r of the bobbin Bw. The bunch winding position x is a position where bunch winding of the yarn Y is performed at a region outside the traversal range r of the bobbin Bw attached to the bobbin holder 41. The bunch winding is formed to make it possible to fetch a yarn end portion of the yarn Y, in order to connect yarn ends of yarns Y of plural wound packages Pw with each other in a later process.

[0057] As shown in FIG. 3 and FIG. 4, the bunch guide 65 is, for example, a bended rod member extending in the base longitudinal direction. The bunch guide 65 is provided below the yarn threading arm 62 at the yarn threading position. The bunch guide 65 has a holding portion 65a that holds the yarn Y while restricting the movement of the yarn Y into the traversal range r and a guide portion 65b that guides the yarn Y disengaged from the yarn engagement portion 62a to the holding portion 65a. As shown in FIG. 4, the guide portion 65b is provided on the traversal range r side of the holding portion 65a in the base longitudinal direction. The guide portion 65b is partially provided on the yarn path of the yarn Y traveling from the traversing fulcrum guide 100 to the hook 41a. To put it differently, the guide portion 65b is partially provided on the yarn path of the yarn Y hooked by the hook 41a, which is on the upstream side of the hook 41a in the yarn running direction. The holding portion 65a includes an inclined portion 65a1 which is inclined downward toward the bunch winding position x from the traversal range r in the base longitudinal direction and a horizontal portion 65a2 which extends horizontally in the base longitudinal direction. The inclined portion 65a1 and the horizontal portion 65a2 are integrally formed. The inclined portion 65a1 is a portion by which movement of the yarn Y into the traversal range r is restricted, whereas the horizontal portion 65a2 is a portion by which the yarn Y is held at a predetermined height. The predetermined height is a height at which the yarn Y is easily caught when the traverse guide 72 moves along the base longitudinal direction. Furthermore, the predetermined height is a height at which the held yarn Y does not make contact with other members of the winding device 21. The horizontal portion 65a2 prevents the yarn Y from moving to a location that is lower than the predetermined height. The bunch guide 65 is positioned so that the yarn path of the yarn Y held by the holding portion 65a intersects with the movement track of the traverse guide 72. The holding portion 65a and the guide portion 65b are integrally formed. The guide portion 65b is tilted downward from the traversal range r in the base longitudinal direction toward the bunch winding position x. In the present embodiment, the tilt angle of the inclined portion 65a1 of the holding portion 65a relative to the horizontal plane is larger than the tilt angle of the guide portion 65b relative to the horizontal plane. The inclined portion 65a1 having a larger inclination angle relative to the horizontal plane restricts the movement of the yarn Y held by the horizontal portion 65a2 into the traversal range r.

[0058] As shown in FIG. 4, the guide portion 65b is partially provided on the traversal range r side of the yarn engagement portion 62a of the yarn threading arm 62 at the yarn threading position. The bunch guide 65 is provided on the bobbin holder 41 side of the traverse guide 72 in a yarn running direction which is a direction in which the yarn Y runs.

(Yarn Threading)

[0059] The following will describe a series of actions from the threading of the yarn Y to the hook 41a by the yarn threading apparatus 60 to the traversal performed by the traverse guide 72, with reference to FIG. 5 to FIG. 9.

[0060] To begin with, as shown in FIG. 5, the yarn Y supplied from the fourth feed roller 20 is sucked and held by the yarn holding member 61. At this stage, the control unit 64 controls the yarn threading arm driving motor so that the yarn threading arm 62 is at the standby position.

[0061] Subsequently, the control unit 64 performs a guide standby step of causing the traverse guide 72 to be on standby at a predetermined position which is on the side opposite to the traversal range r over the yarn Y that is held by the bunch guide 65 in a later-described yarn holding step. In other words, the control unit 64 causes the traverse guide 72 to be on standby at the predetermined position before the yarn threading arm 62 starts to move from the standby position to the yarn threading position. The predetermined position is, for example, set in advance and stored in the control unit 64. The predetermined position is typically in the vicinity of the bunch guide 65.

[0062] Subsequently, as shown in FIG. 6, the control unit 64 drives the yarn threading arm driving motor to rotationally move the yarn threading arm 62 from the standby position to the yarn threading position about a rotational shaft 62b. While the yarn threading arm 62 is being moved from the standby position to the yarn threading position, the control unit 64 executes a yarn engage-

ment step of causing the yarn Y sucked and held by the yarn holding member 61 to be engaged with the first portion 62a1 and the second portion 62a2 of the yarn engagement portion 62a. The yarn engagement step will be specifically explained. While the yarn threading arm 62 is moving from the standby position to the yarn threading position, the first portion 62a1 makes contact with a part of the yarn Y sucked and held by the yarn holding member 61, which is on the upstream of the yarn holding member 61 in the yarn running direction. After the first portion 62a1 makes contact with the yarn Y, the yarn threading arm 62 further moves toward the yarn threading position, with the result that the yarn Y is engaged with the first portion 62a1.

[0063] Furthermore, before the yarn threading arm 62 reaches the yarn threading position, the yarn Y engaged with the second portion 62a2 is engaged with both the first portion 62a1 and the second portion 62a2, and is tensioned between the first portion 62a1 and the second portion 62a2 (see FIG. 7). An end portion of the yarn Y engaged with the yarn engagement portion 62a, which is on the downstream side in the yarn running direction, is sucked and held by the yarn holding member 61.

[0064] As shown in FIG. 7, when the yarn threading arm 62 reaches the yarn threading position, a part of the yarn Y, which is between the first portion 62a1 and the second portion 62a2, is hooked by the hook 41a of the bobbin holder 41 that rotates in a direction indicated by the arrow in FIG. 7. The yarn Y hooked by the hook 41a is wound onto an end portion of the bobbin Bw on account of the rotation of the bobbin Bw. At this stage, the yarn Y hooked by the hook 41a and engaged with the second portion 62a2 is pulled downward in accordance with the rotation of the bobbin holder 41. As a result, the yarn Y is moved downward along the supporting portion 95 tilted downward, and is eventually disengaged from the second portion 62a2. In summary, in the present embodiment, the yarn Y is disengaged from the second portion 62a2 as the yarn Y is hooked by the hook 41a formed on the bobbin holder 41. The yarn Y having been disengaged from the second portion 62a2 makes contact with the guide portion 65b of the bunch guide 65. Thereafter, the yarn Y moves along the inclination of the guide portion 65b and reaches the holding portion 65a. As shown in FIG. 8, the holding portion 65a holds the yarn Y at the bunch winding position x of the bobbin Bw. In this way, in the yarn holding step, the yarn Y disengaged from the yarn engagement portion 62a due to the yarn threading of the yarn Y to the end portion of the bobbin Bw at the yarn threading position is held to be maintained at the bunch winding position x of the bobbin Bw by the bunch guide 65. In the yarn holding step, the yarn Y is bunch-wound onto the bunch winding position x of the bobbin Bw.

[0065] The yarn Y disengaged from the second portion 62a2 is held by the bunch guide 65 at a part on the upstream of the hook 41a in the yarn running direction, and has been engaged with the first portion 62a1 at a part on the downstream of the hook 41a in the yarn running direction. In this state, as the bobbin holder 41 further rotates, the yarn Y hooked by the hook 41a is guided to the position where the cutter 40a is provided on the cradle arm 40, and the yarn Y is cut by the cutter 40a. A part of the yarn Y having been cut by the cutter 40a, which is on the downstream of the cutter 40a in the yarn running direction, is sucked by the yarn holding member 61 and collected.

[0066] In regard to the package driving motor which rotationally drives the contact roller 50 in order to rotate the bobbin Bw and the bobbin holder 41 together, the control unit 64 may start the package driving motor after the yarn threading arm 62 reaches the yarn threading position, or may start the package driving motor before the yarn threading arm 62 reaches the yarn threading position.

[0067] As shown in FIG. 9, when the bunch winding is completed, the control unit 64 executes a traversal step of moving the traverse guide 72 from the predetermined position to the traversal range r and performing traversal. In the traversal step, the yarn Y held by the bunch guide 65 is caught by the traverse guide 72 moving from the predetermined position into the traversal range r. The yarn Y caught by the traverse guide 72 moves along the inclination of the inclined portion 65a1 and the guide portion 65b of the holding portion 65a, and is then disengaged from the guide portion 65b. In other words, the bunch guide 65 is structured to cause the yarn Y held thereby to be caught by the traverse guide 72 moving from the predetermined position into the traversal range r and to be detached from the bunch guide 65.

[0068] In this way, the series of actions from the threading of the yarn Y to the hook 41a by the yarn threading apparatus 60 to the traversal performed by the traverse guide 72 is completed.

(Effects)

[0069] The yarn threading apparatus 60 of the present embodiment includes the yarn holding member 61, the hook 41a, the yarn threading arm 62 having the yarn engagement portion 62a, the traverse guide 72, the control unit 64, and the bunch guide 65. The yarn engagement portion 62a is arranged to be engaged with the yarn Y that is held by the yarn holding member 61 while the yarn threading arm 62 is moving from the standby position to the yarn threading position. When the yarn threading arm 62 is at the yarn threading position, the yarn Y is disengaged from the yarn engagement portion 62a on account of the yarn threading to the hook 41a. The bunch guide 65 holds the yarn Y disengaged from the yarn engagement portion 62a to maintain the yarn Y at the bunch winding position x which is outside the traversal range r of the bobbin Bw. The control unit 64 causes the traverse guide 72 to move between the predetermined position which is on the side opposite to the traversal range r over the yarn Y that is held by the bunch guide 65 and the

traversal range r. The bunch guide 65 is structured to cause the yarn Y held thereby to be caught by the traverse guide 72 moving from the predetermined position into the traversal range r and to be detached from the bunch guide 65.

[0070] The yarn threading method of the present embodiment includes the yarn engagement step of causing the yarn Y held by the yarn holding member 61 to be engaged with the yarn engagement portion 62a, the yarn holding step of holding the yarn Y disengaged from the yarn engagement portion 62a at the yarn threading position by the bunch guide 65, the guide standby step of causing the traverse guide 72 to be on standby at the predetermined position, and the traversal step of moving the traverse guide 72 at the predetermined position to the traversal range r. In the traversal step, the yarn Y held by the bunch guide 65 is caught by the traverse guide 72 moving from the predetermined position into the traversal range r, and is detached from the bunch guide 65.

[0071] According to the embodiment described above, the yarn Y is disengaged from the yarn engagement portion 62a in accordance with the yarn threading to the hook 41a, and the yarn Y is held to be maintained at the bunch winding position x of the bobbin Bw by the bunch guide 65. After the completion of the bunch winding, the yarn Y held by the bunch guide 65 is caught by the traverse guide 72 moving from the predetermined position to the traversal range r, with the result that the yarn Y is disengaged from the bunch guide 65. On this account, during a time period from the disengagement of the yarn Y from the yarn engagement portion 62a to the catch of the yarn by the traverse guide 72, the yarn Y does not exist in the traversal range r and hence the formation of straight winding in the traversal range r is avoided.

[0072] In the yarn threading apparatus 60 of the present embodiment, the control unit 64 causes the traverse guide 72 to be on standby at the predetermined position before the yarn threading to the hook 41a is performed, and once the bunch winding is completed, the control unit 64 causes the traverse guide 72 at the predetermined position to the traversal range r.

[0073] During a time period from the completion of the bunch winding to the traversal, the tension of winding the yarn Y is low as compared to cases where the yarn Y is traversed by the traverse guide 72. The longer the state of low tension of winding the yarn Y continues, the larger the looseness quantity of the yarn Y becomes, and it increases the risk of yarn breakage due to unintentional winding of the yarn Y onto the fourth feed roller 20 on the upstream in the yarn running direction of the winding device 21, the main frame 8, and so on. According to the embodiment above, after the completion of the bunch winding, the traverse guide 72 that is on standby at the predetermined position in advance promptly catches the yarn Y and the traversal starts. It is therefore possible to shorten the time length of a state in which the traversal is not performed and the tension of winding the yarn Y is low. As a result, the looseness quantity of the yarn Y is reduced when the yarn Y is wound onto the bobbin Bw. The occurrence of yarn breakage due to unintentional winding of the yarn Y onto the fourth feed roller 20, etc. can therefore be suppressed.

[0074] In the yarn threading apparatus 60 of the present embodiment, the traverse guide 72 is driven by the traverse guide drive motor 90. Because the traverse guide 72 is driven by the traverse guide drive motor 90, the time during which the bunch winding is performed can be easily controlled. It is therefore possible to further accurately adjust the amount of bunch winding.

[0075] In the yarn threading apparatus 60 of the present embodiment, the bunch guide 65 has the holding portion 65a that holds the yarn Y while restricting the movement of the yarn Y into the traversal range r and the guide portion 65b that guides the yarn Y disengaged from the yarn engagement portion 62a to the holding portion 65a. With this arrangement, the yarn Y disengaged from the yarn engagement portion 62a can be guided to the holding portion 65a by the guide portion 65b. It is therefore possible to further reliably guide the yarn Y disengaged from the yarn engagement portion 62a to the bunch winding position x of the bobbin Bw.

[0076] In the yarn threading apparatus 60 of the present embodiment, the guide portion 65b is partially on the traversal range r side of the yarn engagement portion 62a of the yarn threading arm 62 at the yarn threading position. With this arrangement, even if the yarn Y disengaged from the yarn engagement portion 62a unfavorably moves to the traversal range r side of the yarn engagement portion 62a, it is possible to further reliably guide the yarn Y to the holding portion 65a thanks to the guide portion 65b.

[0077] In the yarn threading apparatus 60 of the present embodiment, the holding portion 65a and the guide portion 65b are integrally formed. With this arrangement, because no gap exists between the holding portion 65a and the guide portion 65b, the yarn Y is smoothly guided from the guide portion 65b to the holding portion 65a without dropping off in halfway.

[0078] In the yarn threading apparatus 60 of the present embodiment, the guide portion 65b is at least partially provided on the yarn path of the yarn Y hooked by the hook 41a, which is on the upstream side of the hook 41a in the yarn running direction. The bunch guide 65 is provided on the bobbin holder 41 side of the traverse guide 72 in a yarn running direction which is a direction in which the yarn Y runs.

[0079] Typically, the yarn Y supplied to the bobbin Bw supported by the bobbin holder 41 is guided to the traversing fulcrum guide 100 that is on the upstream in the yarn running direction of the bobbin holder 41 and is at around the center of the bobbin Bw in the base longitudinal direction. On the other hand, The yarn engagement portion 62a of the yarn threading arm 62 at the yarn threading position is provided in the vicinity of the hook

41a. On this account, when yarn threading to the hook 41a is performed, an oblique yarn path from the traversing fulcrum guide 100 to the hook 41a is formed. To cause the bunch guide 65 to reliably hold the yarn Y disengaged from the yarn engagement portion 62, it is necessary to provide the guide portion 65b of the bunch guide 65 at least on the yarn path from the traversing fulcrum guide 100 to the hook 41a. In this connection, when the bunch guide 65 is provided at a location distant from the bobbin holder 41 in the yarn running direction, the bunch guide 65 must be close to the center of the traversing fulcrum guide 100 in the base longitudinal direction, and hence the bunch guide 65 is provided on the traversal range r side to be distant from the bunch winding position x in the base longitudinal direction. With this arrangement, the yarn Y that is temporarily close to the traversal range r when held by the bunch guide 65 must be sent back to the bunch winding position x, with the result that the width of the bunch winding may be widened. When the bunch winding is too wide, the yarn Y during the bunch winding may enter the traversal range r. As such, when the bunch guide 65 is provided on the traversal range r side to be distant from the bunch winding position x in the base longitudinal direction, it is difficult to maintain the yarn Y held by the bunch guide 65 to be at the bunch winding position x. According to the present embodiment, the guide portion 65b is partially provided on the yarn path of the yarn Y hooked by the hook 41a, which is on the upstream side of the hook 41a in the yarn running direction. The bunch guide 65 is provided on the bobbin holder 41 side of the traverse guide 72 in the yarn running direction. On this account, the bunch guide 65 can be provided at a location close to the bunch winding position x in the base longitudinal direction, and hence the yarn Y can be reliably held to be maintained at the bunch winding position x.

[0080] In the yarn threading apparatus 60 of the present embodiment, the control unit 64 causes the traverse guide 72 to be on standby at the predetermined position before the yarn threading arm 62 starts to move from the standby position to the yarn threading position. This arrangement makes it possible to avoid the yarn Y that is disengaged from the yarn threading arm 62 having reached the yarn threading position and is held by the bunch guide 65 from making contact with the traverse guide 72 that is moving from within the traversal range r to the predetermined position. It is therefore possible to suppress the position where the bunch winding is performed for the bobbin Bw from being deviated from the actual bunch winding position x.

[0081] In the yarn threading apparatus 60 of the present embodiment, the yarn engagement portion 62a includes the supporting portion 95 that supports the yarn Y from below and is inclined downward, and when the yarn threading to the hook 41a is performed, the yarn Y moves downward along the supporting portion 95 and is eventually disengaged. In the present embodiment, when downward force acts on the yarn Y on account of the yarn threading, the yarn Y moves along the supporting portion 95 that is inclined downward, with the result that the yarn Y is disengaged from the yarn engagement portion 62a. It is therefore possible to reliably disengage the yarn Y from the yarn engagement portion 62a in accordance with the yarn threading, without requiring a complicated structure.

(Modifications)

[0082] The following will describe modifications of the above-described embodiment. The members identical with those in the embodiment above will be denoted by the same reference numerals and the explanations thereof are not repeated.

[0083] In the embodiment above, the yarn threading arm 62 is driven by the yarn threading arm driving motor. Alternatively, the yarn threading arm 62 may be driven by an air cylinder, for example. In this case, members such as a solenoid valve for moving the air cylinder are controlled by the control unit 64.

[0084] In the embodiment above, the guide portion 65b is partially on the traversal range r side of the yarn engagement portion 62a of the yarn threading arm 62 at the yarn threading position. Alternatively, the guide portion 65b may be entirely on the traversal range r side of the yarn engagement portion 62a of the yarn threading arm 62 at the yarn threading position. The bunch guide 65 may include only the holding portion 65a.

[0085] In the embodiment above, the bunch guide 65 is a bended rod member. Alternatively, the bunch guide 65 may be a straight rod member. In this case, the bunch guide 65 is tilted downward from the traversal range r in the base longitudinal direction toward the bunch winding position x. The bunch guide 65 may be a plate member or a member having a different shape.

[0086] In the embodiment above, the holding portion 65a and the guide portion 65b are integrally formed. Alternatively, the holding portion 65a and the guide portion 65b may be different members.

[0087] In the embodiment above, the bunch guide 65 is provided on the bobbin holder side of the traverse guide 72 in the yarn running direction. Alternatively, the bunch guide 65 may be provided on the fourth feed roller 20 side of the traverse guide 72 in the yarn running direction.

[0088] In the embodiment above, the holding portion 65a includes the inclined portion 65a1 and the horizontal portion 65a2. Alternatively, the holding portion 65a may include an inclined portion which is inclined downward toward the bunch winding position x from the traversal range r in the base longitudinal direction and an inclined portion which is inclined upward toward the bunch winding position x from the traversal range r in the base longitudinal direction. In this case, the inclined portion inclined downward is a portion for restricting the movement of the yarn Y into the traversal range r, and a portion where the inclined portion inclined downward is connected to the inclined portion inclined upward is a portion for

holding the yarn Y to have a predetermined height. Furthermore, the holding portion 65a may include a first inclined portion which is inclined downward from within the traversal range r in the base longitudinal direction toward the bunch winding position x and a second inclined portion which is inclined downward from within the traversal range r in the base longitudinal direction toward the bunch winding position x and which is smaller in inclination angle relative to the horizontal plane than the first inclined portion. In this case, the first inclined portion is a portion by which the movement of the yarn Y into the traversal range r is restricted, whereas the second inclined portion is a portion by which the yarn Y is held at a predetermined height. In order to cause the yarn Y held by the holding portion 65a to move from within the traversal range r in the base longitudinal direction toward the bunch winding position x, the inclination angle relative to the horizontal plane must be equal to or larger than a predetermined value. When the yarn Y is positioned at the second inclined portion having a smaller inclination angle relative to the horizontal plane, the yarn Y does not move from within the traversal range r in the base longitudinal direction toward the bunch winding position x any more, and the yarn Y is stationary at a point on the second inclined portion. The predetermined value is determined based on, for example, the running speed of the yarn Y, the position of the bunch guide 65, and the position of the bobbin Bw.

[0089] In the embodiment above, the guide standby step is executed prior to the yarn engagement step. In other words, the control unit 64 causes the traverse guide 72 to be on standby at the predetermined position before the yarn threading arm 62 starts to move from the standby position to the yarn threading position. Alternatively, the guide standby step may be executed at the same time as the yarn engagement step, after the yarn engagement step, or after the yarn holding step. To put it differently, the control unit 64 may move the traverse guide 72 to the predetermined position after the yarn threading arm 62 reaches the yarn threading position, or may move the traverse guide 72 to the predetermined position after the yarn Y is hooked by the hook 41a. When the guide standby step is executed at the same time as the yarn engagement step or is executed after the yarn engagement step and before the yarn holding step, the control unit 64 moves the traverse guide 72 to the predetermined position without allowing the traverse guide 72 to make contact with the yarn Y engaged with the yarn threading arm 62 which is moving from the standby position to the yarn threading position. When the guide standby step is executed after the yarn holding step, the control unit 64 moves the traverse guide 72 to the predetermined position in such a way that the traverse guide 72 passes under the yarn Y held by the bunch guide 65.

[0090] In the embodiment above, the traverse guide 72 is driven by the traverse guide drive motor 90. A non-limiting example of the traverse guide drive motor 90 is a motor with an encoder. In this case, a sensor is provided at the yarn threading position of the yarn threading arm 72. When the sensor detects that the yarn threading arm 72 reaches the yarn threading position, the control unit 64 controls the drive of the traverse guide drive motor 90 based on the detection signal.

[0091] In the embodiment above, the yarn engagement portion 62a includes the supporting portion 95 that supports the yarn Y from below and is inclined downward. The yarn Y supported by the yarn engagement portion 62a is disengaged from the yarn engagement portion 62a in such a way that, in accordance with the yarn threading to the hook 41a, the yarn Y moves along the supporting portion 95 that is inclined downward. Alternatively, as shown in FIG. 10, a yarn engagement portion 162a may include a supporting portion 195 which supports the yarn Y from below and is formed on a rotating lever 171. At a lower portion of a second portion 162a2 of a yarn engagement portion 162a, the lever 171 and a stopper 174 that are movable members are attached. The lever 171 is provided with the supporting portion 195 that supports the yarn Y from below. The supporting portion 195 is inclined upward. The lever 171 is rotatable about a rotational shaft 172 that extends in the base width direction. The lever 171 is connected to a first portion 161a1 of the yarn engagement portion 162a through a biasing mechanism 173. The biasing mechanism 173 is, for example, a spring member. The biasing mechanism 173 is configured to bias the lever 171 in the base longitudinal direction, from the second portion 162a2 toward the first portion 162a1. The lever 171 is biased by the biasing mechanism 173 clockwise when viewed in the base width direction, but the rotation of the lever 171 is restricted due to the contact with the stopper 174 (see FIG. 10). When the yarn Y supported by the supporting portion 195 is pulled downward on account of the yarn threading of the yarn Y to the hook 41a, downward force is applied to the supporting portion 195 and hence the lever 171 is pressed downward. Due to this, the lever 171 rotates counterclockwise when viewed in the base width direction (i.e., rotates in a direction indicated by a solid arrow in FIG. 10) against the biasing by the biasing mechanism 173. Consequently, the supporting portion 195 becomes inclined downward. As the yarn Y moves along the supporting portion 195 inclined downward, the yarn Y is disengaged from the second portion 162a2. The lever 171 may be arranged to automatically rotate and a timing of rotation may be controllable.

[0092] In the embodiment above, the yarn threading apparatus 60 is applied to the winding device 21 of the false-twist texturing machine 1. The yarn threading apparatus 60 may be applied not only to the winding device of the false-twist texturing machine 1 but also to a winding device of a rewinder .

Claims

1. A yarn threading apparatus (60) for threading a yarn

(Y) to a bobbin (Bw) that is mounted to be sandwiched between paired bobbin holders (41), comprising:

a yarn holding member (61) which is configured to hold the yarn (Y);
a yarn hooking portion (41a) which is formed on one of the bobbin holders (41);
a yarn threading member (62) which includes a yarn engagement portion (62a, 162a) with which the yarn (Y) held by the yarn holding member (61) is engaged and is movable between a yarn threading position where yarn threading to the yarn hooking portion (41a) is performed and a standby position;
a traverse guide (72) which is configured to reciprocally move along an axial direction of the bobbin holder (41) to traverse the yarn (Y) wound onto the bobbin (Bw) within a traversal range (r); and
a control unit (64) which is configured to control drive of the traverse guide (72),
the yarn engagement portion (62a, 162a) being engaged with the yarn (Y) that is held by the yarn holding member (61) while the yarn threading arm (62) is moving from the standby position to the yarn threading position, and when the yarn threading arm (62) is at the yarn threading position, the yarn (Y) being disengaged from the yarn engagement portion (62a, 162a) in accordance with the yarn threading to the yarn hooking portion (41a),
the yarn threading apparatus (60) further comprising a bunch guide (65) which holds the yarn (Y) threaded to the yarn hooking portion (41a) to be maintained in a bunch winding position (x) that is outside the traversal range (r) of the bobbin (Bw),
the control unit (64) causing the traverse guide (72) to move between a predetermined position which is on the side opposite to the traversal range (r) over the yarn (Y) that is held by the bunch guide (65) and the traversal range (r), and the bunch guide (65) causing the yarn (Y) held by the bunch guide (65) to be caught by the traverse guide (72) moving from the predetermined position to the traversal range (r) and to be detached from the bunch guide (65).

2. The yarn threading apparatus (60) according to claim 1, wherein,

the control unit (64) causes the traverse guide (72) to be on standby at the predetermined position before the yarn threading to the yarn hooking portion (41a), and
when bunch winding is completed, the control unit (64) moves the traverse guide (72) at the predetermined position to the traversal range (r).

3. The yarn threading apparatus (60) according to claim 1 or 2, wherein, the traverse guide (72) is driven by a motor (90).

4. The yarn threading apparatus (60) according to any one of claims 1 to 3, wherein, the bunch guide (65) has a holding portion (65a) that holds the yarn (Y) while restricting movement of the yarn (Y) into the traversal range (r) and a guide portion (65b) that guides the yarn (Y) disengaged from the yarn engagement portion (62a, 162a) to the holding portion (65a).

5. The yarn threading apparatus (60) according to claim 4, wherein, the guide portion (65b) is at least partially on the traversal range (r) side of the yarn engagement portion (62a, 162a) of the yarn threading member (62) at the yarn threading position.

6. The yarn threading apparatus (60) according to claim 4 or 5, wherein, the holding portion (65a) and the guide portion (65b) are integrally formed.

7. The yarn threading apparatus (60) according to any one of claims 4 to 6, wherein,

the guide portion (65b) is at least partially provided on a yarn path of the yarn (Y) threaded to the yarn hooking portion (41a), which is upstream of the yarn hooking portion (41a) in a yarn running direction in which the yarn (Y) runs, and
the bunch guide (65) is provided on the bobbin holder (41) side of the traverse guide (72) in the yarn running direction.

8. The yarn threading apparatus (60) according to any one of claims 1 to 7, wherein, the control unit (64) causes the traverse guide (72) to be on standby at the predetermined position before the yarn threading member (62) starts to move from the standby position to the yarn threading position.

9. The yarn threading apparatus (60) according to any one of claims 1 to 8, wherein,

the yarn engagement portion (62a, 162a) includes a supporting portion (95) that supports the yarn (Y) from below and is inclined downward, and
when the yarn threading to the yarn hooking portion (41a) is performed, the yarn (Y) moves downward along the supporting portion (95) and is disengaged.

10. A false-twist texturing machine (1) comprising:

a yarn supplying unit (2) which is configured to supply a yarn (Y);
a processing unit (3) which is configured to false-twist the yarn (Y) supplied from the yarn supplying unit; and
a winding unit (4) which is configured to wind the yarn (Y) false-twisted by the processing unit, the winding unit (4) including:

a winding device (21) which is configured to form a package (Pw) by winding the yarn (Y) onto a bobbin attached to a bobbin holder (41); and
the yarn threading apparatus (60) of any one of claims 1 to 9.

11. A yarn threading method for threading a yarn (Y) to a bobbin attached to a bobbin holder (41) by using a yarn threading apparatus (60), the yarn threading apparatus (60) including:

a yarn holding member (61) which is configured to hold the yarn (Y);
a yarn hooking portion (41a) which is formed on one of the bobbin holders (41);
a yarn threading member (62) which includes a yarn engagement portion (62a, 162a) with which the yarn (Y) held by the yarn holding member (61) is engaged and is movable between a yarn threading position where yarn threading to the yarn hooking portion (41a) is performed and a standby position;
a traverse guide (72) which is configured to reciprocally move along an axial direction of the bobbin holder (41) to traverse the yarn (Y) wound onto the bobbin within a traversal range (r); and
a bunch guide (65) which holds the yarn (Y) threaded to the yarn hooking portion (41a) to be maintained at a bunch winding position (x) that is outside the traversal range (r) of the bobbin (Bw),
the yarn threading method comprising:

a yarn engagement step of causing the yarn (Y) held by the yarn holding member (61) to be engaged with the yarn engagement portion (62a, 162a) of the yarn threading member (62) while the yarn threading member (62) is being moved from the standby position to the yarn threading position;
a yarn holding step of causing the bunch guide (65) to hold the yarn (Y), which is disengaged from the yarn engagement portion (62a, 162a) in accordance with the yarn threading of the yarn (Y) to the yarn hooking portion (41a) at the yarn threading position, to be maintained at the bunch winding position;
a guide standby step of causing the traverse guide (72) to be on standby at a predetermined position which is on the side opposite to the traversal range (r) over the yarn (Y) that is held by the bunch guide (65); and
a traversal step of moving the traverse guide (72) at the predetermined position to the traversal range (r),
in the traversal step, the yarn (Y) held by the bunch guide (65) being caught by the traverse guide (72) moving from the predetermined position to the traversal range (r) and being detached from the bunch guide (65).

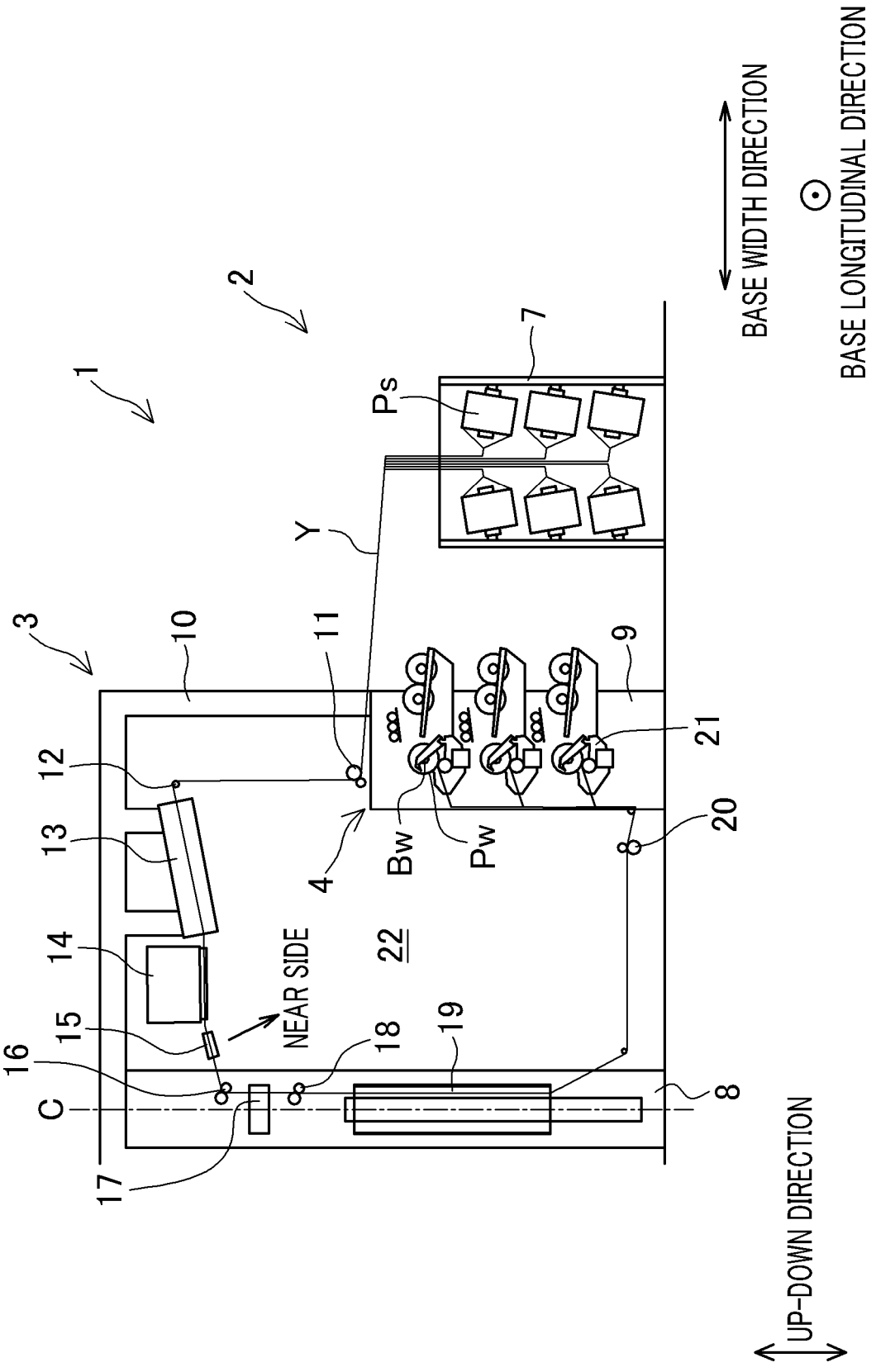

BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
NEAR SIDE
1
2
3
4
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Ps
Y
Bw
Pw
C

FIG.1

FIG.2

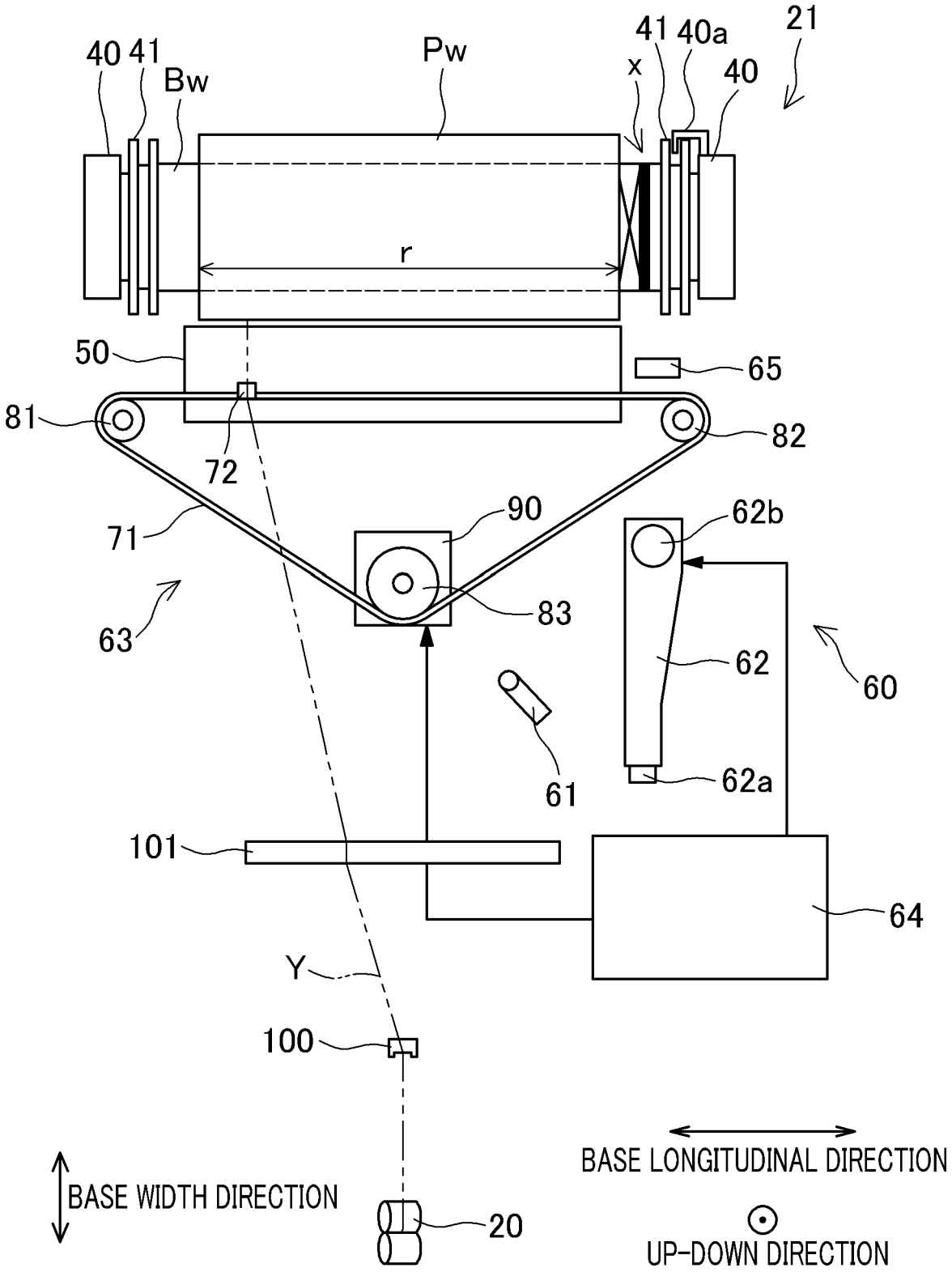

40
41
Bw
Pw
41
40a
x
40
21
r
50
65
81
82
72
71
90
62b
83
63
62
60
61
62a
101
64
Y
100
20
BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION

FIG.3

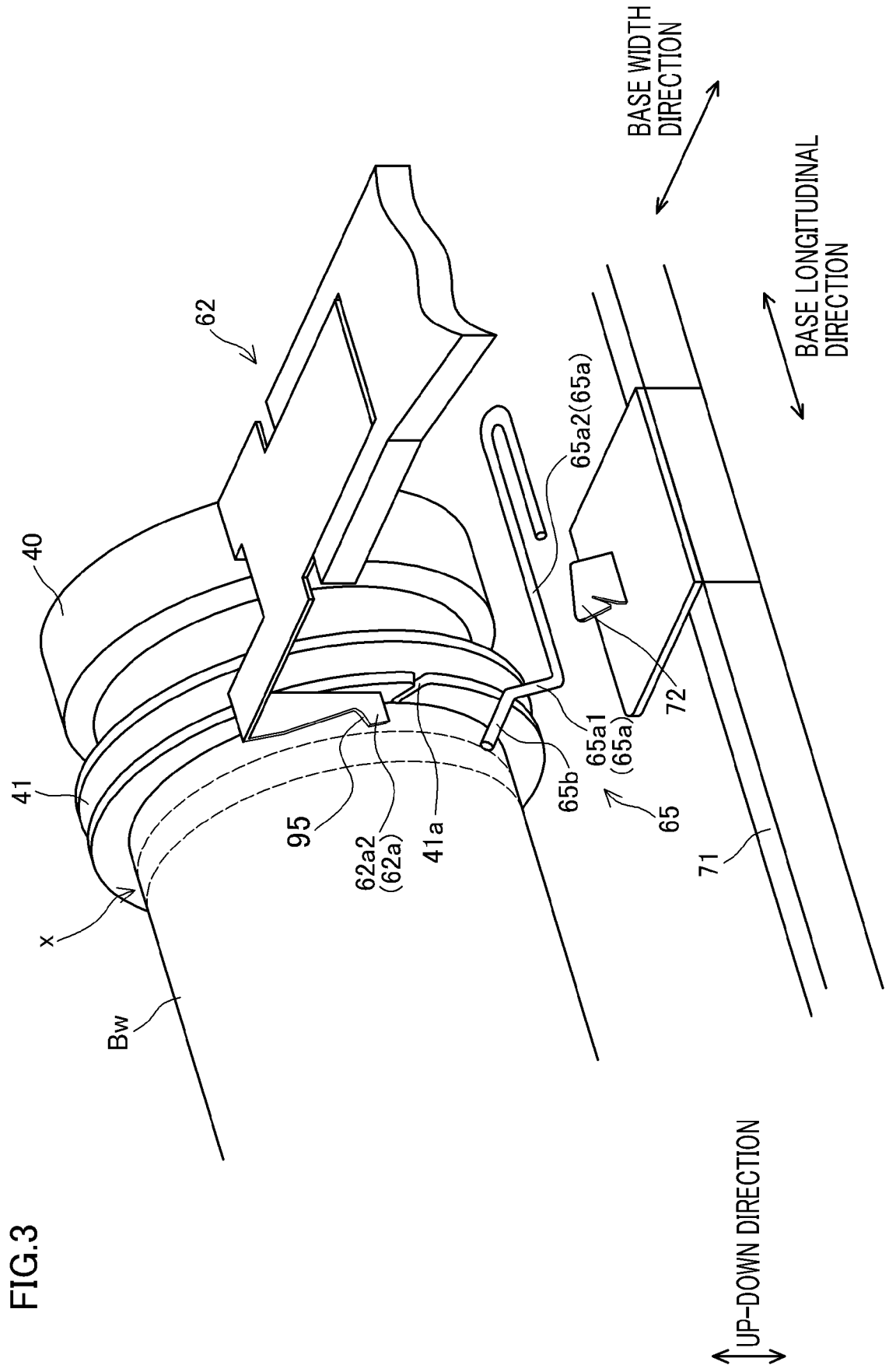

BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
62
40
41
x
Bw
95
62a2 (62a)
41a
65b
65a1 (65a)
65a2(65a)
72
65
71

FIG.4

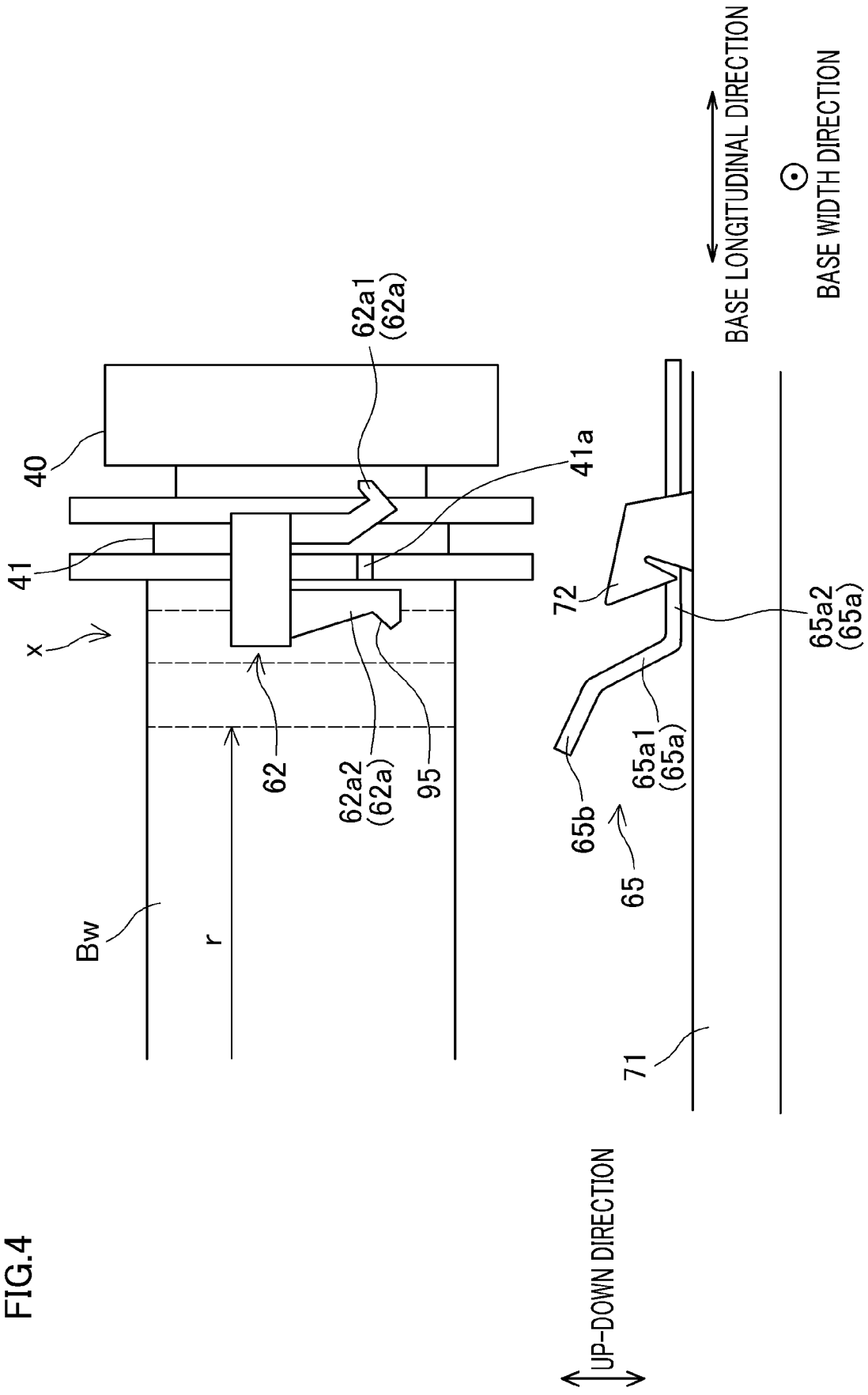

BASE LONGITUDINAL DIRECTION
BASE WIDTH DIRECTION
UP-DOWN DIRECTION
40
41
41a
62a1
(62a)
x
62
62a2
(62a)
95
Bw
r
72
65a2
(65a)
65a1
(65a)
65b
65
71

FIG.5

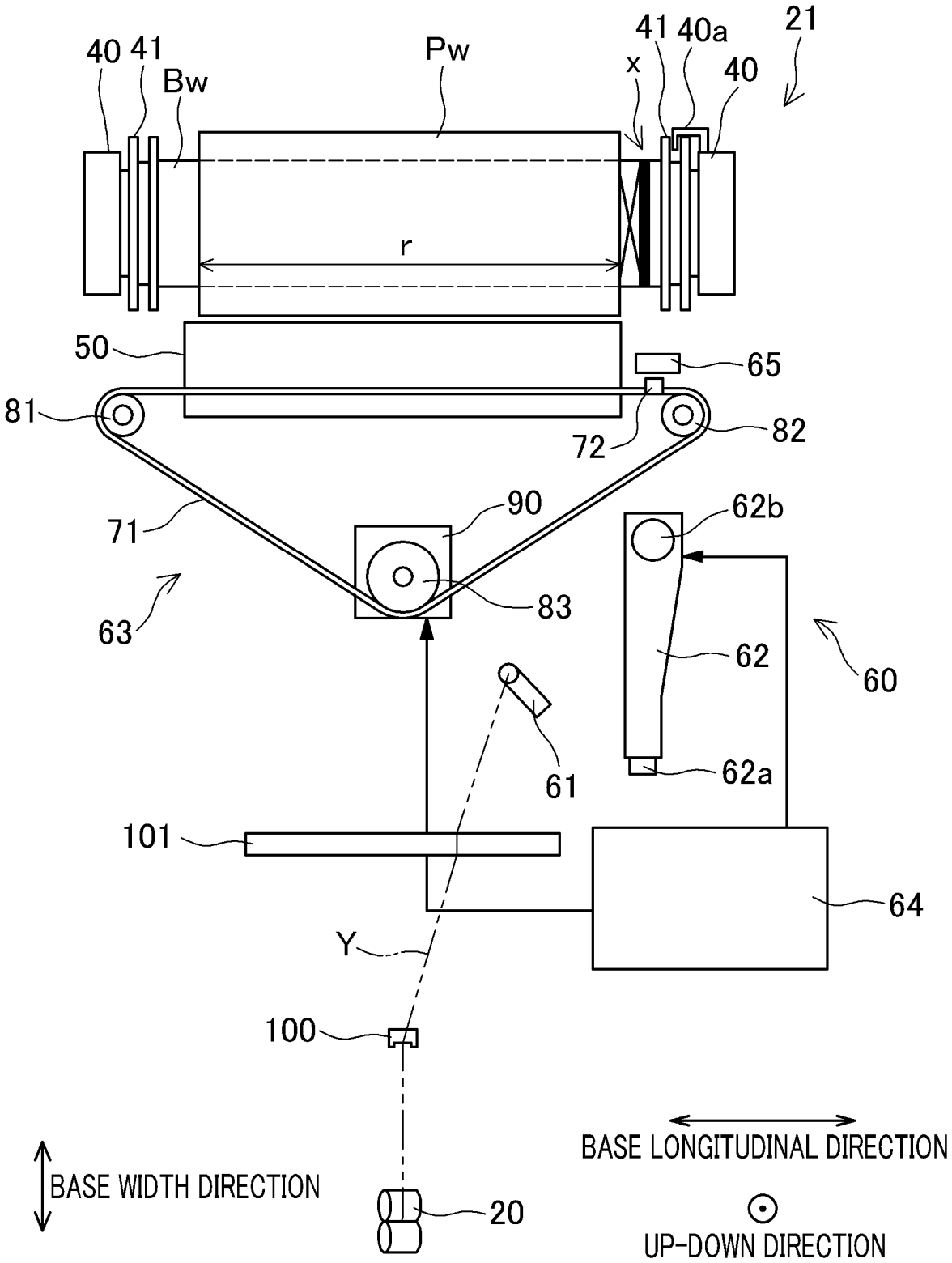

40
41
Bw
Pw
41
40a
x
40
21
r
50
65
81
72
82
71
90
62b
63
83
62
60
61
62a
101
64
Y
100
BASE WIDTH DIRECTION
20
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION

FIG.6

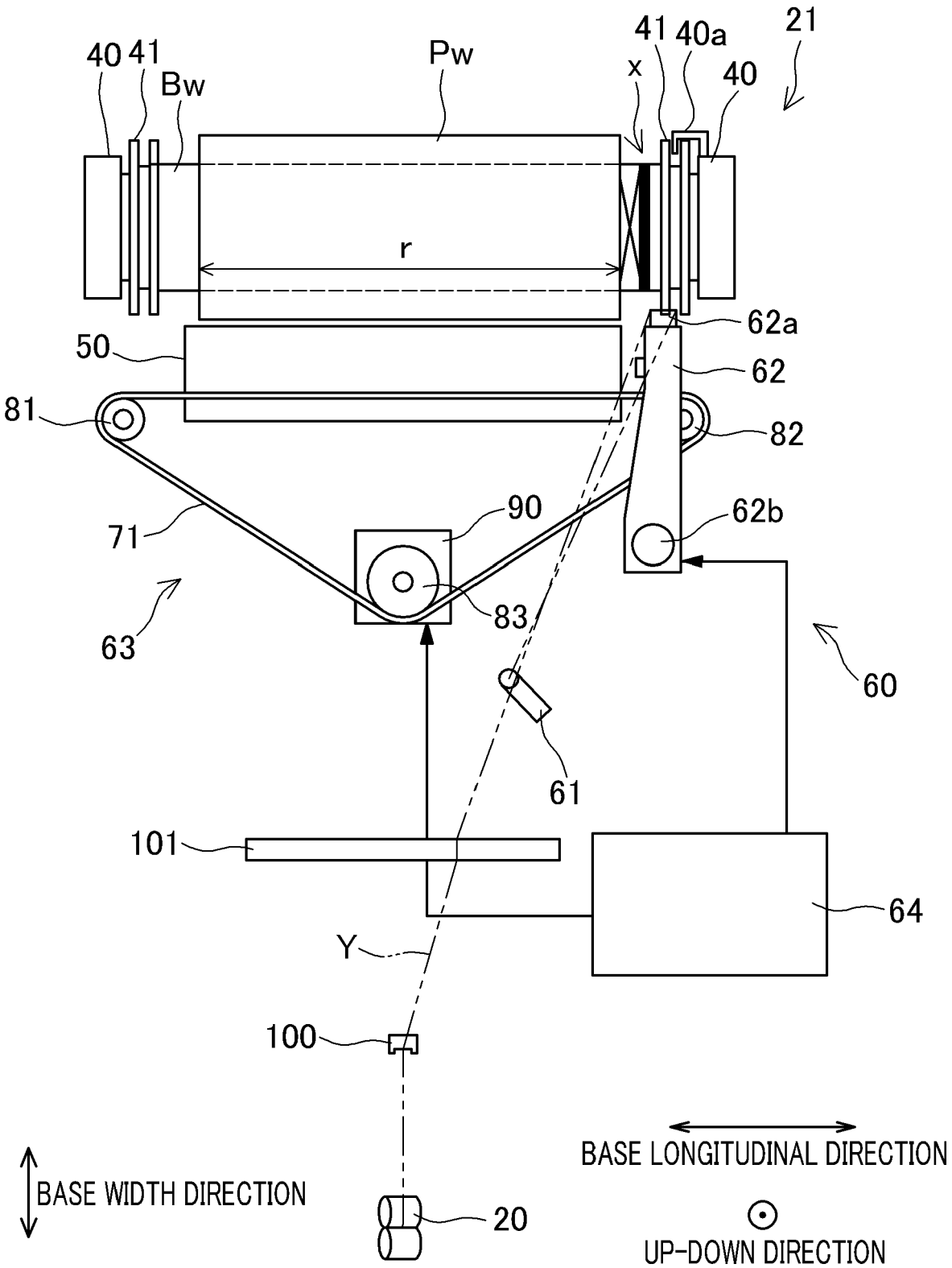

40
41
Bw
Pw
x
41
40a
40
21
r
62a
50
62
81
82
90
62b
71
83
63
60
61
101
64
Y
100
BASE WIDTH DIRECTION
20
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION

FIG.7

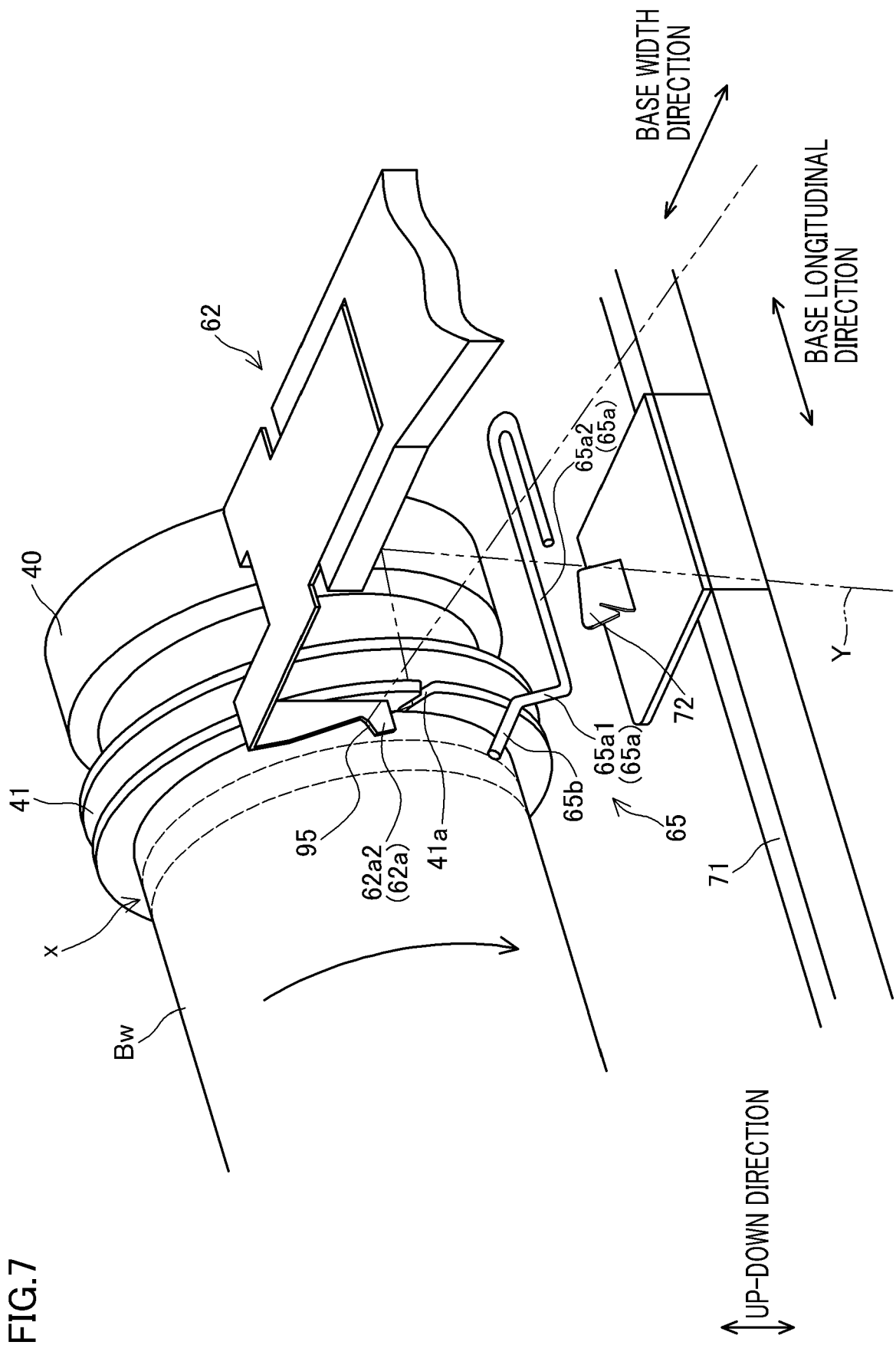

BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
62
40
41
x
Bw
95
62a2 (62a)
41a
65b
65a1 (65a)
65a2 (65a)
65
72
71
Y

FIG.8

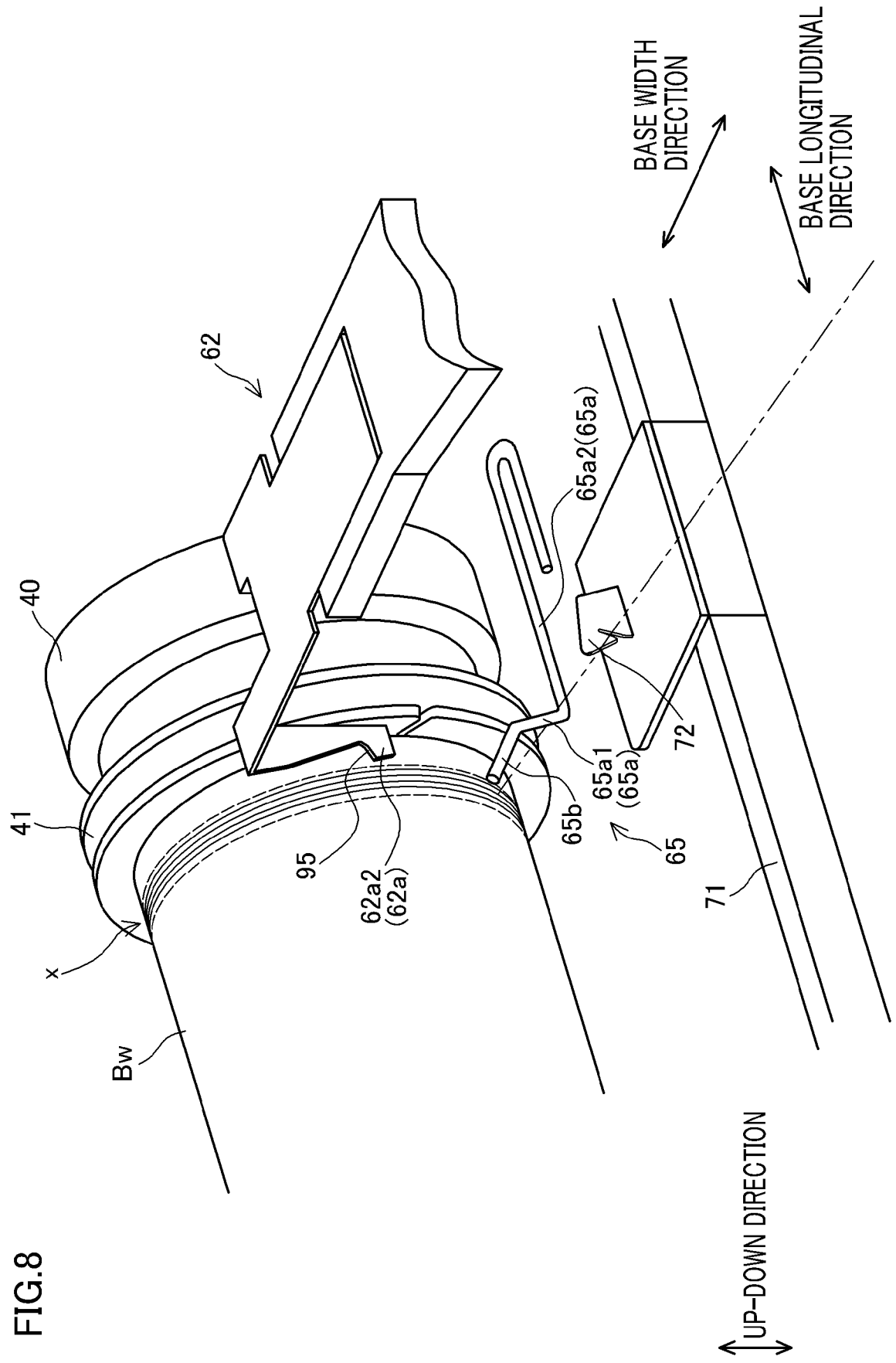

BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
62
40
41
x
Bw
95
62a2 (62a)
65b
65a1 (65a)
65a2(65a)
72
65
71

FIG.9

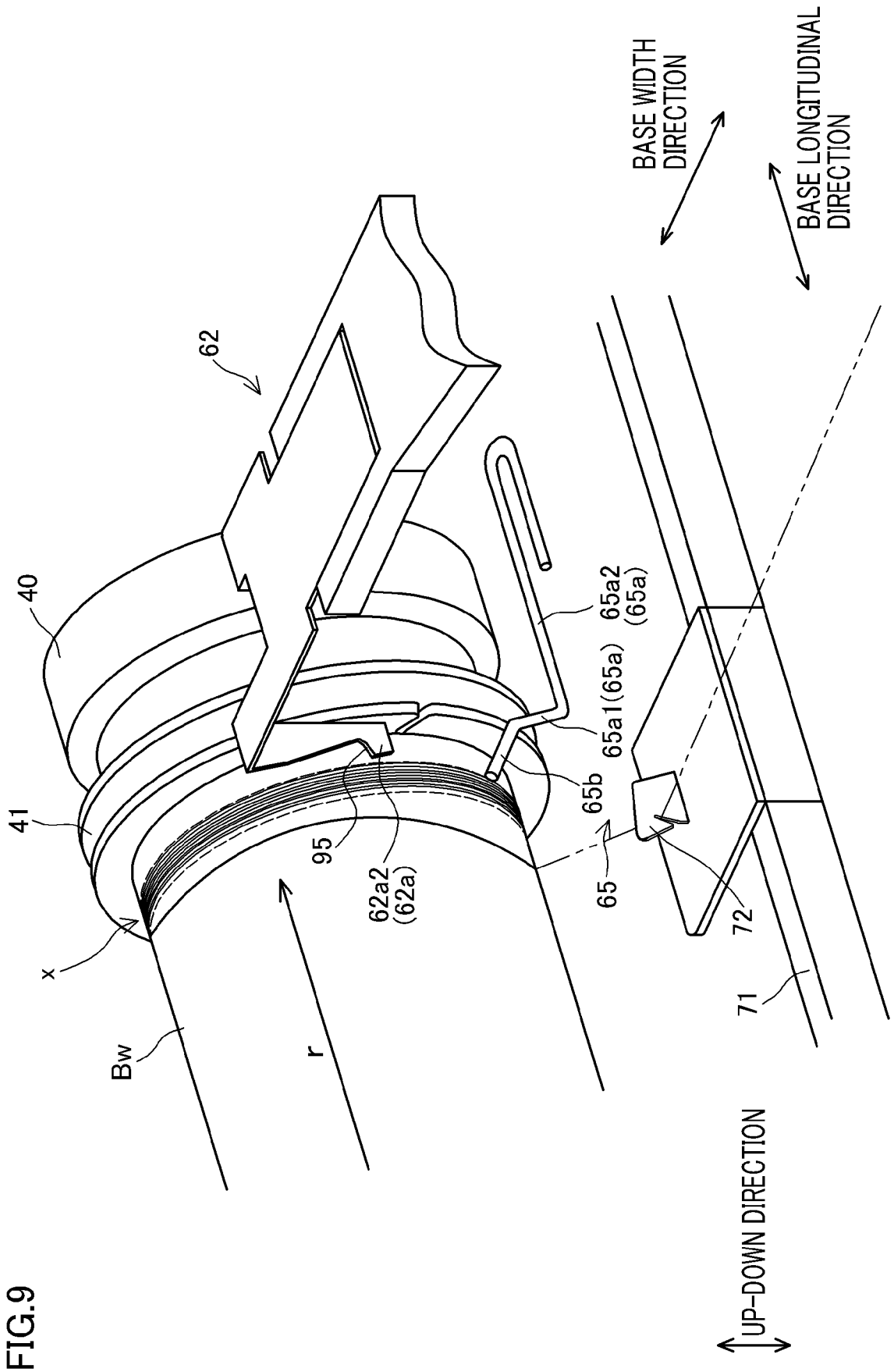
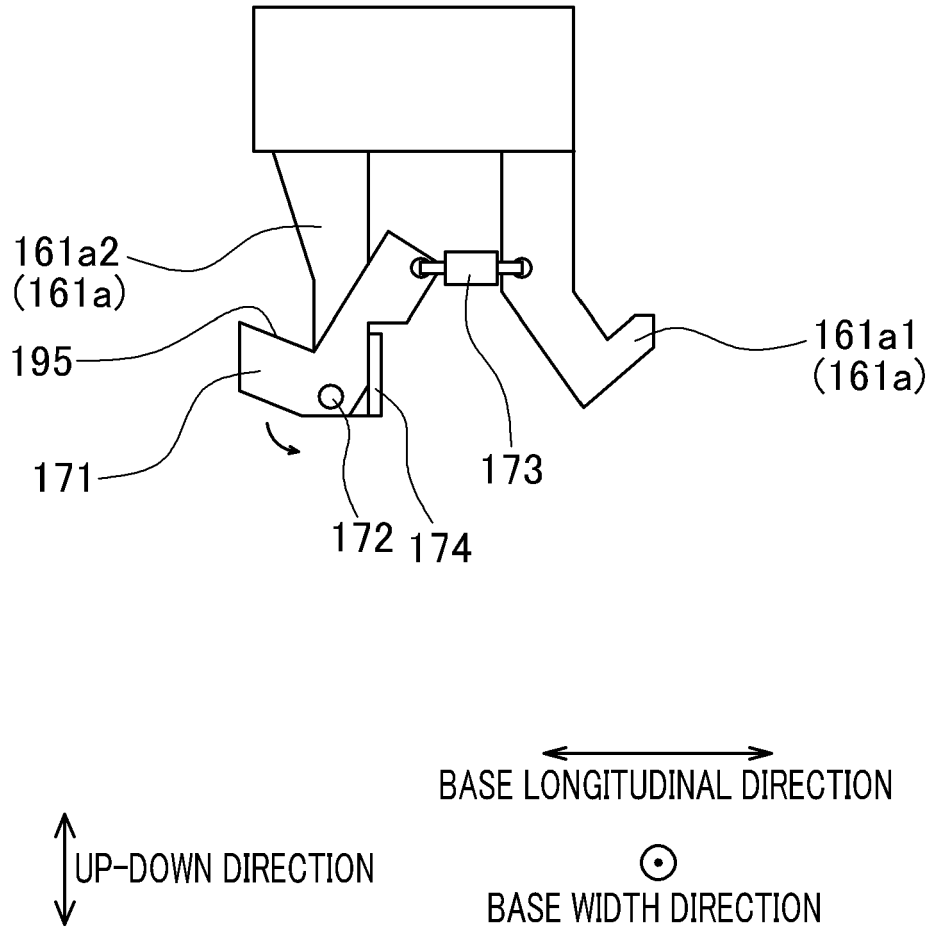

62
40
41
x
Bw
r
95
62a2
(62a)
65b
65a1(65a)
65a2
(65a)
65
72
71
BASE WIDTH
DIRECTION
BASE LONGITUDINAL
DIRECTION
UP-DOWN DIRECTION

FIG.10


161a2
(161a)
195
171
172
174
173
161a1
(161a)
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
BASE WIDTH DIRECTION

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 5512

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	JP H10 194596 A (MURATA MACHINERY LTD) 28 July 1998 (1998-07-28) * abstract; figures 4-9 *	1-11	INV. B65H54/34 B65H65/00
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TECHNICAL FIELDS SEARCHED (IPC)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 July 2023	Pussemier, Bart

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28-07-2023

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