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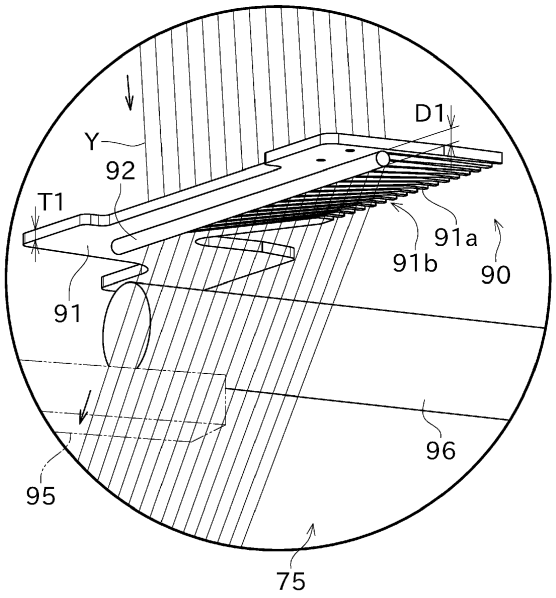
(54) YARN THREADING TOOL AND WINDING DEVICE

(57) [Problem to be solved] To provide a yarn threading tool with a simple configuration that can reduce maintenance costs.

[Solution] A yarn threading tool 90 is used for respectively threading a plurality of pieces yarn Y to a plurality of fulcrum guides. The yarn threading tool 90 includes a body part 91 and a bar guide part 92. The body part 91 is formed in a shape of a plate with a plurality of yarn dividing grooves 91b lined up for inserting the yarn Y. The bar guide part 92 is located on at least one side of the body part 91 in a thickness direction and is arranged spanning the plurality of yarn dividing grooves 91b. The bar guide part 92 is a different member from the body part 91. When viewed in the thickness direction of the body part 91, the bar guide part 92 is disposed partially overlapping the yarn dividing grooves 91b.

FIG. 7



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Description

TECHNICAL FIELD

[0001] The present invention relates to a yarn threading tool used with a spinning machine for yarn threading operation.

BACKGROUND ART

[0002] A conventional spinning machine that supplies a plurality of pieces of yarn made of synthetic fibers from a spinning device and winds them onto bobbins respectively is known. In this spinning machine, as a preparation before winding the pieces of yarn onto the bobbins, it is necessary to thread these pieces of yarn fed from the spinning device onto a plurality of yarn guides respectively. PTL 1 and PTL 2 disclose this type of yarn winder.

[0003] In the yarn threading operation on the yarn winder of PTL 1 and PTL 2, an operator inserts the yarn threading member against the plurality of pieces of yarn to hold these pieces of yarn in a separated state. The operator guides the yarn by moving the yarn threading member.

PRIOR-ART DOCUMENTS

PATENT DOCUMENTS

[0004]

PTL 1: Japanese Unexamined Patent Publication No. 2017-114573
PTL 2: Japanese Unexamined Patent Publication No. 2015-164875

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] In the yarn winder of PTL 1 and PTL 2 above, when the pieces of yarn are hung on the yarn threading member, wear is significant at the teeth roots of its comb-shaped portion, which increases maintenance costs. For example, it is possible to install guides, each in a shape matching a shape each of the teeth roots has, at these teeth roots of the yarn threading member, but this structure is complicated and the cost may increase.

[0006] The present invention is made in view of the circumstances described above, and an object of the present invention is to provide a yarn threading tool with a simple configuration that reduces maintenance costs.

MEANS FOR SOLVING THE PROBLEMS AND EFFECTS THEREOF

[0007] The problem to be solved by the present invention is as described above, and next, means for solving the problem and effects thereof will be described.

[0008] According to the first aspect of the present invention, a yarn threading tool with the following configuration is provided. That is, this yarn threading tool is used for respectively threading a plurality of yarn to a plurality of yarn guides. The yarn threading tool includes a body and a guide. The body is formed in a shape of a plate with a plurality of grooves lined up for inserting the yarn. The guide is located on at least one side of the body in a thickness direction and is arranged spanning the plurality of grooves. The guide is a different member from the body. A hardness of the guide is greater than a hardness of the body. When viewed in the thickness direction of the body, the guide is disposed partially overlapping the grooves or in contact with back portions of the grooves.

[0009] This makes, in the yarn threading tool, the portion in contact with the yarn less likely to be worn with a simple configuration. As a result, the frequency and cost of maintenance work can be reduced. In addition, the contact length of the yarn with the hard guide can be easily increased. Thus, the guides are less likely to be worn.

[0010] In the yarn threading tool described above, it is preferable that the guide is detachably attached to the body.

[0011] This allows for easy replacement of the guide if the guide is worn.

[0012] It is preferable that the yarn threading tool described above is configured as follows. That is, the guide is formed in an elongated shape. Both ends of the guide in a longitudinal direction of the guide are fixed to the body.

[0013] This allows the guide to be fixed to the body in a simple configuration, with the outer circumference of the guide being able to contact with the yarn.

[0014] In the yarn threading tool described above, it is preferable that the guide is located in contact with the body.

[0015] This prevents rattling and the like of the guide.

[0016] In the yarn threading tool described above, it is preferable that the guide has a curved surface.

[0017] This allows the yarn to be bent smoothly by bringing the yarn into contact with the curved surface of the guide.

[0018] It is preferable that the yarn threading tool described above is configured as follows. That is, the guide is formed in an elongated shape. A cross section of the guide perpendicular to a longitudinal direction of the guide is circular.

[0019] This allows the yarn to be bent smoothly at the contact portion with the guide.

[0020] In the yarn threading tool described above, it is preferable that a diameter of the cross section of the guide is greater than a thickness of the body.

[0021] This allows for a longer contact length between the yarn and the guide.

[0022] In the yarn threading tool described above, it is

preferable that the guide is made of ceramic.

[0023] This can improve the wear resistance of the guide.

[0024] In the yarn threading tool described above, it is preferable that, in the plurality of grooves, a distance between two adjacent grooves is larger at a back portion side opposite to an opening side where the yarn is inserted than at the opening side.

[0025] This allows the distance between the pieces of yarn led to the back portions to be greater, which facilitates the operation of threading the pieces of yarn one by one to the yarn guides.

[0026] According to the second aspect of the present invention, a winding device with the following configuration is provided. That is, the winding device winds a plurality of pieces of yarn continuously spun from a spinning device. The winding device includes a plurality of yarn guides and a yarn threading device. The yarn guides guide the plurality of pieces of yarn. The yarn threading device threads the plurality of pieces of yarn continuously spun from the spinning device to the plurality of yarn guides using a yarn threading tool. The yarn threading tool includes a plate-shaped body and a guide. The plate-shaped body is formed with a plurality of grooves lined up for inserting the yarn. The guide is located on at least one side of the body in a thickness direction of the body and is arranged spanning the plurality of grooves. The guide is a different member from the body. A hardness of the guide is greater than a hardness of the body. At least at one point in a process of the yarn threading device moving the yarn threading tool, the yarn bends at a portion of the yarn corresponding to the guide.

[0027] This makes, in the yarn threading tool provided by the yarn threading device, the portion in contact with the yarn less likely to be worn with a simple configuration. As a result, the frequency and cost of maintenance work can be reduced.

[0028] In the winding device described above, it is preferable that, when viewed in the thickness direction of the body, the guide is disposed partially overlapping the grooves or in contact with back portions of the groove.

[0029] This can easily increase the contact length of the yarn with the guide. Thus, the guides are less likely to be worn.

[0030] In the winding device described above, it is preferable that, at least at one point in the process of the yarn threading device moving the yarn threading tool, a contact length of the yarn with the guide is longer than a contact length of the yarn in the groove with the groove.

[0031] This prevents excessive bending of the yarn at the groove. Thus, wear of the yarn threading tool, the occurrence of yarn breakage, and the like can be prevented.

[0032] In the winding device described above, it is preferable that the guide is detachably attached to the body.

[0033] This allows for easy replacement of the guide of the yarn threading device if the guide is worn.

[0034] It is preferable that the winding device described above is configured as follows. That is, the guide is formed in an elongated shape. Both ends of the guide in a longitudinal direction of the guide are fixed to the body.

[0035] This allows the guide to be fixed to the body in a simple configuration, with the outer circumference of the guide being able to contact with the yarn.

[0036] In the winding device described above, it is preferable that the guide is located in contact with the body.

[0037] This prevents rattling and the like of the guides.

[0038] In the winding device described above, it is preferable that the guide has a curved surface.

[0039] This allows the yarn to be bent smoothly by bringing the yarn into contact with the curved surface of the guide.

[0040] It is preferable that the winding device described above is configured as follows. That is, the guide is formed in an elongated shape. A cross section of the guide perpendicular to a longitudinal direction of the guide is circular.

[0041] This allows the yarn to be bent smoothly at the contact portion with the guide.

[0042] In the winding device described above, it is preferable that a diameter of the cross section of the guide is greater than a thickness of the body.

[0043] This allows for a longer contact length between the yarn and the guide.

[0044] In the winding device described above, it is preferable that the guide is made of ceramic.

[0045] This can improve the wear resistance of the guide.

[0046] In the winding device described above, it is preferable that, in the plurality of grooves, a distance between two adjacent grooves is larger at a back portion side opposite to an opening side where the yarn is inserted than at the opening side.

[0047] This allows the distance between the pieces of yarn led to the back portions to be greater, which facilitates the operation of threading the pieces of yarn one by one to the yarn guides by the yarn threading device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0048]

FIG. 1 is a diagonal view of a schematic configuration of a spinning and winding system according to one embodiment of this present invention.

FIG. 2 is a schematic diagram showing the configuration of a spinning and winding unit.

FIG. 3 is a diagonal view showing the configuration of a yarn threading tool.

FIG. 4(a) is a plan view showing the configuration of the yarn threading tool.

FIG. 4(b) is a bottom view showing the configuration of the yarn threading tool.

FIG. 5 is a partial diagonal view showing the operation of inserting the yarn into the yarn threading tool.

FIG. 6 is a partial diagonal view showing the state in

which the yarn is hung on the yarn threading tool.

FIG. 7 is an enlarged diagonal view from a different angle than FIG. 6, showing the state in which the yarn is hung on the yarn threading tool.

FIG. 8 is a cross sectional view showing a case in which the yarn contacts both the body part and the bar guide part.

FIG. 9 is a cross sectional view showing a case in which the yarn contacts only the bar guide.

FIG. 10 is a cross sectional view showing a modification regarding the attachment position of the bar guide.

EMBODIMENT FOR CARRYING OUT THE INVENTION

[0049] Next, embodiments of the present invention will be described with reference to the drawings. FIG. 1 is a diagonal view of a spinning and winding system 100 in accordance with one embodiment of this embodiment. FIG. 2 is a schematic diagram showing the configuration of the spinning and winding unit 1. FIG. 3 is a diagonal view showing the configuration of a yarn threading tool 90. FIG. 4(a) is a plan view showing the configuration of the yarn threading tool 90. FIG. 4(b) is a bottom view showing the configuration of the yarn threading tool 90.

[0050] A spinning and winding system 100 shown in FIG. 1 is a system for generating synthetic fiber yarn Y and winding it to form a package P. In the spinning and winding system 100, the yarn Y of synthetic fibers is produced by extruding molten synthetic fiber material. The spinning and winding system 100 is installed in a building having multiple levels in the plant.

[0051] The spinning and winding system 100 has a plurality of spinning and winding units 1, as shown in FIG. 1. The plurality of spinning and winding units 1 are lined up in a left-right direction. Each spinning and winding unit 1 produces yarn Y of synthetic fiber and a package P.

[0052] Hereinafter, "upstream" and "downstream" mean upstream and downstream in a direction in which the generated yarn Y runs during winding of it. The left-right direction means a direction in which the plurality of spinning and winding units 1 are lined up. The direction perpendicular to both the left-right direction and the up-down direction is referred to as "front-back direction".

[0053] Each of the spinning and winding units 1 includes a spinning device 3, and a spinning take-up device 4. The spinning take-up device 4 is located downstream of the spinning device 3. The spinning take-up device 4 mainly includes a take-up part 6, and a winding device 7. The take-up part 6 performs a process of sending the yarn Y from the spinning device 3 to the winding device 7 along an appropriate path. The winding device 7 performs a process of winding the yarn Y to form the package P. The take-up part 6 and the winding device 7 are a type of yarn processing device.

[0054] The spinning take-up device 4 is equipped with various yarn processing devices in addition to the take-up part 6 and the winding device 7. These yarn processing devices include, for example, lubricant guides 11 and a yarn holding device 14. Details of the lubricant guide 11 and the yarn holding device 14 will be described later.

[0055] A building in which the spinning and winding system 100 is installed is separated into an upper level and a lower level by a partition floor 9. The spinning device 3 is installed on the upper level. The take-up part 6 and the winding device 7, which are part of the spinning take-up device 4, are installed on the lower level.

[0056] Yarn passage holes 9a are formed at the partition floor 9. Each of the yarn passage holes 9a is provided for each spinning and winding unit 1. A plurality of pieces of yarn Y spun by the spinning device 3 can pass through the yarn passage hole 9a. The yarn passage holes 9a constitute a passage for sending the plurality of pieces of yarn Y to the lower level.

[0057] An inter-floor tube 8 formed in a duct-like shape is fixed to the partition floor 9 to connect to the yarn passage hole 9a. The inter-floor tube 8 prevents yarn sway caused by wind or other external factors in the process of multiple pieces of yarn Y running from the upper level to the lower level.

[0058] The spinning device 3 includes a plurality (for example, 16) of spinning ports, not shown. Molten polymer in a hot state is supplied to the spinning ports by a polymer supply device (not shown) including a gear pump or the like. The spinning device 3 extrudes the molten polymer from each of the spinning ports. As a result, the yarn Y is spun from the respective spinning port of the spinning device 3. The number of spinning ports (in other words, the number of pieces of yarn Y spun in the spinning device 3) is not limited to 16, but may be 12, for example. FIGS. 1 and 2 show the spinning and winding unit 1 when the number of pieces of yarn Y is 12, for the sake of brevity of the drawings.

[0059] In the upper level of the spinning and winding system 100, a cooling device 10 and the lubricant guides 11 are installed.

[0060] The cooling device 10 is located immediately below the spinning device 3. The cooling device 10 includes a plurality of cooling cylinders, not shown. Cooling air is supplied to each of the cooling cylinders through cooling air pipes that are not shown. Yarn Y passing through the cooling cylinders is cooled by the cooling air and solidified.

[0061] The lubricant guides 11 is located below the cooling device 10. The lubricant guides 11 are installed in the same number as the number of pieces of yarn Y spun in the spinning device 3. Each of the plurality of lubricant guides 11 applies lubricant to each of the pieces of yarn Y passing through. The plurality of pieces of yarn Y to which the lubricant is applied pass through the yarn passage hole 9a formed in the partition floor 9 to the lower level.

[0062] A operator performs a yarn lowering work that the plurality of pieces of yarn Y are lowered from the upper level to the lower level where the winding device

7 and the like are installed. The yarn threading operation refers to a process of threading the yarn Y from the spinning device 3 to the bobbin B of the winding device 7 after setting the yarn Y from the spinning device 3 to the take-up part 6 along a predetermined path. This yarn threading operation makes the winding device 7 ready to wind the yarn Y to form the package P.

[0063] In the lower level, the yarn holding device 14 is provided near a downstream opening of the inter-floor tube 8. The yarn holding device 14 includes a yarn suction device 14a and a cutter (not shown). When some abnormality occurs in yarn Y or each device in part of the spinning take-up device 4 (for example, the take-up part 6 or the winding device 7) or the like in a downstream side, the yarn holding device 14 cuts the plurality of pieces of yarn Y running downstream from the spinning device 3 by the cutter. Furthermore, the yarn holding device 14 temporarily holds an upstream side (the spinning device 3 side) of the plurality of pieces of yarn Y which are cut, by sucking them with the yarn suction device 14a. Thus, the plurality of pieces of yarn Y spun by the spinning device 3 are sucked into the yarn suction device 14a of the yarn holding device 14 and are held without running to the take-up part 6 and the winding device 7. The yarn holding device 14 continues to hold the yarn until the abnormality is resolved.

[0064] As shown in FIG. 2, a yarn regulation guide 12 is installed downstream from the yarn holding device 14 and upstream of the take-up part 6. The yarn regulation guide 12 can be, for example, a comb-shaped member at which 16 guide grooves according to the number of pieces of yarn Y are formed. The yarn regulation guide 12 is located on the lower level and near the take-up part 6. The yarn regulation guide 12 is movable in a direction parallel to the direction in which the plurality of spinning and winding units 1 are lined up. The yarn regulation guide 12 is driven by a guide actuator (not shown) including, for example, a cylinder.

[0065] The take-up part 6 is used to take up the plurality of pieces of yarn Y which are lowered from the upper level. The take-up part 6 includes a take-up frame 60 and two godet rollers 61, 62. Hereinafter, the godet roller located upstream in the direction in which the yarn Y runs is referred to as upstream godet roller 61, and the godet roller located downstream is referred to as downstream godet roller 62.

[0066] During winding of the yarn Y, the yarn regulation guide 12 is substantially positioned directly above the upstream godet roller 61. In the following description, this position is referred to as "operating position".

[0067] During the yarn threading operation, the yarn regulation guide 12 is positioned in a position that is displaced in the left-right direction from a position directly above the upstream godet roller 61. This makes the yarn threading operation easy. In the following description, the position of the yarn regulation guide 12 during the yarn threading operation will be referred to as "preparing position".

[0068] The upstream godet roller 61 is positioned on the take-up frame 60 so that it is located almost directly below the operating position of the yarn regulation guide 12. On the other hand, the downstream godet roller 62 can move, as shown by a chain line arrow in FIG. 2, between a yarn threading position close to the upstream godet roller 61 and a package forming position directly above the winding device 7.

[0069] During the yarn threading operation, the downstream godet roller 62 is lowered to the yarn threading position near the upstream godet roller 61. When the yarn threading operation is completed, the downstream godet roller 62 rises to the package forming position.

[0070] The winding device 7 winds the plurality of pieces of yarn Y running from the take-up part 6 to form the packages P. The winding device 7 mainly includes a turret 71, two bobbin holders 72, a traverse device 73, a contact roller 74, a yarn threading device 75, and fulcrum guides (yarn guides) 76.

[0071] The turret 71 is installed so that it can rotate. Each of the two bobbin holders 72 is rotatably supported by the turret 71. Each bobbin holder 72 is elongated in the front-back direction. The two bobbin holders 72 are positioned on opposite sides of each other across an axis of rotation of the turret 71. As the turret 71 rotates, the positions of the two bobbin holders 72 are swapped.

[0072] Specifically, one of the two bobbin holders 72 is at the winding position on the upper side and the other is at the lower standby position on the lower side, respectively. The bobbin holder 72 at the winding position is close proximity to the contact roller 74, while the bobbin holder 72 at the standby position is away from the contact roller 74. A plurality of bobbins B are mounted on each of the bobbin holders 72. The plurality of bobbins B are lined up in the longitudinal direction of the bobbin holder 72.

[0073] The traverse device 73 includes a plurality of traverse guides 73a corresponding to the plurality of bobbins B. Each traverse guide 73a is arranged to correspond to each bobbin B. As each of the traverse guides 73a reciprocate in a direction parallel to the longitudinal direction of the bobbin holder 72, the pieces of yarn Y are wound onto the bobbins B while being traversed.

[0074] The contact roller 74 contacts the outer circumferences of the plurality of packages P formed on the respective bobbins B and applies a contact pressure to each of the plurality of packages P.

[0075] The yarn threading device 75 is equipped with a yarn threading tool 90 used during the yarn threading operation. In the yarn threading operation, the plurality of pieces of yarn Y are separated by the yarn threading tool 90. This makes it easier to thread each piece of yarn Y at a predetermined location, thereby improving workability.

[0076] A plurality of fulcrum guides 76 are located upstream of the traverse device 73, corresponding to the plurality of traverse guides 73a. The fulcrum guide 76 is positioned at a location corresponding to the center of

the traverse stroke of the traverse guide 73a.

[0077] The plurality of fulcrum guides 76 can be moved appropriately in the front-back direction by a drive device not shown. As a result, the winding device 7 can be switched as needed between a state of FIG. 2, where the distance between adjacent fulcrum guides 76 is of normal length, and a state of FIGS. 5 and 6, where the distance is shorter length than normal.

[0078] The yarn threading device 75 includes a guide rail 95, a yarn threading arm 96, and the yarn threading tool 90.

[0079] The guide rail 95 is a straightly elongated member. The guide rail 95 is connected to a tip of the yarn threading arm 96, which will be described later. This allows the tip of the yarn threading arm 96 to move along the longitudinal direction of the guide rail 95.

[0080] The guide rail 95 is located generally along the front-back direction. The guide rail 95 can rotate within a predetermined angular range around a vertical axis of rotation located near its rear end portion. The guide rail 95 is connected to a first drive device which is not shown. The configuration of this first drive device is arbitrary, but can include, for example, a fluid cylinder, motor, or the like. By driving the first drive device, the posture of the guide rail 95 can be changed.

[0081] The yarn threading arm 96 is an elongated member. The yarn threading arm 96 is located generally along the front-back direction. A second drive device, not shown, is connected to a base end of the yarn threading arm 96. The configuration of this second drive device is arbitrary, but can include, for example, a fluid cylinder, a motor, or the like. By driving the second drive device, the base end of the yarn threading arm 96 can be pushed or pulled in a direction near the front-back direction. As a result, the tip of the yarn threading arm 96 can be moved along the guide rail 95.

[0082] The yarn threading tool 90 is secured to the tip of the yarn threading arm 96. As shown in FIG. 3, the yarn threading tool 90 mainly includes a body part (body) 91 in a comb shape and a bar guide part (guide) 92.

[0083] The body part 91 is formed from an elongated plate-shaped member. The body part 91 can be made of metal, for example. A plurality of comb teeth 91a are formed in the body part 91 so that these are lined up in a longitudinal direction of the body part 91. A yarn dividing groove (groove) 91b is formed between two comb teeth 91a adjacent to each other. That is, a plurality of yarn dividing grooves 91b are formed in the body part 91 so that these are lined up in the longitudinal direction of the body part 91. Hereinafter, the direction perpendicular to both the longitudinal direction and the thickness direction of the body part 91 may be referred to as width direction of the body part 91.

[0084] In the body part 91 of this embodiment, for example, sixteen yarn dividing grooves 91b are formed in accordance with the number of pieces of yarn Y. One piece of yarn Y is taken in for each yarn dividing groove 91b, thereby separating the 16 pieces of yarn Y.

[0085] As shown in FIGS. 3 and 4, each of the yarn dividing grooves 91b forms an opening in one edge of the body part 91 in the width direction. The yarn Y is taken in via this opening. In the following description, the side of the body part 91 in the width direction where the opening of the yarn dividing groove 91b is formed may be referred to as "opening side" of the body part 91, and the opposite side (where the root portions of the comb teeth 91a is located) may be referred to as "root side" of the body part 91.

[0086] In the yarn dividing groove 91b, back portions that are ends located on the root side are located so that these are lined up in a straight line along the longitudinal direction of the body part 91, as shown in FIG. 4(a). The width of the yarn dividing groove 91b at the opening side of the body part 91 (a dimension of the gap in the longitudinal direction of the body part 91) is larger than the width of the yarn dividing groove 91b at the root side. This allows the yarn Y to be easily inserted into the yarn dividing groove 91b.

[0087] With the exception of the yarn dividing groove 91b located at the most apical end of the body part 91 in the longitudinal direction of the body part 91, inclined portions are disposed at the intermediate parts of the yarn dividing grooves 91b in the longitudinal direction of each of the yarn dividing grooves 91b, so that the yarn dividing groove 91b is formed in a polyline shape. As a result, as shown in FIG. 4, etc., the distance between two adjacent yarn dividing grooves 91b is larger at the root side than at the opening side of the body part 91. This allows the plurality of yarn Y in the plurality of yarn dividing grooves 91b to be held in a widened distance between them.

[0088] The bar guide part 92 is an elongated bar-shaped member. The cross section of the bar guide part 92 cut in a plane perpendicular to the longitudinal direction of the bar guide part 92 (in other words, perpendicular to the longitudinal direction of the body part 91) is circular. The bar guide part 92 is made, for example, of a wear-resistant ceramic.

[0089] In this embodiment, the bar guide part 92 is formed so that the diameter D1 of the circle as its cross section is larger than the thickness T1 of the body part 91 ($D1 > T1$). This allows for a more gradual bending of the yarn Y when it is hung on the yarn threading tool 90.

[0090] The bar guide part 92 is attached to one side of the body part 91 in the thickness direction, as shown in FIG. 4. The bar guide part 92 is located in contact with the body part 91 without any gap between the bar guide part 92 and the body part 91. The bar guide part 92 is detachably fixed to the body part 91, for example, at both ends in the longitudinal direction thereof.

[0091] The method of attaching the bar guide part 92 to the body part 91 is arbitrary. For example, as shown in FIG. 4, both ends of the bar guide part 92 are fixed to the attachment member 93 respectively. The method of fixing the bar guide part 92 to the attachment member 93 may include, but is not limited to, inserting the bar

guide part 92 into a recess formed in the attachment member 93, for example. Each of the two attachment members 93 is fixed to the body part 91 by a detachable bolt or the like. As a result, when the attachment members 93 are removed from the body part 91, the bar guide part 92 can be detached from the body part 91. The attachment positions of the attachment members 93 to the body part 91 are determined so that each attachment member 93 does not overlap with the yarn dividing groove 91b at the root side of the body part 91. This prevents the yarn Y in the yarn dividing groove 91b from being caught in the attachment member 93.

[0092] As shown in FIG. 4, the bar guide part 92 of this embodiment is provided at a position corresponding to the back portions of the yarn dividing grooves 91b and extending along a straight line along which the back portions of the plurality of yarn dividing grooves 91b are aligned. In the plan view shown in FIG. 4(a), the bar guide part 92 is provided so that portions thereof are exposed through the yarn dividing grooves 91b. That is, in the plan view, the portions of the bar guide part 92 overlaps with the yarn dividing grooves 91b.

[0093] This configuration makes it easier for the yarn Y entering the yarn dividing groove 91b to come into contact with a portion of the outer circumference of the bar guide part 92.

[0094] Next, the yarn threading operation will be described in detail with reference to FIGS. 5 through 8. FIG. 5 is a partial diagonal view showing the operation of inserting the yarn Y into the yarn threading tool 90. FIG. 6 is a partial diagonal view showing the state in which the yarn Y is hung on the yarn threading tool 90. FIG. 7 is an enlarged diagonal view from a different angle from FIG. 6, showing the state in which the yarn Y is hung on the yarn threading tool 90. FIG. 8 is a cross sectional view showing a case in which the yarn Y contacts both the body part 91 and the bar guide part 92. In FIG. 7 and following, the attachment member 93 is omitted for simplicity of drawing.

[0095] If necessary, the operator performs the yarn threading operation to thread a plurality of pieces of yarn Y spun from the spinning device 3 of the upper level to the take-up part 6, etc., before starting (resuming) the winding of the yarn Y by the winding device 7. The yarn threading operation may be necessary, for example, in the preparation stage before forming of the package P starts, or when a yarn breakage occurs for some reason.

[0096] In this embodiment, the plurality of pieces of yarn Y from the spinning device 3 are lowered from the upper level to the lower level by manual operation by the operator using an appropriate tool. The yarn threading operation on the plurality of pieces of yarn Y is then automatically performed by the yarn threading device 75, using the yarn threading tool 90 of this embodiment.

[0097] During the yarn threading operation, the operator stands at the front side of the spinning take-up device 4. First, the operator inputs the command for preparing for yarn threading from an operating unit (not shown) of the spinning take-up device 4.

[0098] Once the command to prepare for yarn threading is input, the controller which is not shown causes the spinning take-up device 4 to perform the yarn threading preparation operation as follows. First, the controller operates the motor for lifting and lowering, not shown, to lower the downstream godet roller 62 in a state where it is positioned at the package forming position shown in FIG. 2 or the like from its position, and move it to the yarn threading position near the upstream godet roller 61. The controller also moves all fulcrum guides 76 to the yarn threading and concentrates them on the front side of the spinning take-up device 4. As a result, the fulcrum guides 76 are positioned at a closer spacing to the front than usual.

[0099] When the yarn threading preparation operation of the spinning take-up device 4 is completed, the operator suctions and holds the plurality of pieces of yarn Y running downward from the spinning device 3 above with the suction gun (not shown). Furthermore, the operator operates the suction gun to hang the plurality of pieces of yarn Y on the two godet rollers 61, 62 in this order, which are positioned close to each other above the front end of the winding device 7.

[0100] After completing the yarn threading on the two godet rollers 61, 62, the operator operates the yarn threading device 75 described above. As a result, the yarn threading device 75 respectively threads the plurality of pieces yarn Y on the plurality of fulcrum guides 76 using the yarn threading tool 90.

[0101] The yarn threading operation on the fulcrum guides 76 will be specifically described as follows. Before starting the yarn threading operation, the suction gun suctioning the plurality of pieces of yarn Y is placed in a predetermined position, for example, on the floor or the like near the front of the spinning and winding unit 1. Furthermore, the operator drives the first drive device and the second drive device, so that the yarn threading arm 96 is extended forward and the guide rail 95 is directed right diagonally forward, as the state shown in FIG. 5.

[0102] The operator then drives the second drive device. Consequently, the yarn threading arm 96 contracts backward, so that it moves backward as shown by a white arrow in FIG. 5. As a result, the opening side of the body part 91 of the yarn threading tool 90 is inserted from front to back against the plurality of pieces of yarn Y running between the downstream godet roller 62 and the suction gun not shown.

[0103] By the above operation, the plurality of pieces of yarn Y are inserted one by one into each of the plurality of yarn dividing grooves 91b formed in the body part 91. Accordingly, the plurality of pieces of yarn Y are held in the yarn dividing grooves 91b in a separated state. At this time, the plurality of pieces of yarn Y are continuously supplied from the spinning device 3 to the spinning take-up device 4, and at the same time, they are suctioned by the suction gun downstream. Therefore, tension is exert-

ed on the yarn Y held in the body part 91 of the yarn threading tool 90, and the yarn Y does not come off from the yarn dividing groove 91b by itself.

[0104] By moving the yarn threading tool 90 with the plurality of yarn Y hanging on the yarn threading tool 90, the yarn threading tool 90 moves to the position shown in FIG. 6.

[0105] As the suction gun is located on the front side of the spinning and winding unit 1, when the yarn threading tool 90 moves to the rear of the spinning and winding unit 1, the plurality of pieces of yarn Y run while being bent at the portion corresponding to the yarn threading tool 90, as shown in FIG. 6.

[0106] Specifically, the plurality of pieces of yarn Y contact with the body part 91 at the back portions of the yarn dividing grooves 91b, as shown in FIG. 8, and are slightly bent at these contact points. At the same time, the plurality of pieces of yarn Y contact with the portions of the outer circumference of the bar guide part 92 provided by the yarn threading tool 90 and are bent. The hardness of the bar guide part 92 is greater than that of the body part 91. Accordingly, since the bar guide part 92 is less likely to be worn, the frequency and cost of maintenance work can be reduced.

[0107] As shown in FIG. 8, with respect to each piece of yarn Y, the contact length at the contact portion C2 with the bar guide part 92 is longer than the contact length at the contact portion C1 with the body part 91. Additionally, the radius of curvature of the curved surface of the bar guide part 92 is larger than the radius of curvature of a portion in contact with the yarn Y in the yarn dividing groove 91b. Therefore, wear of the body part 91 and the bar guide part 92 due to running of the yarn Y can be well suppressed. In addition, the bending of the yarn Y can be effectively mitigated, so that the running of the yarn Y becomes smooth.

[0108] Next, the operator drives the second drive device. Consequently, the guide rail 95 rotates as shown by the dashed arrow in FIG. 6, and the guide rail 95 is directed left diagonally forward. Next, the operator drives the first drive device. As a result, the yarn threading arm 96 extends forward, so the tip of the yarn threading arm 96 moves left diagonally forward, as shown by a white arrow in FIG. 6. As a result, the yarn threading tool 90 moves to pass under the plurality of fulcrum guides 76. The direction of movement of the yarn threading tool 90 at this time is a slightly inclined direction such that the yarn dividing groove 91b is displaced toward the fulcrum guide 76 side as it moves forward.

[0109] As a result of this movement of the yarn threading tool 90, each of the yarn dividing grooves 91b moves in a direction that is inclined with respect to the direction of the arrangement of the fulcrum guides 76 (i.e., the front-back direction). Accordingly, the plurality of pieces of yarn Y held in the separated state in the yarn dividing grooves 91b are guided to the plurality of fulcrum guides 76 arranged in one row and are hung on them respectively.

[0110] After yarn threading on all the fulcrum guides 76 is completed, the operator inputs the command to prepare for take-up via the operating unit of the spinning and winding unit 1. When the command to prepare for take-up is input, the controller makes the spinning and winding unit 1 perform the following take-up preparation operations.

[0111] The controller causes the downstream godet roller 62 to move backward and upward from the yarn threading position in the front side to the package forming position in the rear side, by means of a motor for lifting and lowering which is not shown. The controller also moves the plurality of fulcrum guides 76 back to a state where the spacing is normal. As a result, the distance between the fulcrum guides 76 increases. At the same time, or shortly before, the controller causes the winding device 7 to begin its winding operation.

[0112] The operator moves the suction gun to a predetermined position below the bobbin holder 72 so that each of the plurality of pieces of yarn Y contacts the bobbin B corresponding to it. In conjunction with the rotation of the bobbin B, the traverse guides 73a reciprocate in the direction parallel to an axial direction of the bobbin B in conjunction with the rotation of the bobbin B. During the reciprocating movement of the traverse guides 73a, the yarn Y is hooked on each of the traverse guides 73a. Thereafter, each of the pieces of the yarn Y can be wound onto the bobbin B while being traversed by the traverse guide 73a. As a result, the packages P can be formed.

[0113] As described above, the yarn threading tool 90 of this embodiment is used for respectively threading the plurality of pieces of yarn Y to the plurality of fulcrum guides 76. This yarn threading tool 90 includes the body part 91 and the bar guide part 92. The body part 91 is formed in a shape of a plate with the plurality of yarn dividing grooves 91b lined up for inserting the yarn Y. The bar guide part 92 is located on at least one side of the body part 91 in the thickness direction and is arranged spanning the plurality of yarn dividing grooves 91b. The bar guide part 92 is a different member from the body part 91. The hardness of the bar guide part 92 is greater than that of the body part 91. When viewed in the thickness direction of the body part 91, the yarn dividing grooves 91b and the bar guide part 92 are disposed partially overlapping.

[0114] This makes, in the yarn threading tool 90, the portion in contact with the yarn Y less likely to be worn with a simple configuration. As a result, the frequency and cost of maintenance work can be reduced. In addition, the contact length of the yarn Y with the bar guide part 92, which has a high hardness, can be easily increased by the partially overlapping arrangement of the yarn dividing groove 91b and the bar guide part 92. Thus, the bar guide part 92 is less likely to be worn.

[0115] In the yarn threading tool 90 of this embodiment, the bar guide part 92 is detachably attached to the body part 91.

[0116] This allows for easy replacement of the bar

guide part 92 if it is worn.

[0117] In the yarn threading tool 90 of this embodiment, the bar guide part 92 is formed in an elongated shape. Both ends of the bar guide part 92 in the longitudinal direction are fixed to the body part 91.

[0118] This allows the bar guide part 92 to be fixed to the body part 91 in a simple configuration, with the outer circumference of the bar guide part 92 being able to contact with the yarn Y.

[0119] In the yarn threading tool 90 of this embodiment, the bar guide part 92 is located in contact with the body part 91.

[0120] This prevents rattling and the like of the bar guide part 92.

[0121] In the yarn threading tool 90 of this embodiment, the bar guide part 92 has the curved surface.

[0122] This allows the yarn Y to be bent smoothly by bringing the yarn Y into contact with the curved surface of the bar guide part 92.

[0123] In the yarn threading tool 90 of this embodiment, the bar guide part 92 is formed in an elongated shape. The cross section of the bar guide part 92 perpendicular to the longitudinal direction of the bar guide part 92 is circular.

[0124] This allows the yarn Y to be bent smoothly at the contact portion with the bar guide part 92.

[0125] In the yarn threading tool 90 of this embodiment, the diameter of the cross section of the bar guide part 92 is greater than the thickness of the body part 91.

[0126] This allows for a longer contact length between the yarn Y and the bar guide part 92.

[0127] In the yarn threading tool 90 of this embodiment, the bar guide part 92 is made of ceramic.

[0128] This can improve the wear resistance of the bar guide part 92.

[0129] In the plurality of yarn dividing grooves 91b provided with the yarn threading tool 90 of this embodiment, the distance between two adjacent yarn dividing grooves 91b is larger at the back portion side opposite to the opening side where the yarn Y is inserted than at the opening side.

[0130] This allows for greater distance between the pieces of yarn Y led to the back portions, which facilitates the operation of threading the pieces of yarn Y one by one to the fulcrum guides 76.

[0131] The winding device 7 of this embodiment winds the pieces of yarn Y continuously spun from the spinning device 3. The winding device 7 includes the fulcrum guides 76 and the yarn threading device 75. The fulcrum guides 76 guide the yarn Y. The yarn threading device 75 threads the pieces of yarn Y continuously spun from the spinning device 3 to the fulcrum guides 76 using the yarn threading tool 90. At least at one point in the process of the yarn threading device 75 moving the yarn threading tool 90, the yarn Y bends at the portion of yarn Y corresponding to the bar guide part 92.

[0132] This makes, in the yarn threading tool 90 provided by the yarn threading device 75, the portion in contact with the yarn Y less likely to be worn with a simple configuration. As a result, the frequency and cost of maintenance work can be reduced. In addition, the contact length of the yarn Y with the bar guide part 92 can be easily increased by the partially overlapping arrangement of the yarn dividing groove 91b and the bar guide part 92. Thus, the bar guide part 92 is less likely to be worn.

[0133] While some preferred embodiments of the present invention have been described above, the foregoing configurations may be modified, for example, as follows. The modification can be singly made and any combination of several modifications can be made.

[0134] With the yarn Y being threaded to the yarn threading tool 90 as shown in FIG. 7, the yarn Y is in contact with both the back portion of the yarn dividing groove 91b and the bar guide part 92, as shown in FIG. 8. Alternatively, as shown in FIG. 9, the yarn Y may contact only the bar guide part 92 without contacting the back portion of the yarn dividing groove 91b. A situation where "the contact length of the yarn Y with the bar guide part 92 is longer than the contact length of the yarn Y with the yarn dividing groove 91b" includes the case where the yarn Y contacts only the bar guide part 92 without contacting the yarn dividing groove 91b as shown in FIG. 9. In the case of FIG. 9, wear associated with contact with the yarn Y occurs only on the bar guide part 92, so maintenance work related to wear is completed by replacing the bar guide part 92.

[0135] The bar guide part 92 may be arranged in a somewhat inclined orientation with respect to the direction in which the back portions of the yarn dividing grooves 91b are lined up.

[0136] When viewed in the thickness direction of the body part 91, the bar guide part 92 may be located in a position where it does not overlap with the yarn dividing grooves 91b. FIG. 10 shows a modification in which the bar guide part 92 is in contact with the back portions of the yarn dividing grooves 91b when viewed in the thickness direction of the body part 91. In the configuration of FIG. 10, when a yarn threading tool of conventional configuration is used as the body part 91 and the bar guide part 92 is attached, the effective depth of the yarn dividing groove 91b is substantially equal to that of the existing yarn threading tool. Therefore, this is excellent in that it can be applied without requiring significant modification to the conventional winding device.

[0137] Even if the bar guide part 92 does not overlap with the yarn dividing grooves 91b, by bending the yarn Y to some extent at the part of the yarn threading tool 90, it is possible to achieve a situation as described in FIG. 8 where the yarn Y contacts both the yarn dividing groove 91b and the bar guide part 92.

[0138] The respective positions of the downstream godet roller 62, the yarn threading tool 90, and the suction gun when the yarn threading device 75 inserts the yarn Y into the yarn dividing groove 91b of the yarn threading tool 90, as described in FIG. 5, can be changed accord-

ingly. As a result, the position and direction of the path of the yarn Y can be changed. Thus, even in the above-described modification in which the bar guide part 92 is in contact with the back portions of the yarn dividing grooves 91b when viewed in the thickness direction of the body part 91, it is possible to achieve a state in which the pieces of yarn Y are in contact only with the bar guide part 92 and not with the back portions of the yarn dividing grooves 91b, as shown in FIG. 10. As shown in FIG. 10, the yarn Y bends slightly at the contact portion with the bar guide part 92. In the process of moving the yarn threading tool 90 to the position shown in FIG. 6 after the yarn Y is hung on the yarn threading tool 90, for example, by controlling the downstream godet roller 62 to move in tandem from the yarn threading position to the package forming position, the state of FIG. 10 can be maintained where the yarn Y is in contact with the bar guide part 92 only.

[0139] The bar guide part 92 may be directly attached to the body part 91 without the attachment member 93 by means of an adhesive, for example. In other words, the bar guide part 92 may be undetachably fixed to the body part 91.

[0140] A suitable gap may be formed between the bar guide part 92 and the body part 91.

[0141] Instead of being circular, the cross section of the bar guide part 92 may be, for example, elliptical. Not all surfaces of the bar guide part 92 need to be curved. For example, the cross section of the bar guide part 92 can be shaped such that, for example, an arc is formed in only one of the four corners of a rectangle, and the yarn Y can be in contact with the curved surface corresponding to this arc portion.

[0142] The diameter D1 of the circle in the cross section of the bar guide part 92 may be equal to the thickness T1 of the yarn threading tool 90 (D1 = T1). The diameter D1 may be smaller than the thickness T1 (D1 < T1).

[0143] The bar guide part 92 may be formed to have a greater high temperature strength relative to the body part 91. The bar guide part 92 in this configuration can better withstand frictional heat due to contact with the yarn Y. The bar guide part 92 may be formed such that at least one of stiffness and fracture toughness is increased relative to the body part 91. The bar guide part 92 in this configuration can better withstand the moment generated by the yarn Y being pressed against it.

[0144] Instead of ceramic, the bar guide part 92 can be made of, for example, a metal with a suitable surface finish.

[0145] A movement guide rail which is not shown can be provided to move the yarn threading tool 90 in the front-back direction of the spinning and winding unit 1. In this case, the movement of the yarn threading tool 90 in the front-back direction of the spinning and winding unit 1 may be performed automatically during the yarn threading operation.

[0146] In the above embodiment, the bar guide part 92 is attached to a surface of the body part 91 which faces the downstream side during the yarn threading operation. Instead of this, the bar guide part 92 may be attached to a surface of the body part 91 which faces the upstream side. The bar guide part 92 may be attached to each of the surfaces on both sides of the body part 91 in the thickness direction.

[0147] The bar guide part 92, which is circular in cross section, may be configured to change angles about its axis center. If the bar guide part 92 is worn to some extent, the angle of the bar guide part 92 can be changed so that the yarn Y contacts with the unworn portion of the bar guide part 92.

[0148] In the plurality of yarn dividing grooves 91b, the distance between two adjacent yarn dividing grooves 91b on the opening side where the yarn Y is inserted and the distance on the back portion side, which is opposite to the opening side, may be equal.

[0149] Instead of the bar guide part 92 formed in an elongated shape, for example, the yarn threading tool 90 may include a block-shaped guide.

[0150] The yarn threading operation may be performed manually by the operator using the hand-held yarn threading tool 90. In this case, the guide rail 95, the yarn threading arm 96, etc. can be omitted.

DESCRIPTION OF THE REFERENCE NUMERALS

[0151]

76 Fulcrum guide (yarn guide)
90 Yarn threading tool
91 Body part (body)
91b Yarn dividing groove (groove)
92 Bar guide part (guide)
Y Yarn

Claims

1. A yarn threading tool (90) for respectively threading a plurality of pieces of yarn (Y) to a plurality of yarn guides (76), comprising:

   a body (91) formed in a shape of a plate with a plurality of grooves (91b) lined up for inserting the yarn (Y); and
   a guide (92) located on at least one side of the body (91) in a thickness direction of the body (91) and arranged spanning the plurality of grooves (91b), wherein
   the guide (92) is a different member from the body (91),
   a hardness of the guide (92) is greater than a hardness of the body (91), and
   when viewed in the thickness direction of the body (91), the guide (92) is disposed partially overlapping the grooves (91b) or in contact with back portions of the grooves (91b).

2. The yarn threading tool (90) according to claim 1, wherein
the guide (92) is detachably attached to the body (91).

3. The yarn threading tool (90) according to claim 1 or 2, wherein

the guide (92) is formed in an elongated shape, and
both ends of the guide (92) in a longitudinal direction of the guide (92) are fixed to the body (91).

4. The yarn threading tool (90) according to any one of claims 1 to 3, wherein
the guide (92) is located in contact with the body (91).

5. The yarn threading tool (90) according to any one of claims 1 to 4, wherein
the guide (92) has a curved surface.

6. The yarn threading tool (90) according to claim 5, wherein

the guide (92) is formed in an elongated shape, and
a cross section of the guide (92) perpendicular to a longitudinal direction of the guide (92) is circular.

7. The yarn threading tool (90) according to claim 6, wherein
a diameter of the cross section of the guide (92) is greater than a thickness of the body (91).

8. The yarn threading tool (90) according to any one of claims 1 to 7, wherein
the guide (92) is made of ceramic.

9. The yarn threading tool (90) according to any one of claims 1 to 8, wherein
in the plurality of grooves (91b), a distance between two adjacent grooves (91b) is larger at a back portion side opposite to an opening side where the yarn (Y) is inserted than at the opening side.

10. A winding device (7) for winding a plurality of pieces of yarn (Y) continuously spun from a spinning device (3), comprising:

a plurality of yarn guides (76) guiding the plurality of pieces of yarn (Y); and
a yarn threading device (75) to thread the plurality of pieces of yarn (Y) continuously spun from the spinning device (3) to the plurality of yarn guides (76) using a yarn threading tool (90), wherein
the yarn threading tool (90) comprises:

a body (91) formed in a shape of a plate with a plurality of grooves (91b) lined up for inserting the yarn (Y); and
a guide (92) located on at least one side of the body (91) in a thickness direction of the body (91) and arranged spanning the plurality of grooves (91b),
the guide (92) is a different member from the body (91),
a hardness of the guide (92) is greater than a hardness of the body (91), and
at least at one point in a process of the yarn threading device (75) moving the yarn threading tool (90), the yarn (Y) bends at a portion of the yarn (Y) corresponding to the guide (92).

11. The winding device (7) according to claim 10, wherein
when viewed in the thickness direction of the body (91), the guide (92) is disposed partially overlapping the grooves (91b) or in contact with back portions of the grooves (91b).

12. The winding device (7) according to claim 10 or 11, wherein
at least at one point in the process of the yarn threading device (75) moving the yarn threading tool (90), a contact length of the yarn (Y) with the guide (92) is longer than a contact length of the yarn (Y) placed in the groove (91b) with the groove (91b).

13. The winding device (7) according to any one of claims 10 to 12, wherein
the guide (92) is detachably attached to the body (91).

14. A winding device (7) according to any one of claims 10 to 13, wherein

the guide (92) is formed in an elongated shape, and
both ends of the guide (92) in a longitudinal direction of the guide (92) are fixed to the body (91).

15. A winding device (7) according to any one of claims 10 to 14, wherein
the guide (92) is located in contact with the body (91).

16. A winding device (7) according to any one of claims 10 to 15, wherein
the guide (92) has a curved surface.

17. A winding device (7) according to claim 16, wherein

the guide (92) is formed in an elongated shape, and
a cross section of the guide (92) perpendicular to a longitudinal direction of the guide (92) is circular.

18. A winding device (7) according to claim 17, a diameter of the cross section of the guide (92) is greater than a thickness of the body (91).

19. A winding device (7) according to any one of claims 10 to 18, wherein
the guide (92) is made of ceramic.

20. The winding device (7) according to any one of claims 10 to 19, wherein
in the plurality of grooves (91b), a distance between two adjacent grooves (91b) is larger at a back portion side opposite to an opening side where the yarn (Y) is inserted than at the opening side.

FIG. 1

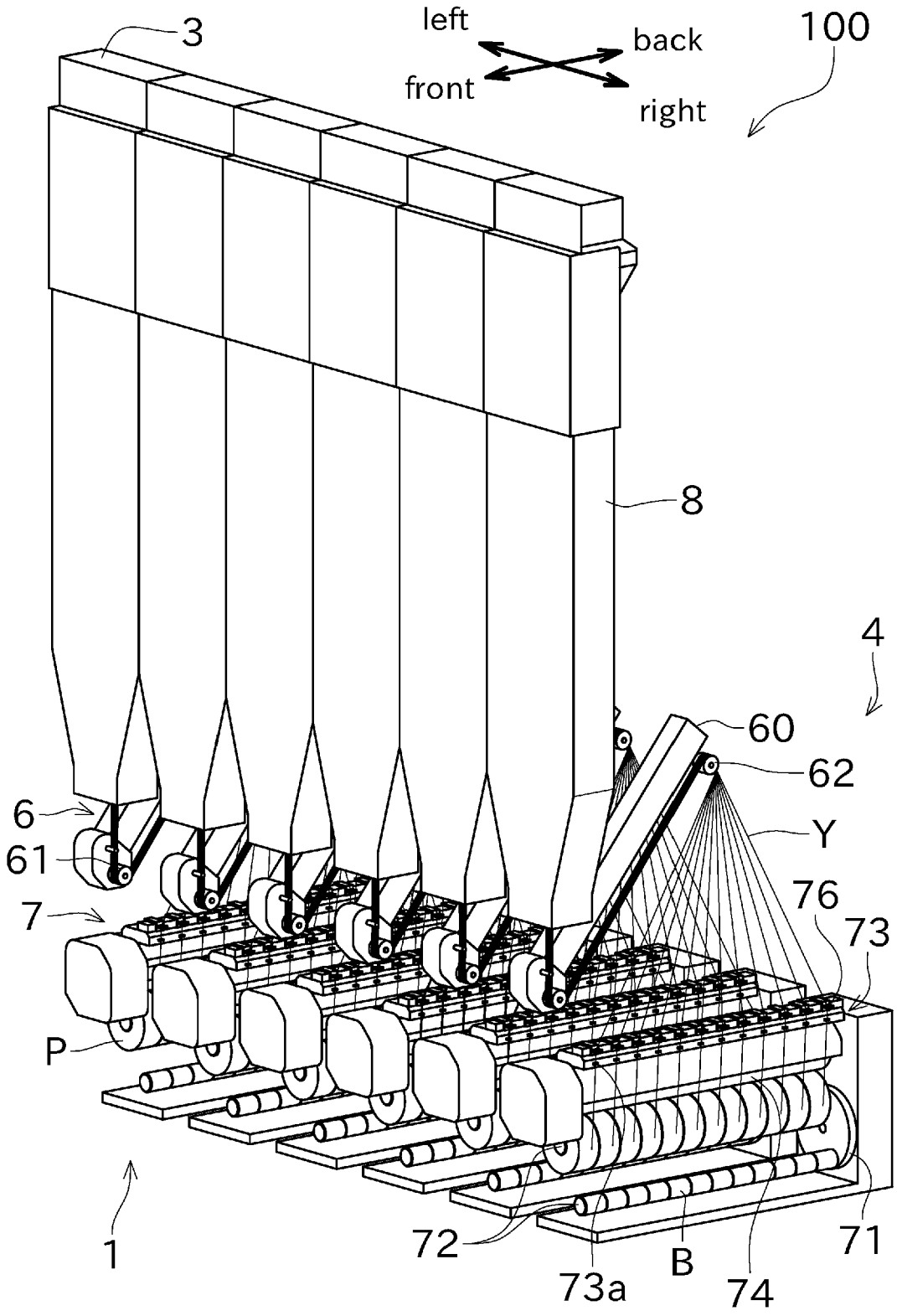


FIG. 2

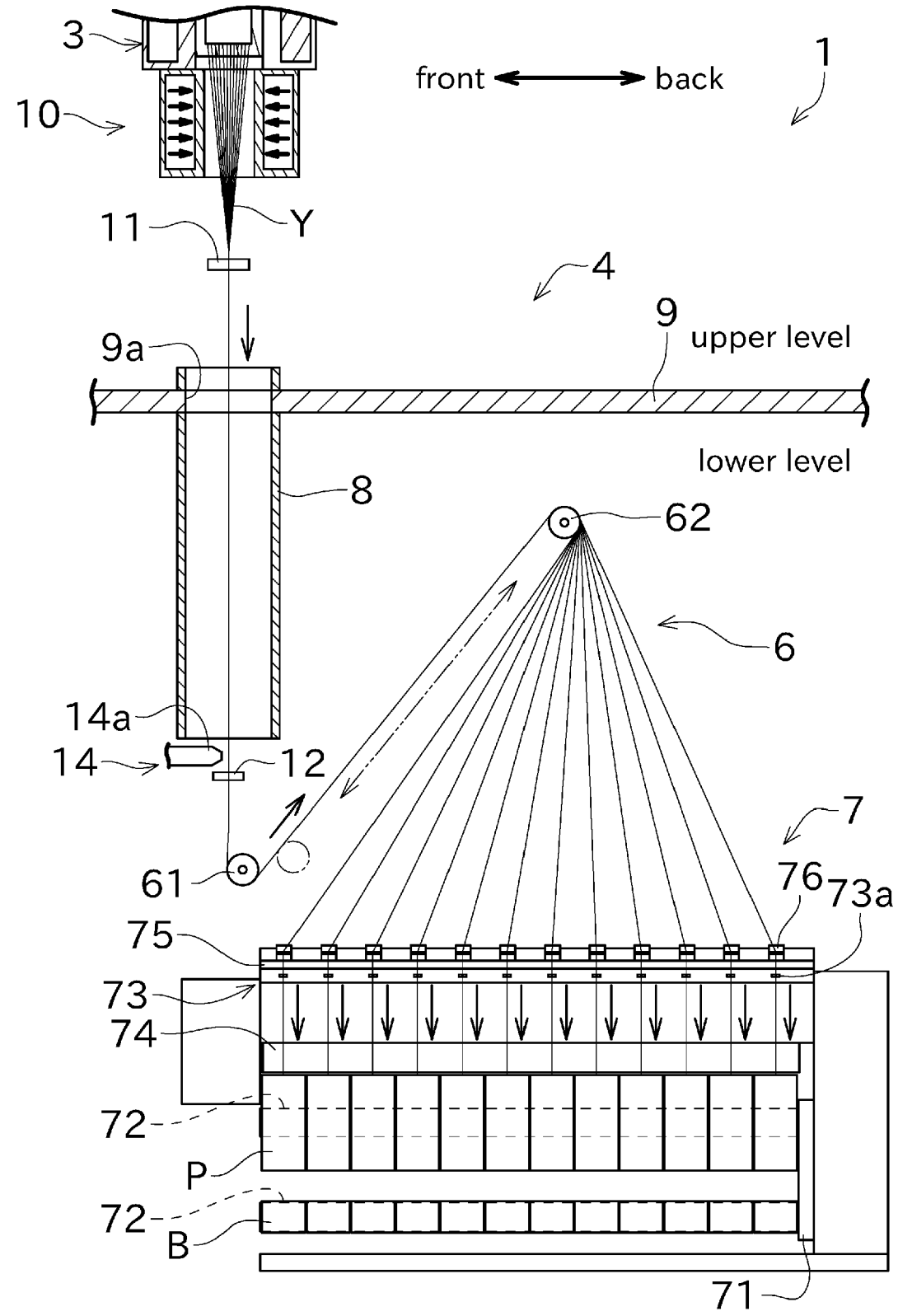

3
10
front
back
1
11
Y
4
9
upper level
9a
lower level
8
62
6
14a
14
12
7
61
76
73a
75
73
74
72
P
72
B
71

FIG. 3

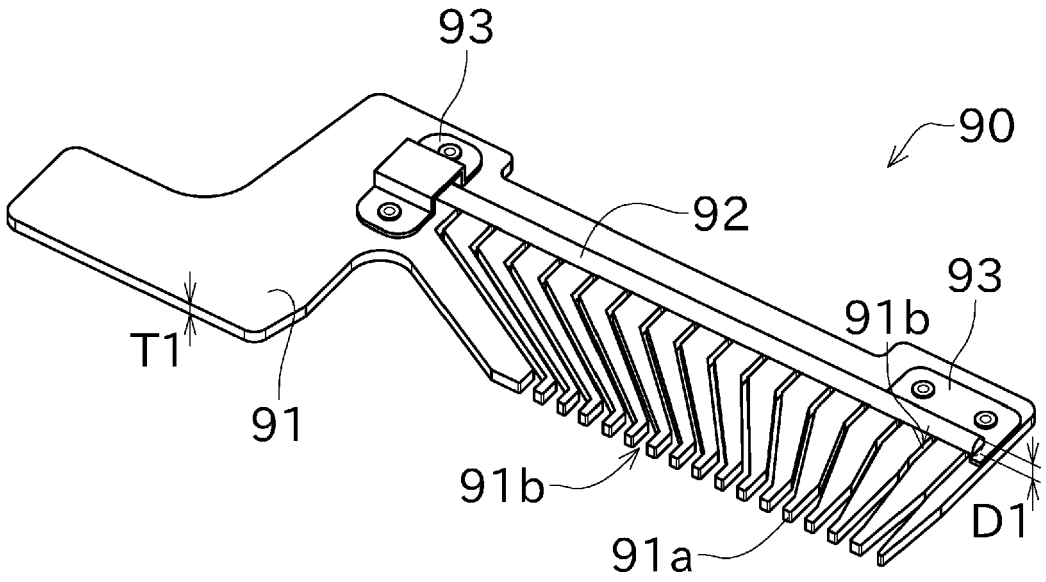


FIG. 4

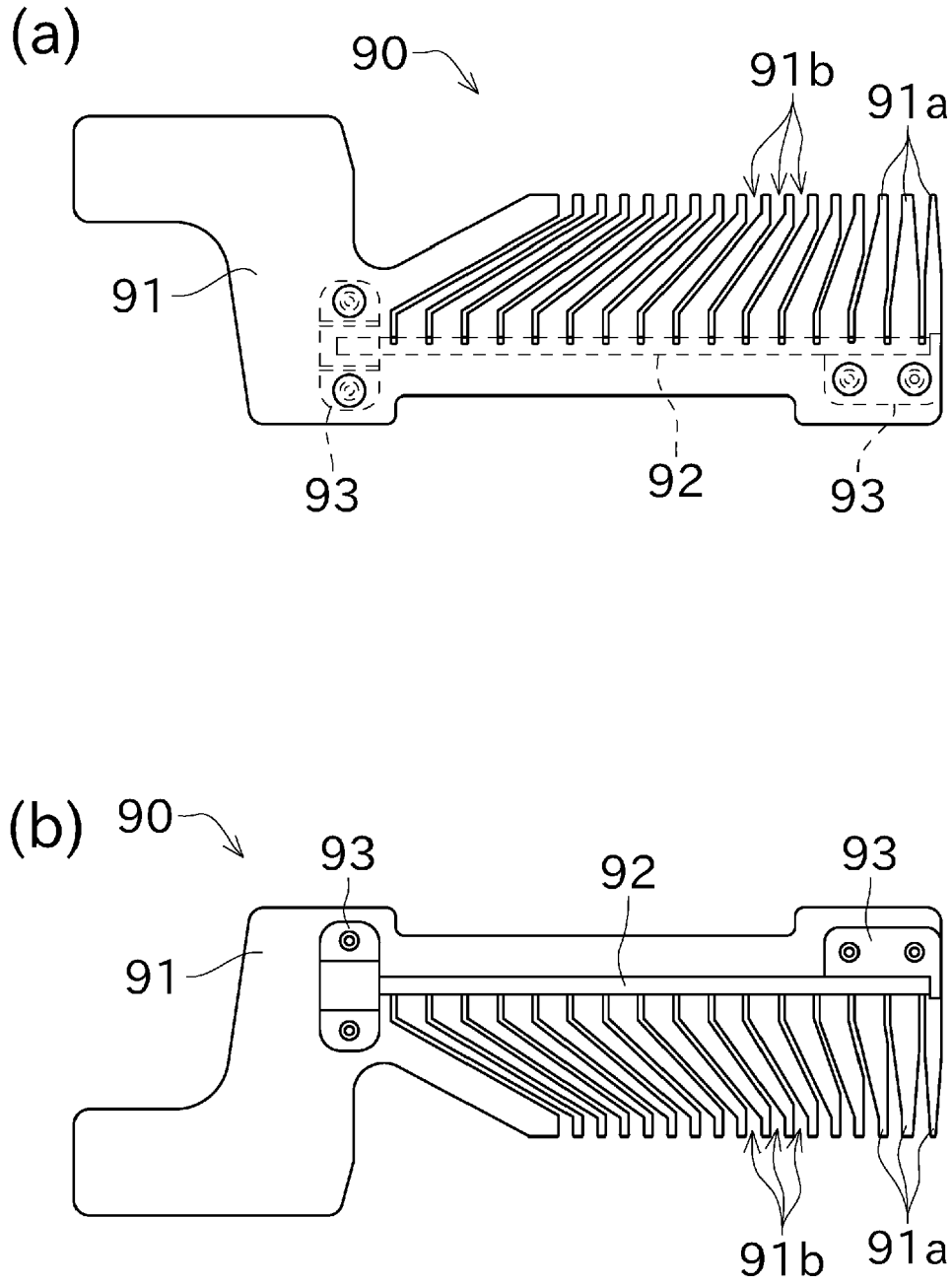
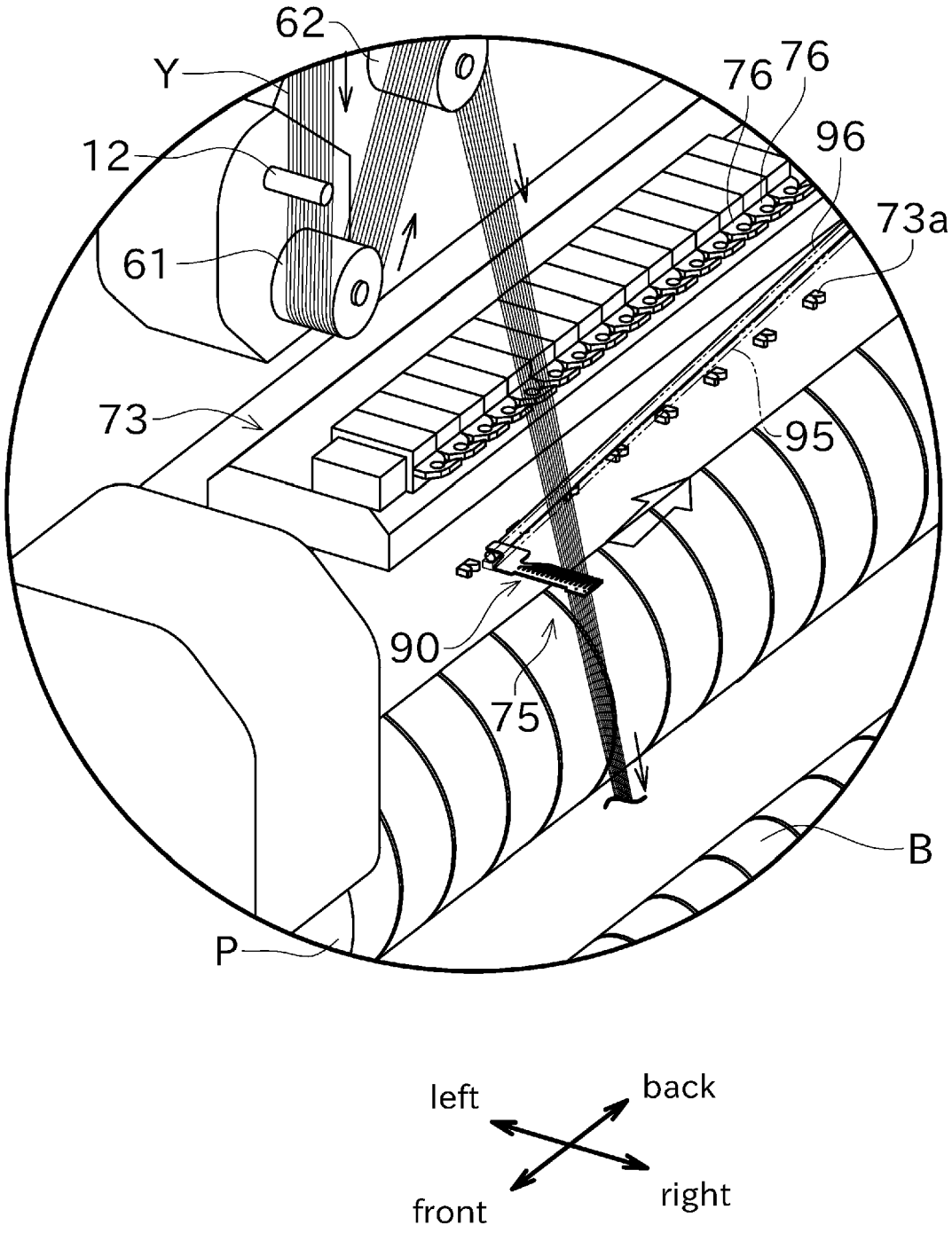


FIG. 5



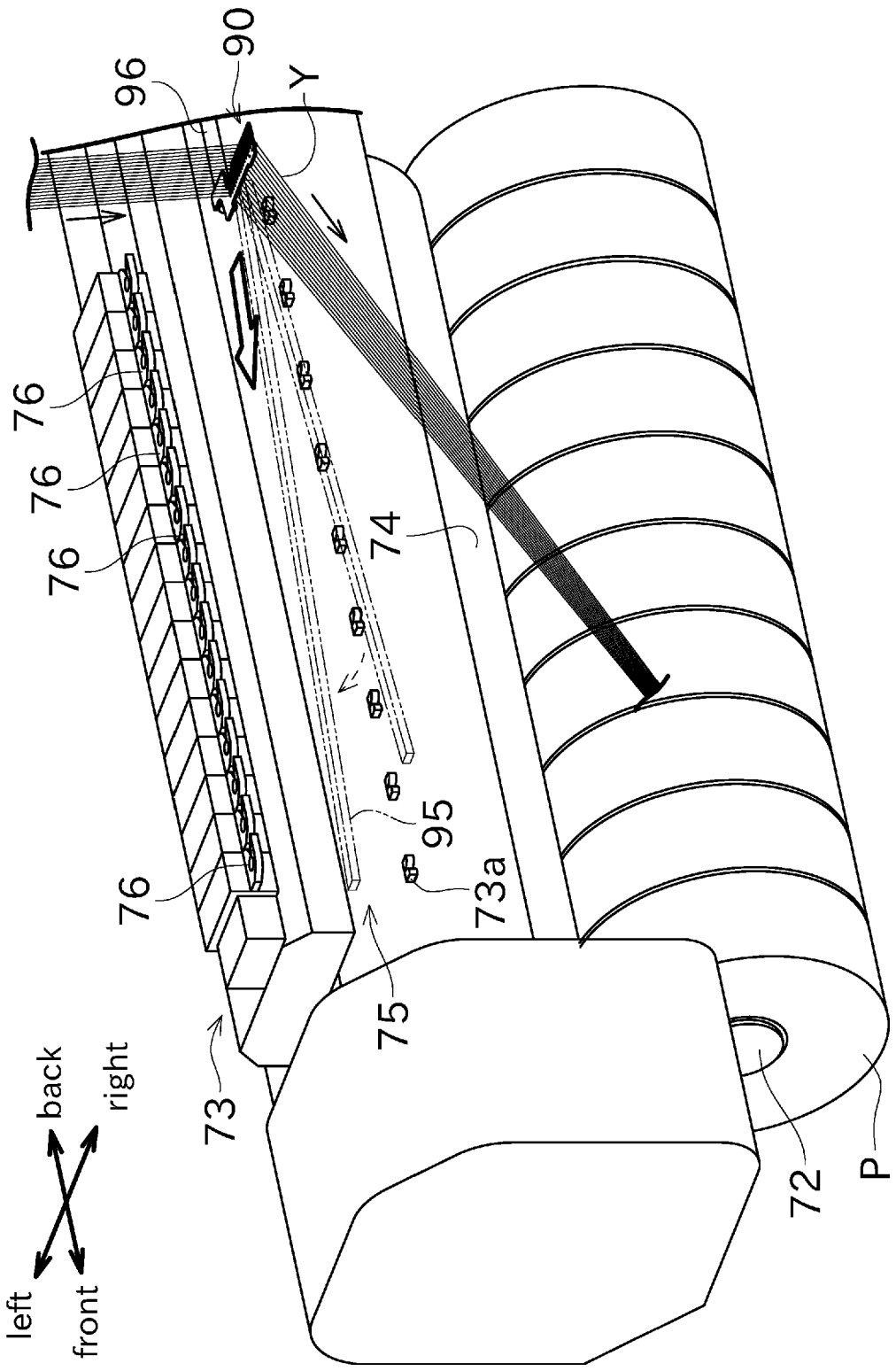


FIG. 6

FIG. 7

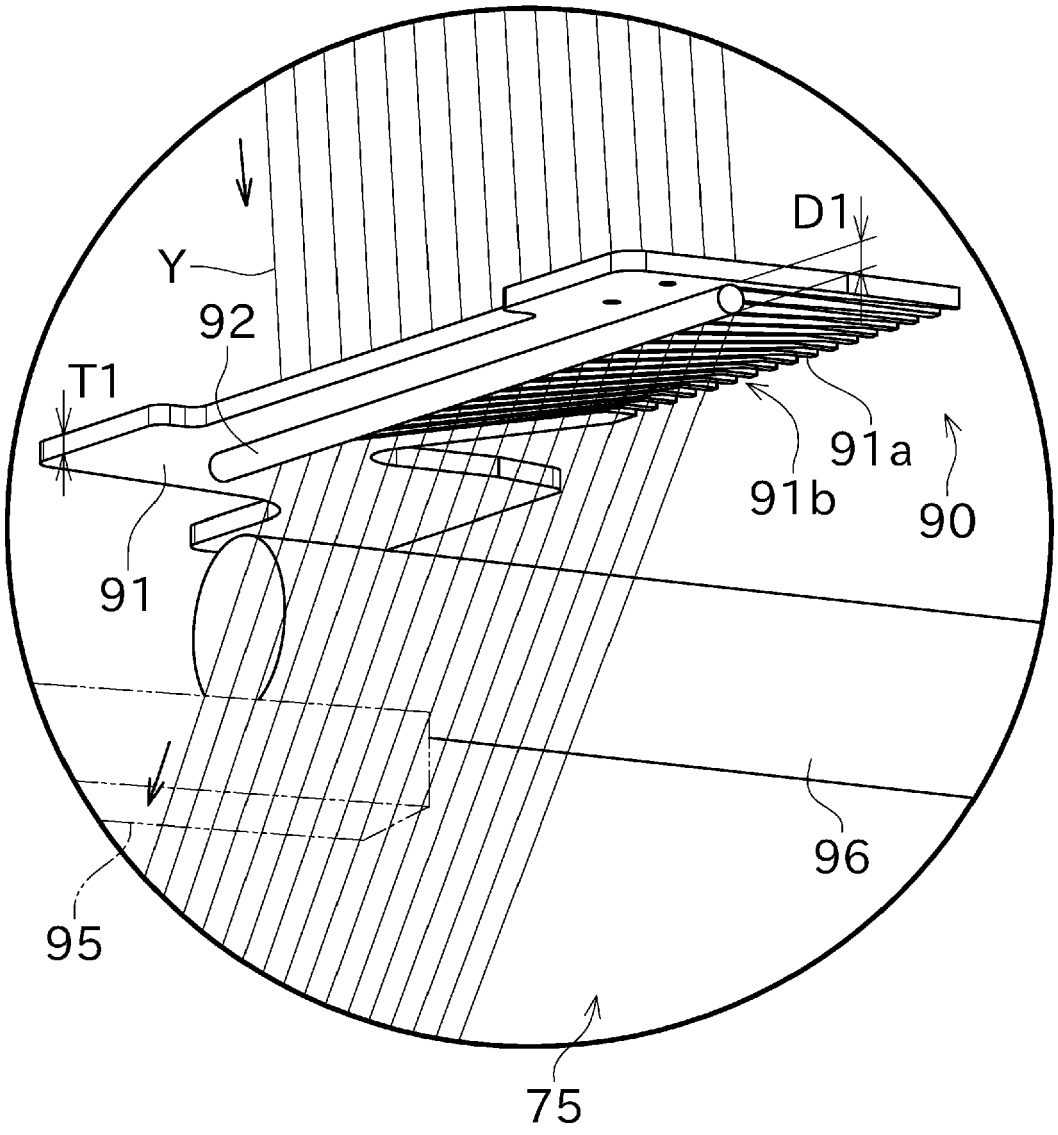


FIG. 8

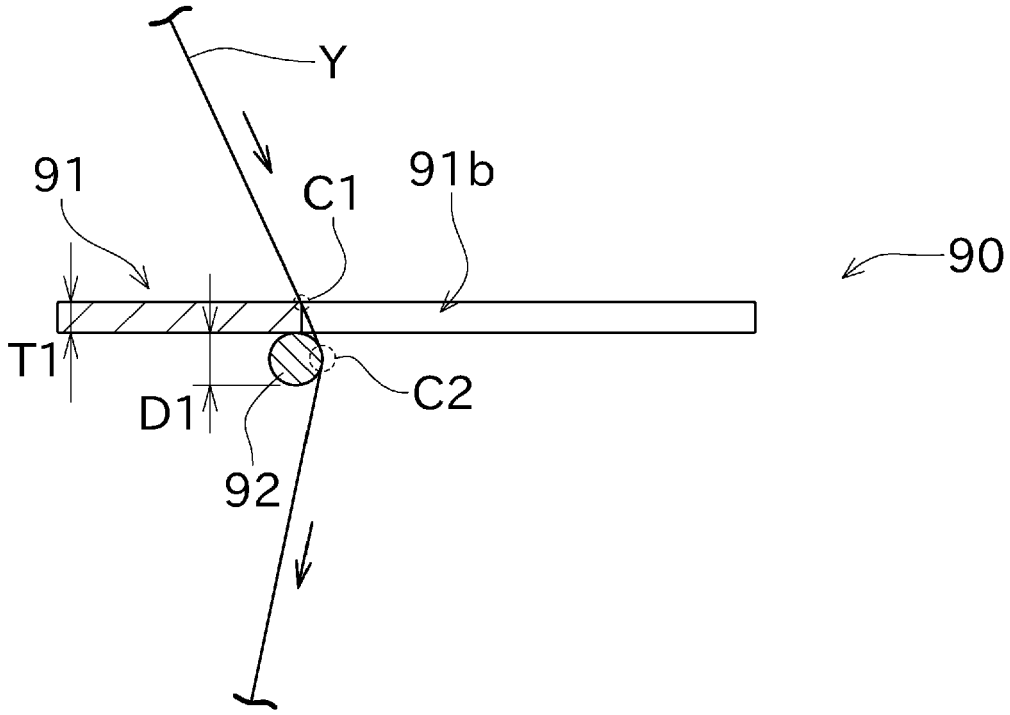


FIG. 9

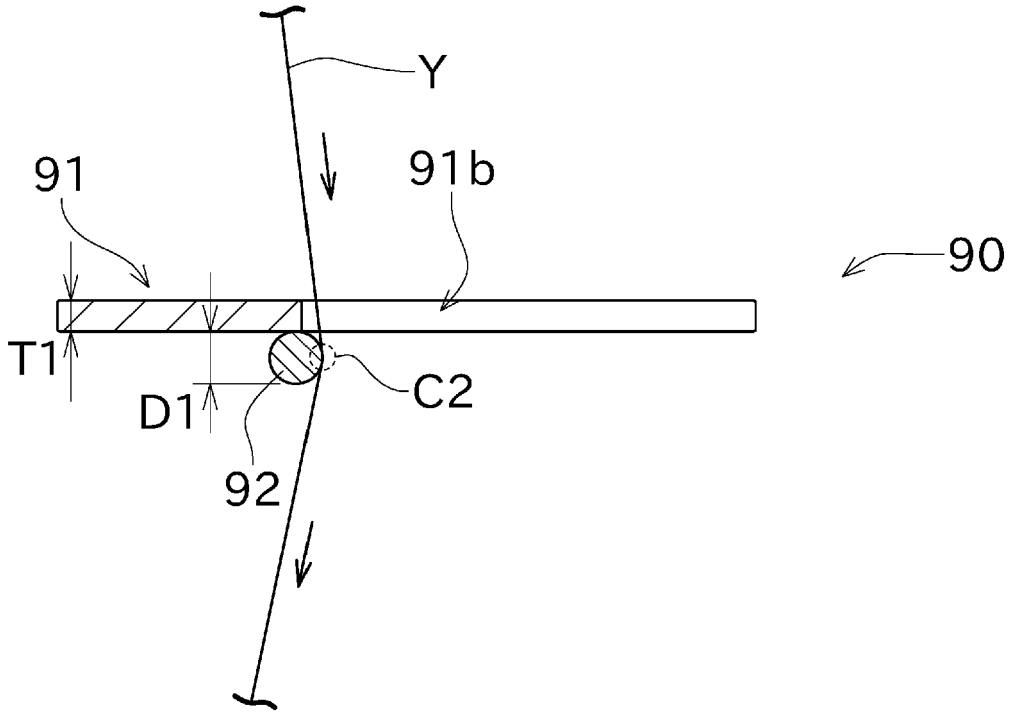
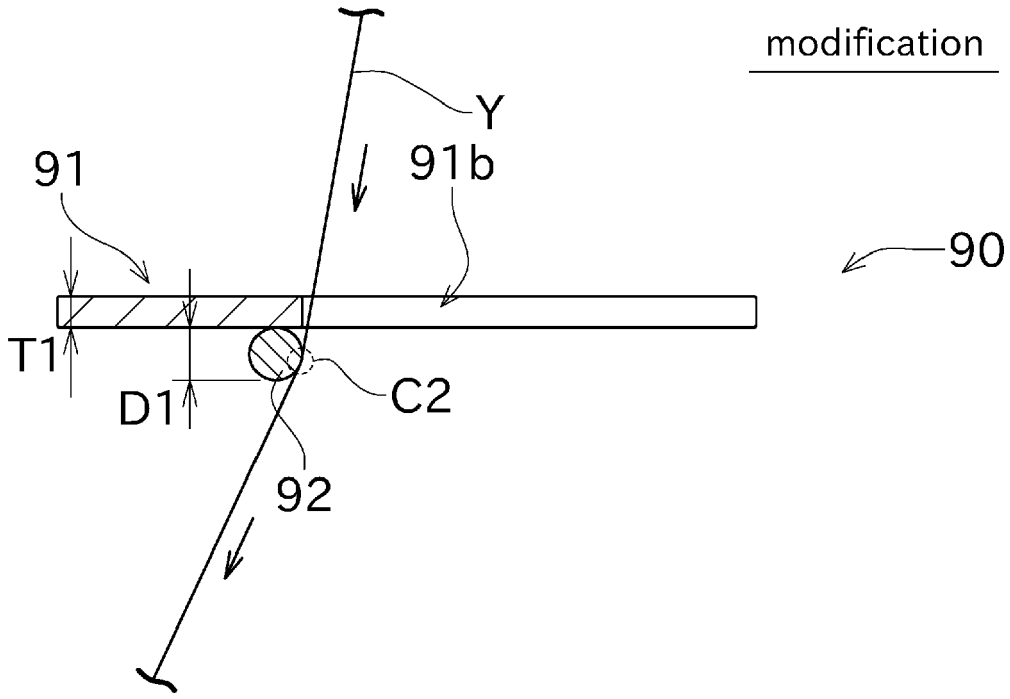


FIG. 10



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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 3087

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 3 666 701 A1 (TMT MACHINERY INC [JP]) 17 June 2020 (2020-06-17) * paragraphs [0056] - [0061], [0068]; figure 8 *	1,5-8, 10-12, 16-19 2-4, 13-15	INV. B65H57/00 B65H57/16 B65H57/24
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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	10 April 2024	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 21 3087

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10-04-2024

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