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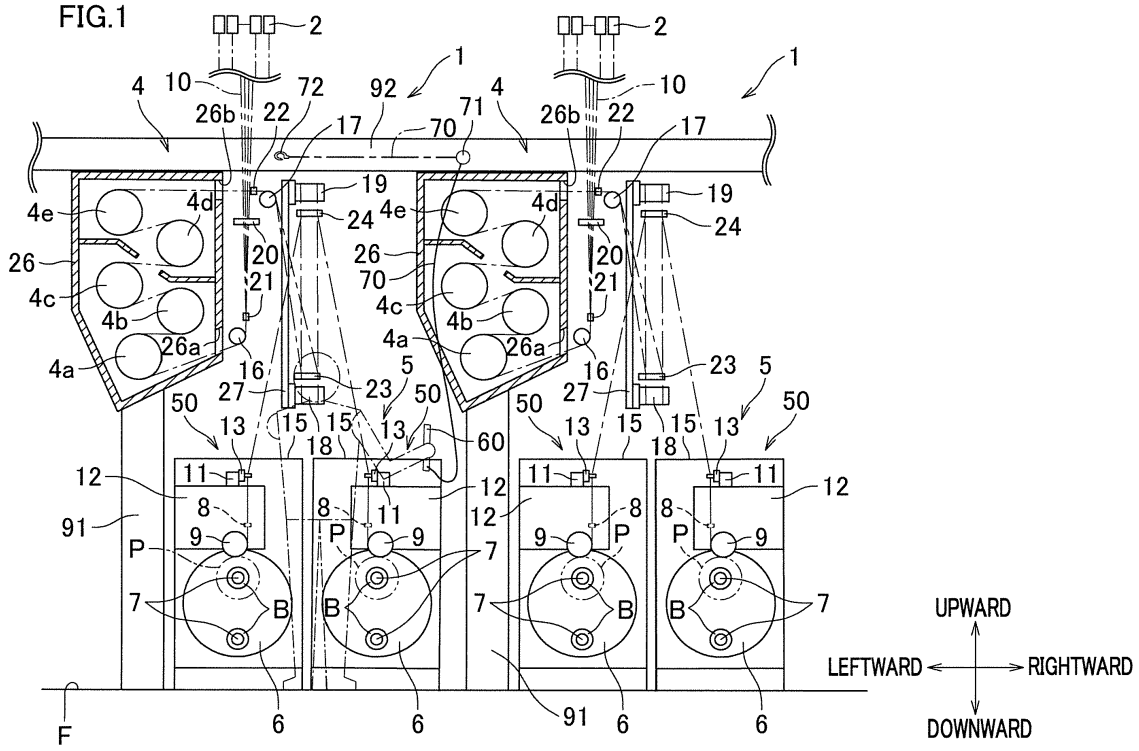
(54) SPUN YARN TAKE-UP MACHINE AND YARN THREADING ASSISTING TOOL FOR SPUN YARN TAKE-UP MACHINE

(57) A spun yarn take-up machine and a yarn threading assisting tool for the spun yarn take-up machine, which prevent an operator from receiving an electric shock when performing yarn threading, are provided. The spun yarn take-up machine includes a conductive frame 92, a ground wire 70, a magnet 71 which conductively attaches the ground wire 70 to the frame 92, and a hook member 72 which conductively attaches the ground wire 70 to a yarn threading assisting tool 60.

FIG.1



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a spun yarn take-up machine and a yarn threading assisting tool for the spun yarn take-up machine.

[0002] There exists a spun yarn take-up machine for taking up synthetic fiber yarns spun out from a spinning apparatus and for packaging them by winding onto bobbins with a yarn winder, including yarn threading portions where the yarns are threaded. For example, Patent Literature 1 (Japanese Laid-Open Patent Publication No. 2015-165060) discloses a spun yarn take-up machine in which a take-up roller takes up plural yarns spun out from a spinning apparatus, and then, a yarn feed roller takes up and sends the yarns from the take-up roller to a yarn winder. The yarn winder includes plural distribution guides (yarn threading portions) to which the respective yarns sent from the yarn feed roller are threaded and winds the yarns onto bobbins while traversing the yarns with distribution guides functioning as fulcrums.

[0003] In the spun yarn take-up machine of Patent Literature 1, yarn threading to the distribution guides is performed by using a yarn threading assisting tool having grooves in which the respective yarns are retained. An operator performs the yarn threading to each distribution guide while holding the yarn threading assisting tool retaining the yarns by hand.

SUMMARY OF THE INVENTION

[0004] In recent years, the number of yarns processed by one spun yarn take-up machine has been increased (large number yarn production) and the winding speed of winding yarns has been increased. In accordance with the advancement of the large number yarn production and the high-speed winding, an amount of static electricity generated due to the friction between the yarns and the yarn threading assisting tool increases. Furthermore, in the spun yarn take-up machine, oil may be applied to the yarns in order to restrain yarn breakage and generation of fluff in the running yarns. When the density of the used oil is high, the amount of static electricity generated due to the friction between the yarns and the yarn threading assisting tool increases.

[0005] When the yarn threading assisting tool is electrically charged, electric discharge may occur between the body of an operator performing yarn threading by using the yarn threading assisting tool and a metal part around the operator. When the amount of static electricity generated due to the friction between the yarns and the yarn threading assisting tool is large as described above, the electric charge amount of the yarn threading assisting tool is large, with the result that the operator receives a severe electric shock when electric discharge occurs. This prevents the operator from comfortably performing the yarn threading.

[0006] An object of the present invention is to provide a spun yarn take-up machine and a yarn threading assisting tool for the spun yarn take-up machine, which prevent an operator from receiving an electric shock when performing yarn threading.

[0007] According to the first aspect of the invention, a spun yarn take-up machine includes a plurality of yarn threading portions to which yarns spun out from a spinning apparatus are threaded, the yarns being threaded to the yarn threading portions by using a yarn threading assisting tool capable of retaining the yarns, the spun yarn take-up machine comprising: a conductive frame; a ground wire; a first attaching portion by which the ground wire is conductively attached to the frame; and a second attaching portion by which the ground wire is conductively attached to the yarn threading assisting tool.

[0008] According to the present invention, it is possible to conductively attach the ground wire to the conductive frame and to conductively attach the ground wire to the yarn threading assisting tool.

[0009] On this account, it is possible to discharge the static electricity accumulated in the yarn threading assisting tool to the frame via the ground wire,
when the operator performs the yarn threading to the yarn threading portions by using the yarn threading assisting tool.

[0010] As a result, it is possible to prevent the operator from receiving an electric shock when performing the yarn threading.

[0011] According to the second aspect of the invention, the spun yarn take-up machine of the first aspect is arranged such that an attaching position of the ground wire to the frame by the first attaching portion is above the yarn threading portions.

[0012] When the attaching position of the ground wire to the frame is low, the ground wire obstructs the yarn threading by the operator and deteriorates the workability. In the present invention, because the attaching position of the ground wire to the frame is above the yarn threading portions, the deterioration of the workability on account of the ground wire is restrained.

[0013] According to the third aspect of the invention, the spun yarn take-up machine of the second aspect further includes a take-up unit which is provided below the spinning apparatus and includes one or more rollers for taking up the yarns spun out from the spinning apparatus, an attaching position of the ground wire to the frame by the first attaching portion being above the take-up unit.

[0014] In the present invention, because the attaching position of the ground wire to the frame is above the take-up unit, the ground wire is less likely to interfere with the rollers of the take-up unit. It is therefore possible to restrain the ground wire from being caught by a roller.

[0015] According to the fourth aspect of the invention, the spun yarn take-up machine of the third aspect further includes a yarn winding apparatus which is provided below the take-up unit to wind the yarns supplied from the take-up unit onto respective bobbins the yarn threading

portions being provided below the take-up unit and the yarns supplied from the take-up unit to the yarn winding apparatus being threaded to the yarn threading portions.

[0016] In the present invention, electric charge is accumulated in the yarns on account of friction between one or more roller of the take-up member and the yarns. On this account, the amount of the electric charge of the yarn threading assisting tool is large when the yarns sent from the take-up unit to the yarn winding apparatus are threaded to the yarn threading portions. The present invention is therefore effectively applied to discharge the static electricity accumulated in the yarn threading assisting tool to the frame via the ground wire.

[0017] According to the fifth aspect of the invention, in the spun yarn take-up machine of any one of the first to fourth aspects, the frame is ferromagnetic and the first attaching portion is a conductive magnet fixed to the ground wire.

[0018] According to the present invention, it is easy to conductively attach the ground wire to the frame.

[0019] According to the sixth aspect of the invention, the spun yarn take-up machine of any one of the first to fifth aspects is arranged so that the second attaching portion detachably attaches the ground wire to the yarn threading assisting tool.

[0020] According to the present invention, it is possible to detach the ground wire from the yarn threading assisting tool when the yarn threading is not performed. The operator who performs the yarn threading is therefore able to carry the yarn threading assisting tool. Furthermore, one yarn threading assisting tool can be used for plural spun yarn take-up machines.

[0021] According to the seventh aspect of the invention, the spun yarn take-up machine of the sixth aspect is arranged so that the second attaching portion is a hook member which is fixed to the ground wire and is able to be hooked into a hole formed in the yarn threading assisting tool.

[0022] According to the present invention, it is easy to detachably attach the ground wire to the yarn threading assisting tool.

[0023] According to the eighth aspect of the invention, the spun yarn take-up machine of the sixth aspect is arranged so that the second attaching portion is a ring-shaped member which is fixed to the ground wire, is able to be engaged with a hole formed in the yarn threading assisting tool, and is openable and closable.

[0024] According to the present invention, it is easy to detachably attach the ground wire to the yarn threading assisting tool.

[0025] According to the ninth aspect of the invention, the spun yarn take-up machine of the seventh or eighth aspect is arranged so that

the first attaching portion attaches one end portion of the ground wire to the frame,

the second attaching portion is fixed to the other end portion of the ground wire, which is opposite to the one end portion,

and an engaging member including an engaging portion capable of being engaged with the second attaching portion is provided on the frame.

[0026] According to the present invention, when the yarn threading is not performed,

the second attaching portion (hook member or ring-shaped member) fixed to the ground wire can be engaged with not the hole of the yarn threading assisting tool but the engaging portion of the engaging member of the frame.

[0027] One end portion of the ground wire is attached to the frame by the first attaching portion and the second attaching portion is fixed to the other end portion of the ground wire. With this arrangement, the entirety of the ground wire is attached to the frame.

[0028] It is therefore possible to restrain the ground wire from hanging down from the frame and making contact with, for example, the yarns and/or the rollers of the take-up unit, when the yarn threading is not performed.

[0029] According to the tenth aspect of the invention, the spun yarn take-up machine of the sixth aspect is arranged so that

the first attaching portion attaches one end portion of the ground wire to the frame, and

a retaining portion is further provided to detachably attach another end portion of the ground wire opposite to the one end portion to the frame so as to attach the entirety of the ground wire to the frame.

[0030] According to the present invention, the entirety of the ground wire frame can be attached to the frame by the retaining portion, when the yarn threading is not performed.

[0031] It is therefore possible to restrain the ground wire from hanging down from the frame and making contact with, for example, the yarns and/or the rollers of the take-up unit, when the yarn threading is not performed.

[0032] According to the eleventh aspect of the invention, the spun yarn take-up machine of any one of the first to tenth aspects is arranged so that

the attaching position of the ground wire to the frame by the first attaching portion is closer to a working space than the yarn threading portions, in a direction in which the yarn threading portions are lined up.

[0033] When the attaching position of the ground wire to the frame is far from the working space (i.e., on the far side), the operator is required to stretch his/her arm to the far side when attaching the ground wire. As such, the attaching operation is tiresome.

[0034] Furthermore, when the ground wire is attached on the far side, the ground wire tends to overlap the yarn path in the yarn threading, and the ground wire may interfere with the yarns. In this connection, with the present invention, the attachment of the ground wire to the frame can be easily done and interference of the ground wire to the yarns can be restrained.

[0035] According to the twelfth aspect of the invention, a yarn threading assisting tool for threading yarns spun out from a spinning apparatus to yarn threading portions

of a spun yarn take-up machine includes:

a main body in which retaining grooves retaining the respective yarns are formed;
a ground wire which is conductively attached to the main body; and
an attaching portion which detachably attaches the ground wire to a conductive frame of the spun yarn take-up machine to be transmit electricity between the ground wire and the frame when the ground wire is attached to the frame.

[0036] In the present invention, the ground wire conductively attached to the main body is conductively attachable to the conductive frame of the spun yarn take-up machine.

[0037] It is therefore possible to discharge the static electricity accumulated in the main body of the yarn threading assisting tool to the frame via the ground wire, when the operator performs the yarn threading to the yarn threading portion by using the yarn threading assisting tool. As a result, it is possible to prevent the operator from receiving an electric shock when performing the yarn threading.

[0038] According to the thirteenth aspect of the invention, the yarn threading assisting tool for a spun yarn take-up machine of the twelfth aspect further includes a winding mechanism which is capable of winding the ground wire.

[0039] According to the present invention, because the ground wire is wound by the winding mechanism when the yarn threading is not performed, the portability of the yarn threading assisting tool is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040]

FIG. 1 is a schematic diagram of a facility in which a spun yarn take-up machine of First Embodiment of the present invention is provided.
FIG. 2 is a side view of the spun yarn take-up machine shown in FIG. 1.
FIG. 3 shows fulcrum guides located at a yarn threading position.
FIG. 4 is a perspective view of the yarn threading assisting tool shown in FIG. 1.
FIG. 5 shows an operation to thread yarns into retaining grooves of the yarn threading assisting tool.
FIG. 6 shows yarn threading performed by using the yarn threading assisting tool.
FIG. 7(a) and FIG. 7(b) show a yarn threading assisting tool of a second embodiment. FIG. 7(a) relates to a state in which a ground wire is wound, whereas FIG. 7(b) relates to a state in which the ground wire is drawn.
FIG. 8 shows a frame of a spun yarn take-up apparatus of a first modification of the first embodiment.
FIG. 9(a) and FIG. 9(b) show part of a ground wire of a spun yarn take-up apparatus of a second modification of the first embodiment. A ring-shaped member is in a closed state in FIG. 9(a), whereas the ring-shaped member is in an open state in FIG. 9(b).

DESCRIPTION OF THE PREFERRED EMBODIMENTS

<First Embodiment>

[0041] The following will describe a first embodiment of the present invention with reference to figures.

(Outline of Spun Yarn Take-Up Machine 1)

[0042] FIG. 1 is a schematic diagram of a facility in which a spun yarn take-up machine 1 of the present embodiment is provided. As shown in FIG. 1, the spun yarn take-up machine 1 is configured to take-up yarns 10, made of polyester, nylon, etc., spun out from a spinning apparatus 2. by a take-up unit 4 provided below the spinning apparatus 2, and then to wind the yarns by a yarn winding apparatus 5 provided below the take-up unit 4. Hereinafter, the leftward direction in FIG. 1 will be referred to as "left", the rightward direction in FIG. 1 will be referred to as "right", the direction toward the viewer of FIG. 1 will be referred to as "front", and the direction away from the viewer of FIG. 1 will be referred to as "rear".

[0043] As shown in FIG. 1, the take-up unit 4 includes members such as a yarn guide 20, a yarn feed roller 16, three first heating rollers 4a, 4b, and 4c, two second heating rollers 4d and 4e, and yarn feed rollers 17 to 19, which are provided in order along the yarn running direction.

[0044] The yarn guide 20 is provided below the spinning apparatus 2. As shown in FIG. 2, the yarn guide 20 bends the yarns 10 spun out from the spinning apparatus 2 and guides the yarns 10 to the yarn feed roller 16.

[0045] The yarn feed roller 16 is disposed so that its axis is parallel to the front-rear direction. Onto the yarn feed roller 16, the yarns 10 guided by the yarn guide 20 are wound. The yarns 10 wound onto the yarn feed roller 16 are sent to a thermal insulation box 26 through a slit 26a, by the yarn feed roller 16.

[0046] As shown in FIG. 1, the three first heating rollers 4a, 4b, and 4c and the two second heating rollers 4d and 4e are housed in the thermal insulation box 26. Each of the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e is disposed so that its axis is parallel to the front-rear direction. To the thermal insulation box 26, a door (not illustrated) is attached to be openable and closable and to cover the front end surfaces of the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e.

[0047] Each of the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e is heated by a heater (not illustrated) provided inside each roller. Heat radiation from the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e is restrained be-

cause these rollers are housed in the thermal insulation box 26 which is made of a heat insulating material. The surface temperatures of the second heating rollers 4d and 4e are arranged to be temperatures (e.g., 120 to 140 degrees centigrade) higher than the surface temperatures (e.g., 80 to 100 degrees centigrade) of the first heating rollers 4a, 4b, and 4c.

[0048] Each of the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e is a drive roller driven by a motor (not illustrated). The second heating rollers 4d and 4e are arranged to be higher in yarn feeding speed than the first heating rollers 4a, 4b, and 4c. The yarns 10 sent to the thermal insulation box 26 are drawn between the first heating rollers 4a, 4b, and 4c and the second heating rollers 4d and 4e. The yarns 10 having been drawn are heated by the second heating rollers 4d and 4e, with the result that the drawn yarns are thermally set.

[0049] By the three first heating rollers 4a, 4b, and 4c and the two second heating rollers 4d and 4e, the yarns 10 having been heated and drawn are sent out toward a yarn feed roller 17 which is provided outside the thermal insulation box 26, via a slit 26b. The yarn feed roller 17 is disposed so that its axis is parallel to the front-rear direction. The yarns 10 having been sent out from the thermal insulation box 26 are wound onto the yarn feed roller 17 and are then sent to yarn feed rollers 18 and 19 which are provided downstream in the yarn running direction of the yarn feed roller 17.

[0050] Below the spinning apparatus 2, the yarn feed rollers 18 and 19 are disposed so that their axes are parallel to the left-right direction. The yarns 10 having been sent out from the yarn feed roller 17 are wound onto the yarn feed roller 18 and the yarn feed roller 19 in this order, and are then sent to the yarn winding apparatus 5.

[0051] As shown in FIG. 2, the two yarn feed rollers 18 and 19 are supported by a long supporting member 27 which extends obliquely upward and rearward from a location above the front end portion of the yarn winding apparatus 5. The yarn feed roller 18 is attached to the front end portion of the supporting member 27. The yarn feed roller 19 is attached to be movable relative to the supporting member 27, along the length of the supporting member 27. The yarn feed roller 19 is moved, by an elevation motor (not illustrated), between a "front position" indicated by two-dot chain lines in FIG. 2 and a "rear position" indicated by solid lines in the figure. As described later, the front position of the yarn feed roller 19 is a position for yarn threading, whereas the rear position is a position for yarn winding by the yarn winding apparatus 5.

[0052] Yarn guides 21 to 24 are provided immediately upstream of the yarn feed rollers 16 to 19 in the yarn feeding direction, respectively. Because the yarns 10 are threaded to these yarn guides 21 to 24, the yarns 10 are separated from one another at predetermined intervals in the arrangement direction of the yarns 10.

[0053] As shown in FIG. 1, the yarn winding apparatus 5 includes two winding units 50. The two winding units 50 are lined up in the left-right direction and are provided to sandwich a yarn path of the yarns 10 which are sent from the yarn feed roller 19 above. The two winding units 50 are provided to be symmetrical in the left-right direction. The yarns 10 spun out from the spinning apparatus 2 are sent to the two winding units 50 in a separated manner. For example, when 24 yarns 10 are sent from the spinning apparatus 2, a half of them, i.e., 12 yarns are wound by the left winding unit 50, whereas the remaining half of the yarns, i.e., 12 yarns are wound by the right winding unit 50.

[0054] Each winding unit 50 includes members such as a frame 15, a disc-shaped turret 6 rotatably attached to the frame 15, two bobbin holders 7 to which bobbins B are attached along the axial direction of the bobbin holders, a supporting member 12 extending in the front-rear direction to be parallel to the bobbin holder 7, fulcrum guides 13 to which the respective yarns 10 are threaded, traverse guides 8 by which the respective yarns 10 wound onto bobbins B are traversed, and a contact roller 9 making contact with the bobbins B attached to the bobbin holder 7.

[0055] The two bobbin holders 7 are rotatably supported at rear end portions by the turret 6 so that the axis of each bobbin holder 7 is parallel to the front-rear direction. Each of the two bobbin holders 7 is rotationally driven by a motor (not illustrated). As each bobbin holder 7 rotates, the bobbins B attached to the bobbin holder 7 rotate together with the bobbin holder 7. As the turret 6 rotates, the positions of the two bobbin holders 7 are switched between a winding position (upper position in FIG. 1 and FIG. 2) and a retracted position (lower position in FIG. 1 and FIG. 2).

[0056] Above the bobbin holder 7,
fulcrum guides 13 attached to an upper portion of the supporting member 12 via a guide member 11 and
traverse guides 8 attached to the supporting member 12
are provided to correspond to the respective bobbins B. A half of the yarns 10 sent from the yarn feed roller 19 are threaded to the respective fulcrum guides 13.

[0057] Each fulcrum guide 13 functions as a fulcrum of traversal of the yarn 10 by the traverse guide 8.

[0058] The fulcrum guides 13 are movably attached to the guide member 11. The guide member 11 is disposed so that its length is parallel to the axial direction (front-rear direction) of the bobbin holder 7. The fulcrum guides 13 attached to the guide member 11 are aligned in a line in the front-rear direction. The fulcrum guides 13 are arranged to be movable between a fulcrum position shown in FIG. 2 where the fulcrum guides 13 are provided directly above the respective bobbins B and function as fulcrums of traversal and a yarn threading position shown in FIG. 3 where all fulcrum guides 13 are gathered to a front end portion of the guide member 11 and neighboring fulcrum guides 13 are close to each other.

[0059] The yarns 10 threaded to the respective fulcrum guides 13 are wound onto bobbins B attached to the bob-

bin holder 7 at the winding position, respectively, while being traversed about the fulcrum guides 13 in the axial direction of the bobbins B by the traverse guides 8. As a result, packages P are formed around the bobbins B. When the yarns are wound, as the contact roller 9 in contact with the outer circumferential surface of each package P rotates while applying a predetermined contact pressure to each package P, the shape of the package P is adjusted.

[0060] In the facility shown in FIG. 1, a plurality of spun yarn take-up machines 1 are aligned in the left-right direction. In the facility shown in FIG. 1, furthermore, frames 91 and 92 are provided to support members such as the thermal insulation box 26 and the yarn feed rollers 16 and 17 of each spun yarn take-up machine 1. The frame 91 extends in the up-down direction and is provided between neighboring spun yarn take-up machines 1.

[0061] An upper end portion of the frame 91 is substantially as high as an upper end portion of the thermal insulation box 26. The frame 92 is provided above the frame 91 and extends along the left-right direction across plural spun yarn take-up machines 1. The height from the floor surface F on which the yarn winding apparatus 5 is placed to the frame 92 is about 2.8 meters. The frame 92 is located above the components (yarn guides 20 to 24, the yarn feed rollers 16 to 19, the first heating rollers 4a, 4b, and 4c, and the second heating rollers 4d and 4e) constituting the take-up unit 4. The frame 92 is made of a material which is conductive and ferromagnetic, such as iron. The frame 92 is grounded. Furthermore, as shown in FIG. 2, a front surface of the frame 92 is located before the fulcrum guides 13. In other words, in the direction in which the fulcrum guides 13 are lined up, the front surface of the frame 92 is closer to a space where an operator (see FIG. 1) performs after-mentioned yarn threading operation than the fulcrum guides 13.

[0062] As shown in FIG. 2, the frame 92 is provided substantially directly below the spinning apparatus 2. The yarns 10 spun out from the spinning apparatus 2 pass in front of the frame 92 and reach the yarn guide 20, are bended at the yarn guide 20, and are then sent to the yarn feed roller 16.

(Structures of Yarn Threading Assisting Tool 60 and Ground Wire 70)

[0063] The yarns 10 are threaded by the operator to the yarn guides 20 to 24 and the fulcrum guides 13 of the above-mentioned spun yarn take-up machine 1, by using a yarn threading assisting tool 60 shown in FIG. 4 and FIG. 5. The yarn threading assisting tool 60 is a flat plate member having a plurality of retaining grooves 61 and made of stainless steel. The retaining grooves 61 retain the respective yarns 10, and each of the grooves is a slit cut off from the edge. The respective retaining grooves 61 are arranged radially in a fan-like shape widen from the open end side (thread inlet side) of the slit toward the closed end side. Each retaining groove 61 linearly extends from the open end side toward the closed end side. For this reason, an inclination angle between the central retaining groove 61 and another retaining groove 61 increases as the another retaining groove 61 gets away from the central one. Furthermore, the retaining grooves 61 are arranged so that the distance W1 between neighboring retaining grooves 61 on the open end side is shorter than the distance W2 between the neighboring retaining grooves 61 on the closed end side.

[0064] The yarn threading assisting tool 60 has a grip 62 which extends along the direction in which the retaining grooves 61 are aligned. A hole 63 is formed at an end portion of the grip 62 on the opposite side of the retaining grooves 61. As shown in FIG. 5, on yarn threading, a hook member 72 fixed to an after-mentioned ground wire 70 is hooked into the hole 63.

[0065] When the operator performs the yarn threading by using the above-mentioned yarn threading assisting tool 60, the operation is performed through the yarn threading assisting tool 60 with the ground wire 70 being attached, as shown in FIG. 1. A conductive magnet 71 is fixed to one end portion of the ground wire 70. The magnet 71 is magnetically attached to the front surface of the frame 92 (see FIG. 1). In other words, the ground wire 70 is conductively attached to the frame 92 by the magnet 71.

[0066] The hook member 72 shown in FIG. 5 is attached to the other end portion of the ground wire 70, which is opposite to the one end portion to which the magnet 71 is fixed. The hook member 72 is made of a conductive material. The hook member 72 can be hooked into the hole 63 of the yarn threading assisting tool 60. By the hook member 72, the ground wire 70 can be conductively and detachably attached to the yarn threading assisting tool 60.

[0067] The hook member 72 is intrinsically made of a magnet in itself, or a magnet (not illustrated) is attached extrinsically. When the operator performs the yarn threading, the hook member 72 is hooked into the hole 63 of the yarn threading assisting tool 60 as shown in FIG. 5. When the yarn threading is not performed, the hook member 72 is detached from the yarn threading assisting tool 60 and is magnetically fixed to the frame 92. At this stage, the whole ground wire 70 is attached to the frame 92 as indicated by a one-dot chain line in FIG. 1. To be more specific, as shown in FIG. 1, the ground wire 70 is attached to a location between two groups of the yarns 10 which are spun out from the spinning apparatuses 2 of two neighboring spun yarn take-up machines 1 and pass in front of the frame 92.

[0068] The ground wire 70 of the present embodiment has a spring property (elasticity). Because the ground wire 70 has a spring property, the ground wire 70 is shortened and the entirety of the wire is attached to the frame 92 when the yarn threading is not performed, with the result that a space for attaching the ground wire 70 is downsized. The ground wire 70 is therefore attached to a location where the wire does not interfere with the yarns

10 passing in front of the frame 92. Furthermore, because the ground wire 70 can be elongated when the yarn threading is performed, the accessible range is wide.

(Yarn Threading Process)

[0069] Further referring to FIG. 6, the following will describe a process executed when yarns are threaded to the spun yarn take-up machine 1. The yarn threading is performed in a state in which the yarn feed roller 19 is at the front position (indicated by two-dot chain lines in FIG. 2) and the fulcrum guides 13 are at the yarn threading position (which is shown in FIG. 3). The operator performs the yarn threading from the front side of the spun yarn take-up machine 1. When the yarn threading is not performed, the whole ground wire 70 is attached to the frame 92 as the magnet 71 and the hook member 72 are attached to the frame 92, as indicated by one-dot chain lines in FIG. 1. The operator performing the yarn threading detaches the hook member 72 of the ground wire 70 from the frame 92 and hooks the detached member into the hole 63 of the yarn threading assisting tool 60, as shown in FIG. 5. When hooking or removing the hook member 72 into or from the frame 92, the operator works on a step which is not illustrated.

[0070] To begin with, the operator performs the yarn threading to the yarn guide 20, the yarn guide 21, the yarn feed roller 16, the first heating rollers 4a, 4b, and 4c, the second heating rollers 4d and 4e, the yarn guide 22, the yarn feed roller 17, the yarn guide 23, the yarn feed roller 18, the yarn guide 24, and the yarn feed roller 19, while sucking the yarns 10 spun out from the spinning apparatus 2 by a suction gun (not illustrated).

[0071] Then the operator performs the yarn threading to the fulcrum guides 13. Subsequently, at a location between the yarn feed roller 19 and the suction gun (not illustrated), the operator combs the yarn threading assisting tool 60 in the yarns 10 as shown in FIG. 5. As a result, the yarns 10 threaded into the respective retaining grooves 61 are held by the retaining grooves 61 in a distributed manner.

[0072] Thereafter, as shown in FIG. 6, the yarns are threaded to the respective fulcrum guides 13 at the yarn threading position, as the yarn threading assisting tool 60 retaining the yarns 10 is operated. The operator holds the yarn threading assisting tool 60 and moves it so that the respective yarns 10 retained by the retaining grooves 61 are moved to the leading end portions 13a of the fulcrum guides 13corresponding to the respective yarns 10. In other words, the yarn threading assisting tool 60 is moved in a direction (obliquely leftward and forward as indicated by the arrow in the figure) which intersects with the front-rear direction which is identical with the arrangement direction of the fulcrum guides 13, on a horizontal plane. As a result, the yarns 10 are threaded to the respective fulcrum guides 13 while running along tracks indicated by two-dot chain lines in the figure. The yarns 10 are inserted into the fulcrum guides 13 from one side. The position of the yarn threading assisting tool 60 before the yarn threading is indicated by two-dot chain lines.

[0073] After the completion of the yarn threading to the fulcrum guides 13, the yarn feed roller 19 is moved from the front position to the rear position. Subsequently, the fulcrum guides 13 are moved from the yarn threading position to the fulcrum position. Then winding starts so that the yarns 10 are wound by bobbins B provided below.

(Advantageous Effects of First Embodiment)

[0074] As described above, the spun yarn take-up machine 1 of the first embodiment includes a plurality of yarn threading portions (fulcrum guides 13 and yarn guides 20 to 24) to which yarns 10 spun out from the spinning apparatus 2 are threaded, and threads the yarns to the yarn threading portions by using the yarn threading assisting tool 60 which is able to retain the yarns 10. The spun yarn take-up machine 1 includes the conductive frame 92, the ground wire 70, the magnet 71 which conductively attaches the ground wire 70 to the frame 92, and the hook member 72 which conductively attaches the ground wire 70 to the yarn threading assisting tool 60. It is therefore possible to conductively attach the ground wire 70 to the conductive frame 92 and to conductively attach the ground wire 70 to the yarn threading assisting tool 60. On this account, it is possible to discharge the static electricity accumulated in the yarn threading assisting tool 60 to the frame 92 via the ground wire 70, when the operator performs the yarn threading to the yarn threading portions (fulcrum guides 13 and yarn guides 20 to 24) by using the yarn threading assisting tool 60. As a result, it is possible to prevent the operator from receiving an electric shock when performing the yarn threading.

[0075] In addition to the above, in the first embodiment, by the magnet 71, the ground wire 70 is attached to the frame 92 which is above the yarn threading portions (fulcrum guides 13 and yarn guides 20 to 24). In other words, the attaching position of the ground wire 70 to the frame 92 by the magnet 71 is above the yarn threading portions. When the attaching position of the ground wire 70 is low, the ground wire 70 obstructs the yarn threading by the operator and deteriorates the workability. In the first embodiment, because the attaching position of the ground wire 70 is above the yarn threading portions, the deterioration of the workability on account of the ground wire 70 is restrained.

[0076] In addition to the above, in the first embodiment, by the magnet 71, the ground wire 70 is attached to the frame 92 which is above the take-up unit 4. In other words, the attaching position of the ground wire 70 to the frame 92 by the magnet 71 is above the take-up unit 4. Because the attaching position of the ground wire 70 is above the take-up unit 4, the ground wire 70 is less likely to interfere with the rollers (yarn feed rollers 16 to 19) of the take-up unit 4. It is therefore possible to restrain the ground wire 70 from being caught by a roller.

[0077] In the first embodiment, yarns are threaded by using the yarn threading assisting tool 60 to the fulcrum guides 13 which are provided below the take-up unit 4 and to which the yarns 10 sent from the take-up unit 4 to the yarn winding apparatus 5 are threaded. In the present embodiment, electric charge is accumulated in the yarns 10 on account of friction between the rollers (yarn feed rollers 16 to 19, first heating rollers 4a, 4b, and 4c, and second heating rollers 4d and 4e) of the take-up unit 4 and the yarns 10. On this account, the amount of the electric charge of the yarn threading assisting tool 60 is large when the yarns 10 sent from the take-up unit 4 to the yarn winding apparatus 5 are threaded to the yarn threading portions. The present invention is therefore effectively applied to discharge the static electricity accumulated in the yarn threading assisting tool 60 to the frame 92 via the ground wire 70.

[0078] In the first embodiment, the fulcrum guides 13 are aligned in a line in the front-rear direction. When yarn threading is performed to the fulcrum guides 13 aligned in a line in the front-rear direction along the horizontal plane, the yarn threading is performed while the yarn threading assisting tool 60 is moved along one direction which intersects with the front-rear direction in the horizontal plane. As the yarn threading assisting tool 60 is moved in the one direction in the horizontal plane, the positional relationship between the attaching position of the ground wire 70 to the frame 92 and the yarn threading assisting tool 60 is changed. On this account, the ground wire 70 may be warped depending on the positional relationship between the attaching position of the ground wire 70 to the frame 92 and the yarn threading assisting tool 60. In the present embodiment, the attaching position of the ground wire 70 to the frame 92 is above the take-up unit 4 and the fulcrum guides 13 are provided below the take-up unit 4, and the distance between the attaching position of the ground wire 70 to the frame 92 and the fulcrum guides 13 is relatively long. On this account, the warpage of the ground wire 70 is relatively small on the yarn threading operation, and the ground wire 70 is less likely to be caught by a roller of the take-up unit 4 or the like. As such, the present invention is effectively employed.

[0079] In the first embodiment, the frame 92 is ferromagnetic and the conductive magnet 71 is fixed to the ground wire 70. The ground wire 70 is conductively attached to the frame 92 by the magnet 71. It is therefore easy to conductively attach the ground wire 70 to the frame 92.

[0080] In addition to the above, in the first embodiment, the ground wire 70 can be detachably attached to the yarn threading assisting tool 60. It is therefore possible to detach the ground wire 70 from the yarn threading assisting tool 60 when the yarn threading is not performed. The operator who performs the yarn threading is able to carry the yarn threading assisting tool 60. Furthermore, it is possible to use one yarn threading assisting tool 60 for plural spun yarn take-up machines 1.

[0081] In the first embodiment, the hook member 72 which can be hooked into the hole 63 of the yarn threading assisting tool 60 is fixed to the ground wire 70. It is therefore easy to detachably attach the ground wire 70 to the yarn threading assisting tool 60.

[0082] In the first embodiment, the magnet 71 is fixed to one end portion of the ground wire 70 in order to attach the ground wire 70 to the frame 92. The hook member 72 is fixed to the other end portion of the ground wire 70, which is opposite to the one end portion to which the magnet 71 is fixed. The hook member 72 is intrinsically made of a magnet, or a magnet is attached extrinsically. It is therefore possible to magnetically attach the hook member 72 to the frame 92 in a detachable manner. The entirety of the ground wire 70 can therefore be attached to the frame 92 when the yarn threading is not performed. It is possible to restrain the ground wire 70 from hanging down from the frame 92 and making contact with, for example, the yarns 10 and the rollers of the take-up unit 4, when the yarn threading is not performed.

<Second Embodiment>

[0083] The following will describe a second embodiment of the present invention with reference to FIG. 7(a) and FIG. 7(b). Each of FIG. 7(a) and FIG. 7(b) shows a yarn threading assisting tool of the second embodiment of the present invention. While in the embodiment above-mentioned the spun yarn take-up machine 1 includes the ground wire 70, in the present embodiment a yarn threading assisting tool 160 includes a ground wire 170. In the descriptions below, members identical with those in the first embodiment will be denoted by the same reference numerals and the explanations thereof may not be repeated.

[0084] As shown in FIG. 7(a) and FIG. 7(b), the yarn threading assisting tool 160 of the present embodiment includes a plate-shaped main body 165 in which retaining grooves 161 and a grip 162 are formed, the ground wire 170 conductively attached to the main body 165, a winding mechanism 175 configured to wind the ground wire 170 extending from the main body 165, and a magnet 171 which is pasted on a casing 175a of the winding mechanism 175. The magnet 171 is conductive, and electricity can be transmitted between the magnet 171 and the ground wire 170.

[0085] The winding mechanism 175 is not detailed because it is a known mechanism disclosed in, for example, Japanese Unexamined Patent Publication No. 2005-345107.

[0086] The winding mechanism 175 is arranged such that, when an operation button (not illustrated) is not operated, the ground wire 170 drawn out from the casing 175a by an operator is not wound back even if the operator removes a hand from the ground wire 170. When the operation button (not illustrated) is operated, the ground wire 170 having been drawn out is wound back to the casing 175a.

[0087] When yarn threading is not performed, the yarn threading assisting tool 160 is arranged such that the ground wire 170 is wound by the winding mechanism 175, and the yarn threading assisting tool 160 is held by the operator in this state. When yarn threading is not performed, the yarn threading assisting tool 160 may be stored in the vicinity of the spun yarn take-up machine 1. When performing the yarn threading, the operator draws the ground wire 170 out from the casing 175a of the winding mechanism 175 of the yarn threading assisting tool 160 and magnetically fixes the magnet 171 to the frame 92. As a result, electricity becomes transmittable between the ground wire 170 and the frame 92.

(Advantageous Effects of Second Embodiment)

[0088] In the second embodiment, being similar to the first embodiment, the ground wire 170 conductively attached to the main body 165 can be conductively attached to the conductive frame 92 of the spun yarn take-up machine 1. It is therefore possible to discharge the static electricity accumulated in the main body 165 of the yarn threading assisting tool 160 to the frame 92 via the ground wire 170, when the operator performs the yarn threading to the fulcrum guides 13 by using the yarn threading assisting tool 160. As a result, it is possible to prevent the operator from receiving an electric shock when performing the yarn threading.

[0089] In the second embodiment, the winding mechanism 175 capable of winding the ground wire 170 is provided. Because the ground wire 170 is wound by the winding mechanism 175 when the yarn threading is not performed, the portability of the yarn threading assisting tool 160 is improved.

(Modifications)

[0090] The embodiments of the present invention are described hereinabove. However, the specific structure of the present invention shall not be interpreted as to be limited to the above-mentioned embodiments. The scope of the present invention is defined not by the above embodiments but by claims set forth below, and shall encompass the equivalents in the meaning of the claims and every modification within the scope of the claims.

[0091] For example, while in the first embodiment above the ground wire 70 is attached to the frame 92 by the magnet 71, the ground wire 70 may be attached to the frame 92 by another means. For example, the ground wire 70 may be fixed by using a screw. While in the first embodiment above the hook member 72 by which the ground wire 70 is detachably attached to the yarn threading assisting tool 60 is magnetically attached to the frame 92 when the yarn threading is not performed, the hook member 72 may be attached to the frame 92 by using another means. For example, a ring-shaped member may be provided on the frame 92 to hook the hook member 72.

[0092] The following will describe a first modification of the first embodiment with reference to FIG. 8. In this modification, hook members 271 and 272 are fixed to end portions of a ground wire 270, respectively. The hook member 271 is hooked into a ring-shaped member 274a of the frame 92. The hook member 272 is hooked into a ring-shaped member 275a of the frame 92 when the yarn threading is not performed. In other words, as indicated by a one-dot chain line in FIG. 8, the entirety of the ground wire 270 is attached to the frame 92 when the yarn threading is not performed. When the yarn threading is performed, the hook member 272 is detached from the ring-shaped member 275a and is hooked into the hole 63 of the yarn threading assisting tool 60 in the same manner as in the first embodiment (see FIG. 5).

[0093] The ring-shaped members 274a and 275a and the hook members 271 and 272 are made of a conductive material. On this account, as the hook member 271 is hooked into the ring-shaped member 274a, the ground wire 270 is conductively attached to the frame 92. The hook member 272 may be magnetically attached to the frame 92 in the same manner as in the first embodiment.

[0094] While the first and second embodiments above and the first modification of the first embodiment describe that the ground wire 70 (170, 270) is attached to the frame 92 which is above the take-up unit 4 and the yarn threading portions (fulcrum guides 13 and yarn guides 20 to 24) to which yarns are threaded by the yarn threading assisting tool 60 (160), the position where the ground wire 70 (170, 270) is attached is not limited to this. The ground wire 70 (170, 270) may be attached to a frame different from the frame 92 lower than the yarn threading portions and the take-up unit 4.

[0095] While the first and second embodiments above and the first modification of the first embodiment describe that the fulcrum guides 13 are aligned in a line in the front-rear direction, the arrangement direction of the fulcrum guides 13 is not limited to this. For example, the fulcrum guides may be aligned in a line in a direction intersecting with the front-rear direction, or may not be aligned in a line.

[0096] While in the first embodiment above and its first modification the ground wire 70 (270) is detachably attached to the yarn threading assisting tool 60 by the hook member 72 (272), the disclosure is not limited to this arrangement. For example, in a second modification of the first embodiment shown in FIG. 9(a) and FIG. 9(b), the ground wire 70 is detachably attached to the yarn threading assisting tool 60 by an openable ring-shaped member 372 instead of the hook member 72 (272). The ring-shaped member 372 is formed of two circular-arc-shaped members 372a and 372b. The circular-arc-shaped members 372a and 372b are connected to each other at end portions by a shaft 372c. The ring-shaped member 372 is switched between a closed state in which a ring shape is formed as shown in FIG. 9(a) and an open state in which the ring is partially cut out as shown in FIG. 9(b), as the circular-arc-shaped members 372a and 372b are

rotated about the shaft 372c. When the ground wire is attached to or detached from the yarn threading assisting tool 60, the ring-shaped member 372 is opened. After being attached to the yarn threading assisting tool 60, the ring-shaped member 372 is closed. This prevents the ground wire 70 from being detached from the yarn threading assisting tool 60 during the yarn threading. The ring-shaped member 372 may not be formed of the two circular-arc-shaped members 372a and 372b. The ring-shaped member may be formed of one circular-arc-shaped member and one rectilinear member, such as a carabiner. The ground wire 70 (270) may not be detachable from the yarn threading assisting tool 60.

[0097] While in the first embodiment above and its first modification the entirety of the ground wire 70 is attached to the frame 92 by attaching the hook member 72 (272) to the frame 92, the hook member 72 (272) may not be attachable to the frame 92.

[0098] In the second embodiment above, the magnet 171 is pasted onto the casing 175a of the winding mechanism 175, and the ground wire 170 is attached to the frame 92 by magnetically fixing the magnet 171 to the frame 92. However, means for attaching the ground wire 170 to the frame 92 is not limited to this. For example, the ground wire 170 may be attached to the frame 92 in such a way that a hook member provided on the casing 175a of the winding mechanism 175 is hooked into a ring-shaped member provided on the frame 92.

[0099] While in the embodiments above the yarns are threaded to the yarn guides 20 to 24 and the fulcrum guides 13 by using the yarn threading assisting tool 60, the disclosure is not limited to this arrangement. The yarn threading assisting tool 60 may be used to perform yarn threading to at least one of the yarn guides 20 to 24 and the fulcrum guides 13.

[0100] While in the embodiments above the ground wire 70 has a spring property (elasticity), the disclosure is not limited to this arrangement. The ground wire 70 may not have a spring property (elasticity), on condition that the ground wire 70 can be attached to a position where the wire does not interfere with the yarns 10 when the yarn threading is not performed and the ground wire 70 is long enough for the yarn threading.

Claims

1. A spun yarn take-up machine (1) which includes a plurality of yarn threading portions (13) to which yarns (10) spun out from a spinning apparatus (2) are threaded,
the yarns (10) being threaded to the yarn threading portions (13) by using a yarn threading assisting tool (60) capable of retaining the yarns (10),
the spun yarn take-up machine (1) comprising:

a conductive frame (92);
a ground wire (70);
a first attaching portion (71) by which the ground wire (70) is conductively attached to the frame (92); and
a second attaching portion (72) by which the ground wire (70) is conductively attached to the yarn threading assisting tool (60).

2. The spun yarn take-up machine (1) according to claim 1, wherein,
an attaching position of the ground wire (70) to the frame (92) by the first attaching portion (71) is above the yarn threading portions (13).

3. The spun yarn take-up machine (1) according to claim 2 further comprising
a take-up unit (4) which
is provided below the spinning apparatus (2) and
includes one or more rollers (16, 17, 18, 19) for taking up the yarns (10) spun out from the spinning apparatus (2),
an attaching position of the ground wire (70) to the frame (92) by the first attaching portion (71) being above the take-up unit (4).

4. The spun yarn take-up machine (1) according to claim 3 further comprising
a yarn winding apparatus (5) which
is provided below the take-up unit (4) to wind the yarns (10) supplied from the take-up unit (4) onto respective bobbins (B),
the yarn threading portions (13) being provided below the take-up unit (4) and
the yarns (10) supplied from the take-up unit (4) to the yarn winding apparatus (5) being threaded to the yarn threading portions (13).

5. The spun yarn take-up machine (1) according to any one of claims 1 to 4, wherein,
the frame (92) is ferromagnetic, and
the first attaching portion (71) is a conductive magnet (71) fixed to the ground wire (70).

6. The spun yarn take-up machine (1) according to any one of claims 1 to 5, wherein,
the second attaching portion (72) detachably attaches the ground wire (70) to the yarn threading assisting tool (60) .

7. The spun yarn take-up machine (1) according to claim 6, wherein,
the second attaching portion (72) is a hook member (72) which is fixed to the ground wire (70) and is able to be hooked into a hole (63) formed in the yarn threading assisting tool (60).

8. The spun yarn take-up machine (1) according to claim 6, wherein,
the second attaching portion (72) is a ring-shaped

member (372) which is fixed to the ground wire (70), is able to be engaged with a hole (63) formed in the yarn threading assisting tool (60), and is openable and closable.

9. The spun yarn take-up machine (1) according to claim 7 or 8, wherein,
the first attaching portion (71) attaches one end portion of the ground wire (70) to the frame (92),
the second attaching portion (72) is fixed to the other end portion of the ground wire (70), which is opposite to the one end portion, and
an engaging member (275a) including an engaging portion capable of being engaged with the second attaching portion (72) is provided on the frame (92).

10. The spun yarn take-up machine (1) according to claim 6, wherein,
the first attaching portion (71) attaches one end portion of the ground wire (70) to the frame (92), and
a retaining portion (72) is further provided to detachably attach the other end portion of the ground wire (70) opposite to the one end portion to the frame (92) so as to attach the entirety of the ground wire (70) to the frame (92).

11. The spun yarn take-up machine (1) according to any one of claims 1 to 10, wherein,
the attaching position of the ground wire (70) to the frame (92) by the first attaching portion (71) is closer to a working space than the yarn threading portions (13), in a direction in which the yarn threading portions (13) are lined up.

12. A yarn threading assisting tool (160) for threading yarns (10) spun out from a spinning apparatus (2) to yarn threading portions (13) of a spun yarn take-up machine (1), comprising:

a main body (165) in which retaining grooves (161) for retaining the respective yarns (10) are formed;
a ground wire (170) which is conductively attached to the main body (165); and
an attaching portion (171) which detachably attaches the ground wire (170) to a conductive frame (92) of the spun yarn take-up machine (1) to transmit electricity between the ground wire (170) and the frame (92) when the ground wire (170) is attached to the frame (92).

13. The yarn threading assisting tool (160) for a spun yarn take-up machine according to claim 12, further comprising
a winding mechanism (175) which is capable of winding the ground wire (170).

FIG.1

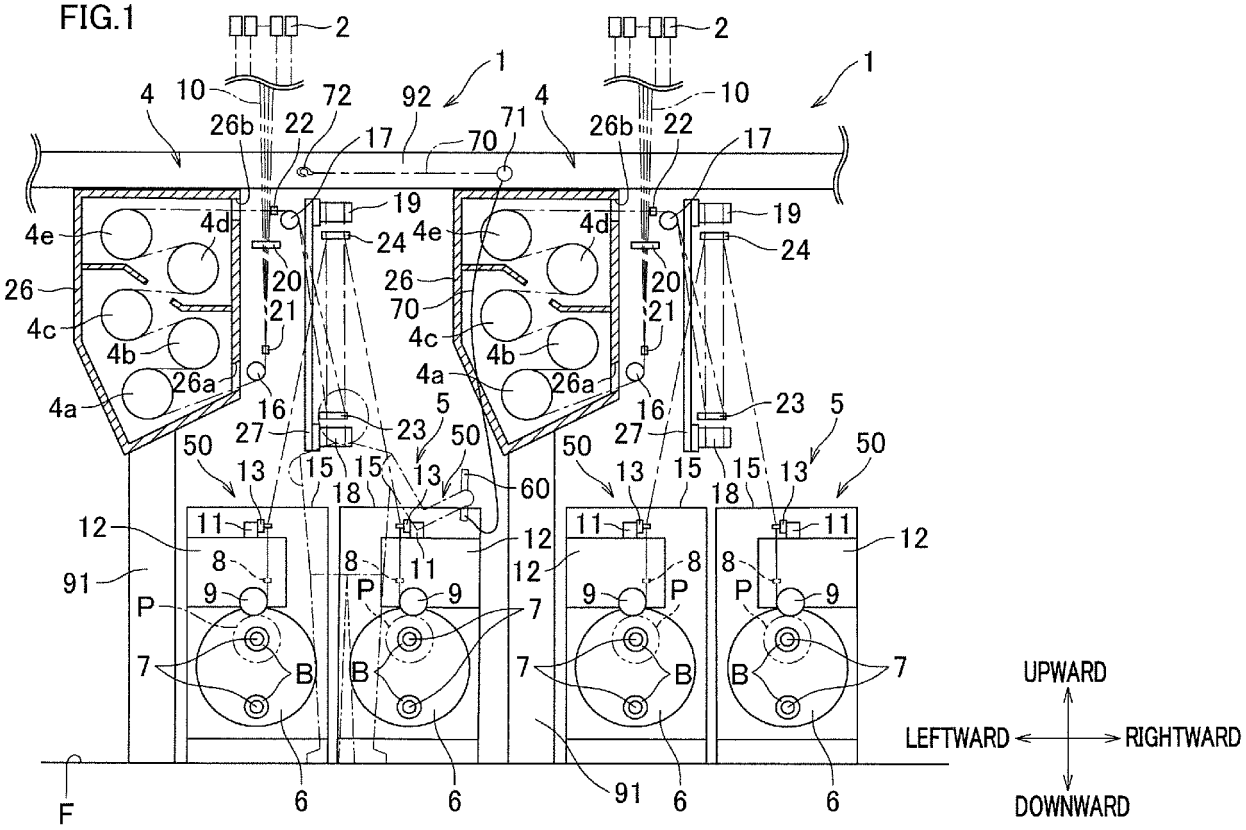

2
1
4
10
72
92
71
26b
22
17
70
19
24
4e
4d
26
20
21
4c
4b
26a
4a
16
27
23
5
50
13
15
18
60
12
11
8
9
P
7
B
91
6
F
UPWARD
LEFTWARD
RIGHTWARD
DOWNWARD

FIG.2

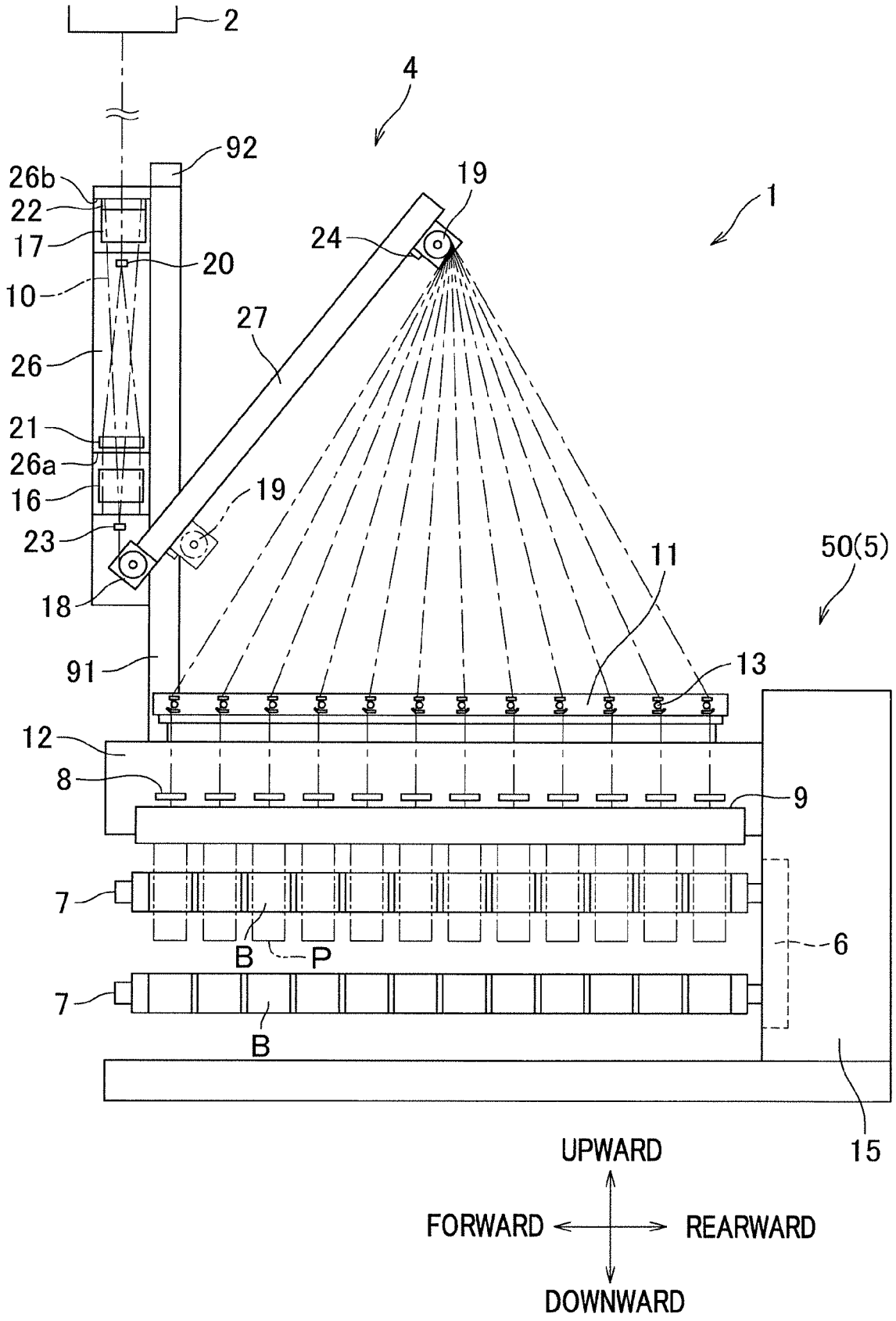

2
4
92
26b
22
17
20
10
26
21
26a
16
23
18
91
19
24
19
1
27
50(5)
11
13
12
8
9
7
B
P
6
7
B
15
UPWARD
FORWARD
REARWARD
DOWNWARD

FIG.3

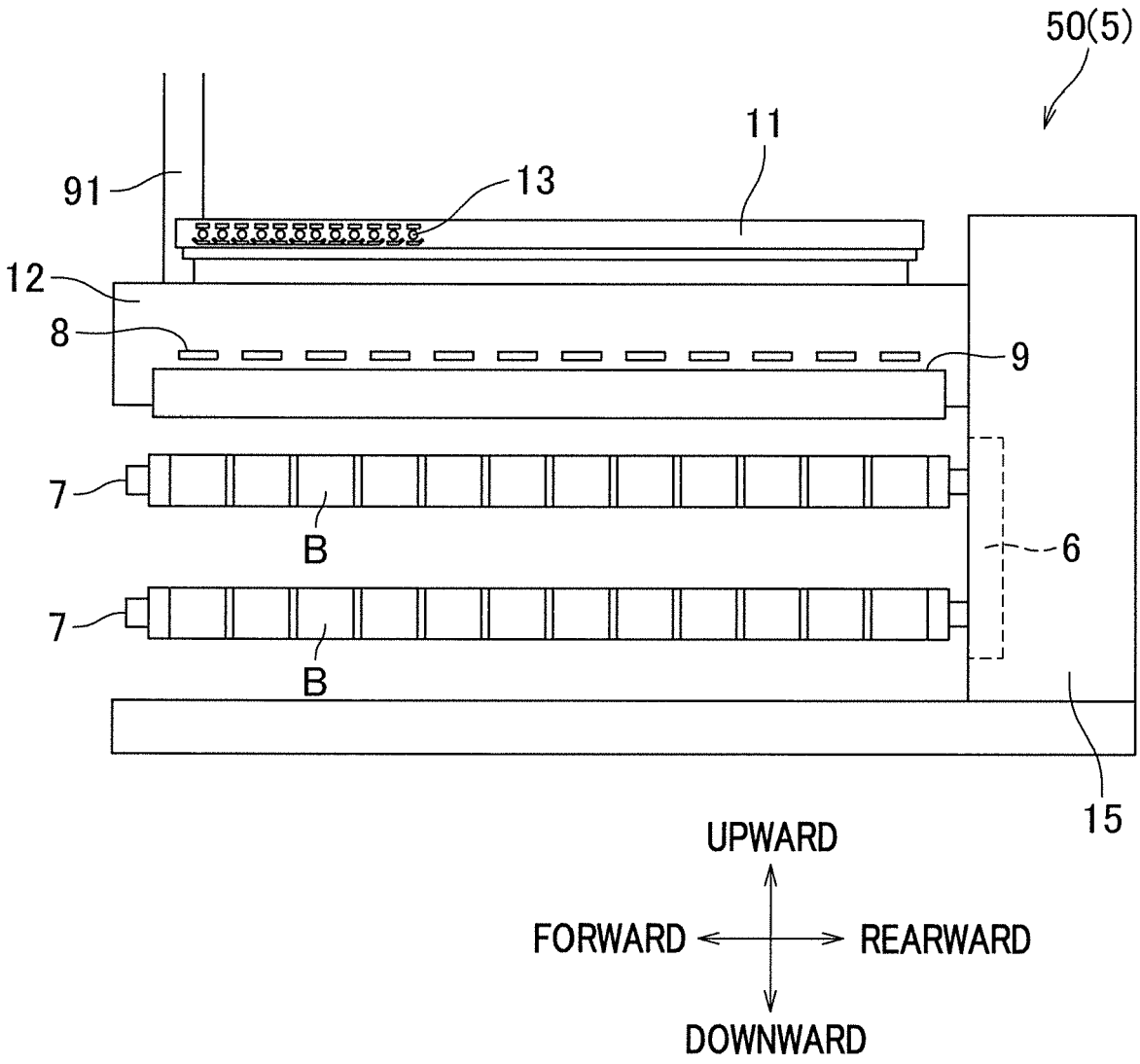


FIG.4

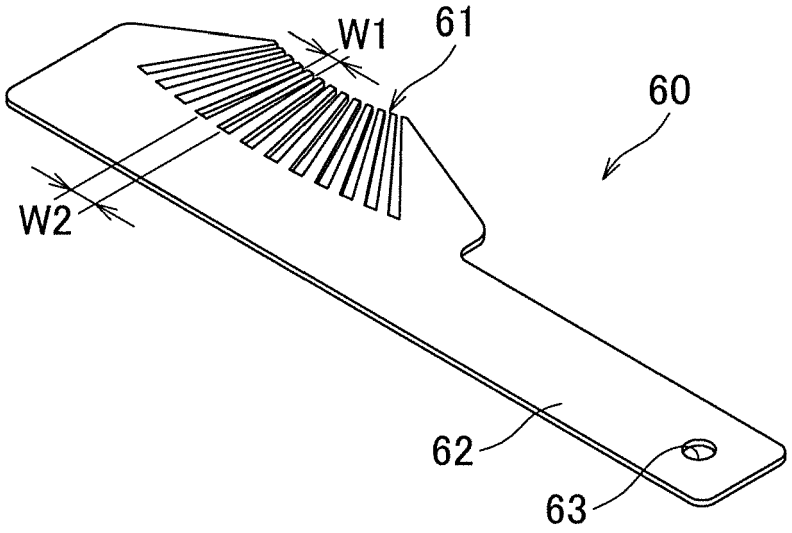


FIG.5

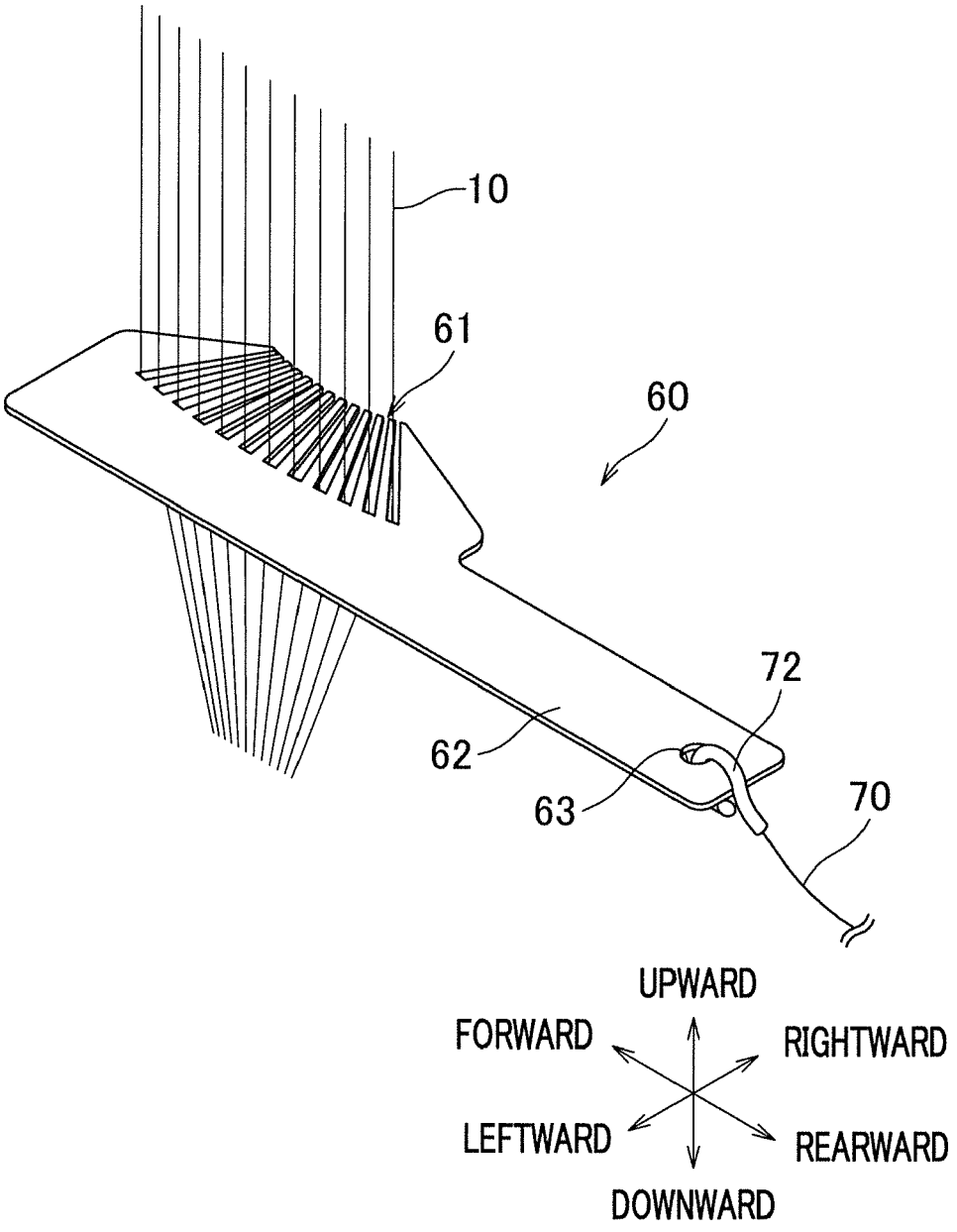

10
61
60
72
62
63
70
UPWARD
FORWARD
RIGHTWARD
LEFTWARD
REARWARD
DOWNWARD

FIG.6

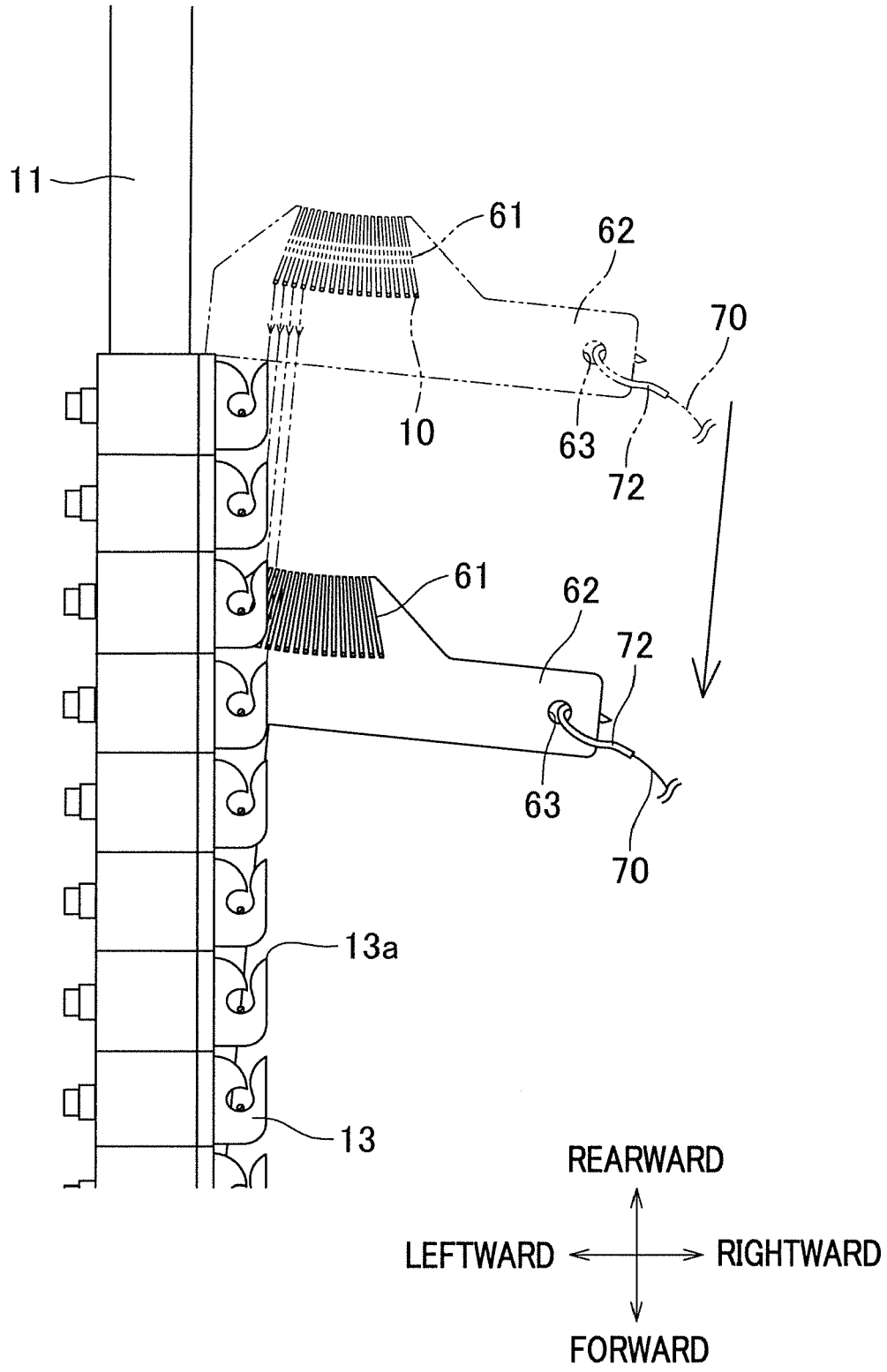
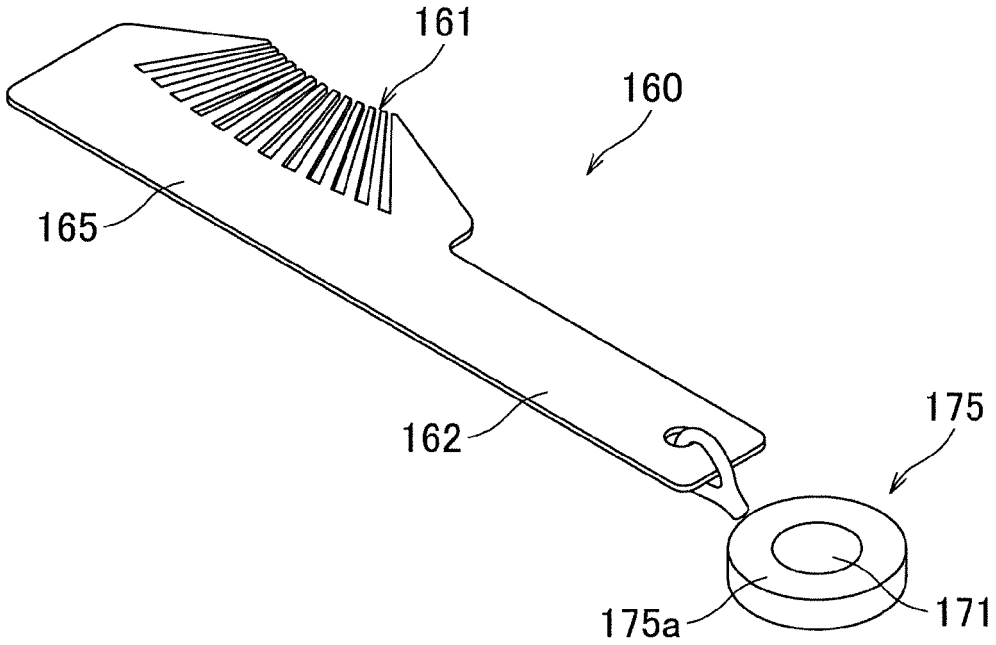

11
61
62
70
10
63
72
61
62
72
63
70
13a
13
REARWARD
LEFTWARD
RIGHTWARD
FORWARD

FIG.7

(a)



(b)

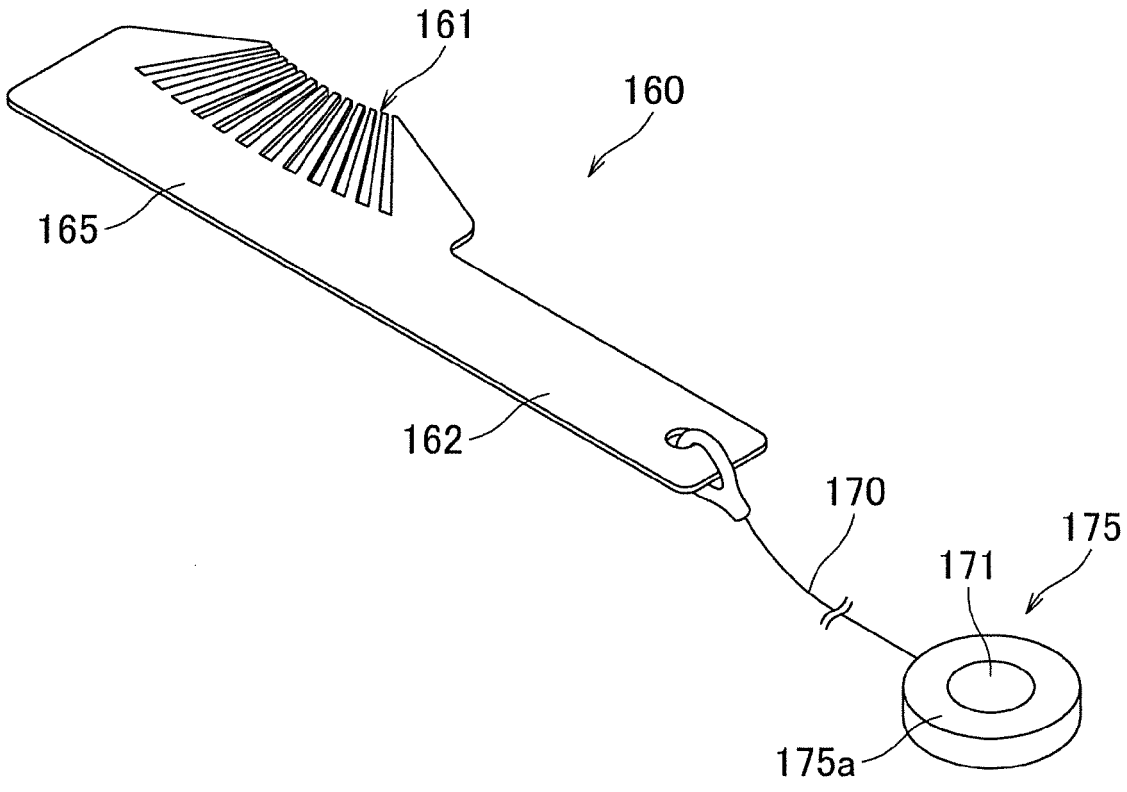


FIG.8

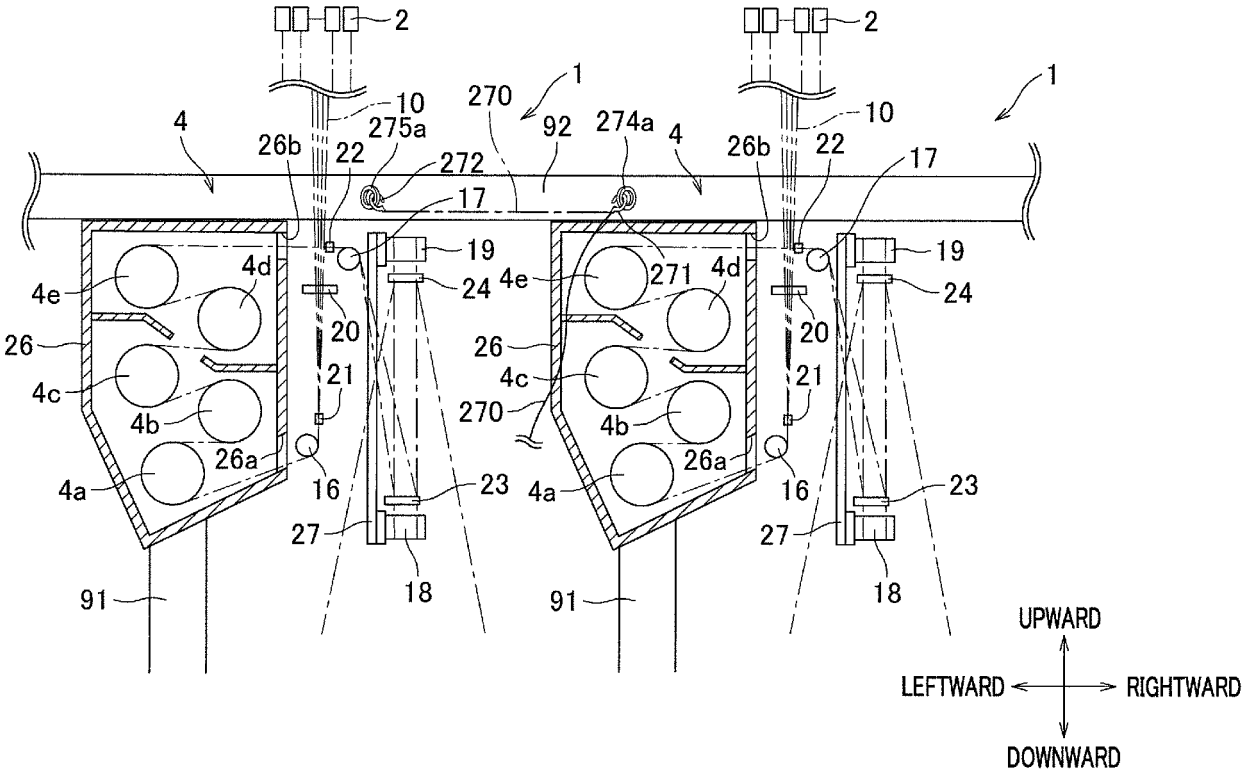
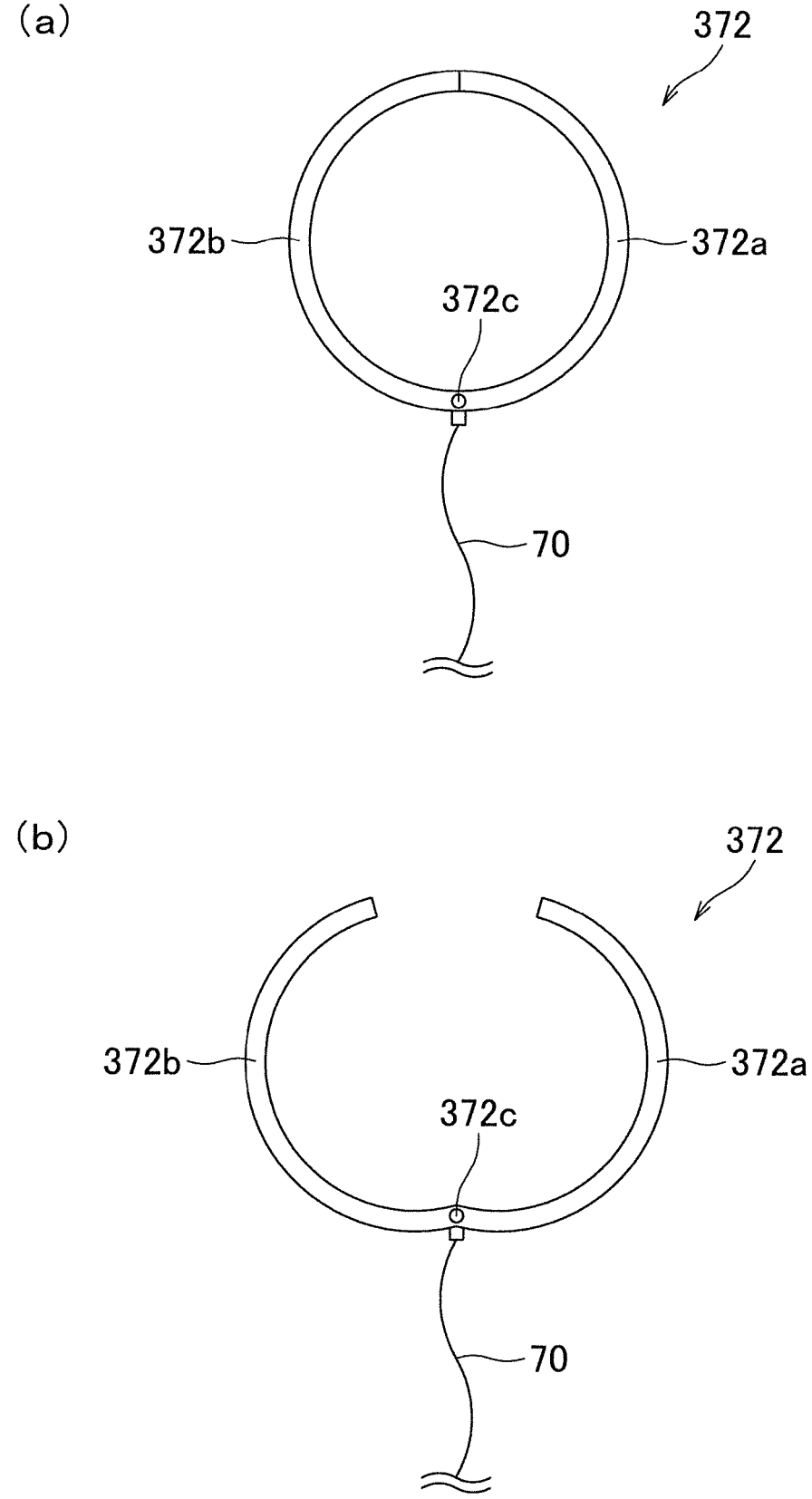

2
2
1
1
10
10
270
92
274a
275a
272
4
4
26b
22
26b
22
17
17
19
19
24
24
4d
4e
271
4d
4e
20
20
26
26
21
21
4c
4c
270
4b
4b
26a
26a
4a
4a
16
16
23
23
27
27
18
18
91
91
UPWARD
LEFTWARD
RIGHTWARD
DOWNWARD

FIG.9



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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 3595

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraph [0027] - paragraph [0031] *	12,13	
A	* paragraph [0042] *	2-4	
	* figure 3 *		

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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	13 December 2019	Guisan, Thierry

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13-12-2019

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