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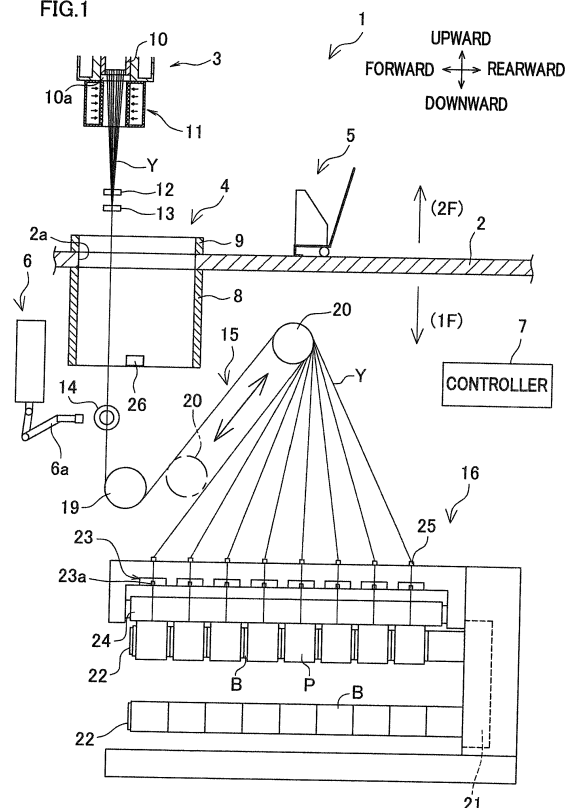
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(54) **YARN BRING-DOWN APPARATUS AND SPUN YARN TAKE-UP SYSTEM**

(57) Yarn bring-down at each spun yarn take-up apparatus is achieved with low cost, even when a large number of spun yarn take-up apparatuses are lined up. A yarn bring-down apparatus 5 is provided in a spun yarn take-up system configured to take up, on a lower floor, yarns spun out from a spinning apparatus on an upper floor, and includes a wagon main body 30 configured to be movable on the upper floor and a yarn bring-down member 31 which is provided in the wagon main body 30 and is capable of moving down to the lower floor while retaining the yarns Y spun out from the spinning apparatus.

FIG. 1



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn bring-down apparatus for bringing down yarns spun out from a spinning apparatus and a spun yarn take-up system including the yarn bring-down apparatus.

[0002] For example, Patent Literature 1 (International Publication No. 2015/198698) discloses a spun yarn take-up apparatus configured to take up yarns spun out from a spinning apparatus. This spun yarn take-up apparatus is structured to have two stages. The spinning apparatus is provided on the second floor, whereas a take-up unit taking up yarns spun out from the spinning apparatus and a winding device are provided on the first floor. For this reason, to thread yarns onto the take-up unit and the winding device, it is necessary to bring yarns spun out from the spinning apparatus down to the first floor. Patent Literature 1 therefore discloses a yarn bring-down apparatus which is configured to bring yarns spun out from the spinning apparatus from the second floor to the first floor, while retaining these yarns.

SUMMARY OF THE INVENTION

[0003] In order to improve the efficiency in production of yarns, spun yarn take-up systems of these days are often arranged so that a lot of spinning apparatuses and spun yarn take-up apparatuses are lined up in each system. If the yarn bring-down apparatus of Patent Literature 1 is employed in such a system, it is necessary to provide a bring-down device for each spun yarn take-up apparatus. Increase in cost of the system including the maintenance cost is a matter of concern.

[0004] The present invention has been done to solve the problem above, and an object of the present invention is to achieve yarn bring-down at each spun yarn take-up apparatus with low cost, even when a plurality of spun yarn take-up apparatuses are lined up.

[0005] A yarn bring-down apparatus of the present invention is provided in a spun yarn take-up system configured to bring yarns spun out from a spinning apparatus on an upper floor down to a lower floor, and includes a wagon main body configured to be movable on the upper floor and a yarn bring-down member which is provided in the wagon main body and is capable of moving down to the lower floor while retaining the yarns spun out from the spinning apparatus.

[0006] With this arrangement, because the yarn bring-down member is provided in the wagon main body which is movable on the upper floor, yarn bring-down can be done at a suitable location by moving the wagon main body. On this account, when a plurality of spun yarn take-up apparatuses are lined up, yarn bring-down at each spun yarn take-up apparatus is possible by moving the wagon main body, and no dedicated apparatus is required for each spun yarn take-up apparatus. It is there-

fore possible to restrain the cost of the system including the maintenance cost.

[0007] In the yarn bring-down apparatus of the present invention, the yarn bring-down member may include a plurality of hooking portions which are spaced apart from each other in a direction intersecting with the up-down direction and are each able to hook the yarns.

[0008] According to this arrangement, as the yarns are hooked on the hooking portions, it is possible, above the hooking portions, to cause the yarns upstream of the hooking portions to be spaced apart from the yarns on the downstream. On this account, when the yarns are handed over on the lower floor, the yarns are certainly handed over only from one of the upstream side and the downstream side.

[0009] In the yarn bring-down apparatus of the present invention, each of the hooking portions may form a slit which is open downward.

[0010] With this arrangement, because the yarns are hooked on the hooking portions when the yarn bring-down member is brought down, the yarns are easily retained by the yarn bring-down member.

[0011] The yarn bring-down apparatus of the present invention may be arranged such that, the yarn bring-down member is connected to a wire, and a first reel for winding the wire is provided in the wagon main body.

[0012] With this arrangement, as the wire is drawn out from the first reel, the yarn bring-down member is brought down. Furthermore, the apparatus is small in size because the wire is wound on the first reel in cases other than the yarn bring-down.

[0013] In the yarn bring-down apparatus of the present invention, a first driving unit may be provided in the wagon main body to rotationally drive the first reel.

[0014] With this arrangement, the yarn bring-down member is automatically moved up or down by driving the first driving unit, and this reduces the burden on the operator. Furthermore, as the first driving unit functions as a brake, the wire is not unintentionally drawn out by the weight of the yarn bring-down member, and hence the yarn bring-down member is stably brought down.

[0015] In the yarn bring-down apparatus of the present invention, a guide member for guiding the yarn bring-down member in the up-down direction may be provided in the wagon main body.

[0016] This arrangement allows the yarn bring-down member to be brought down along the guide member, and hence the yarn bring-down member is stably brought down to a desired location.

[0017] The yarn bring-down apparatus of the present invention may be arranged such that the guide member is flexible and woundable, and a second reel for winding the guide member is provided in the wagon main body.

[0018] With this arrangement, as the guide member is drawn out from the second reel, the guide member is brought down. Furthermore, the apparatus is small in size because the guide member is wound on the second reel in cases other than the yarn bring-down.

[0019] In the yarn bring-down apparatus of the present invention, a second driving unit may be provided in the wagon main body to rotationally drive the second reel.

[0020] With this arrangement, the guide member is automatically moved up or down by driving the second driving unit, and this reduces the burden on the operator. Furthermore, as the second driving unit functions as a brake, the guide member is not unintentionally drawn out by the weight of the guide member, and hence the guide member is stably brought down.

[0021] In the yarn bring-down apparatus of the present invention, a suction member may be provided in the wagon main body to suck the yarns spun out from the spinning apparatus.

[0022] With this arrangement, as the suction member sucks the yarns, it is easy to cause the yarn bring-down member to retain the yarns.

[0023] A spun yarn take-up system of the present invention is configured to take up, on a lower floor, yarns spun out from a spinning apparatus provided on an upper floor, the spun-yarn take-up system including a yarn bring-down apparatus configured to bring down the yarns spun out from the spinning apparatus from the upper floor to the lower floor, the yarn bring-down apparatus including: a wagon main body configured to be movable on the upper floor; and a yarn bring-down member which is provided in the wagon main body and is capable of moving down to the lower floor while retaining the yarns spun out from the spinning apparatus.

[0024] With this arrangement, because the yarn bring-down member is provided in the wagon main body which is movable on the upper floor, yarn bring-down can be done at a suitable location by moving the wagon main body. On this account, when a plurality of spun yarn take-up apparatuses are lined up, yarn bring-down to the sucking retaining unit at each spun yarn take-up apparatus is possible by moving the wagon main body, and no dedicated apparatus is required for each spun yarn take-up apparatus. It is therefore possible to restrain the cost of the system including the maintenance cost.

[0025] In the spun yarn take-up system of the present invention, a guide member which is capable of moving up and down may be provided in the wagon main body to guide the yarn bring-down member in an up-down direction.

[0026] This arrangement allows the yarn bring-down member to be brought down along the guide member, and hence the yarn bring-down member is stably brought down to a desired location.

[0027] The spun yarn take-up system of the present invention may be arranged such that, a positioning portion is provided on the lower floor to position the guide member, and an engaging portion which is positioned by being engaged with the positioning portion is provided at a lower end portion of the guide member.

[0028] With this arrangement, the accuracy of the descending position where the yarn bring-down member is brought down along the guide member is improved be-

cause the guide member is positioned. This makes it possible to accurately hand over the yarns on the first floor.

[0029] The spun yarn take-up system of the present invention may be arranged such that an opening allowing the yarns to pass therethrough is formed in a partition floor provided between the upper floor and the lower floor, and a tubular cover member is provided at the periphery of the opening to protrude downward from the partition floor, and the positioning portion is provided on the inner wall of the cover member.

[0030] With this arrangement, the guide member moves along the inner wall of the cover member when the guide member is brought down, with the result that the engaging portion is easily engaged with the positioning portion.

[0031] The spun yarn take-up system of the present invention may be arranged such that a drop prevention wall is provided at the periphery of the opening to protrude upward from the partition floor and a contact portion is formed at a front end portion of the wagon main body to be able to make contact with the drop prevention wall, and as the wagon main body is positioned so that the contact portion is in contact with the drop prevention wall, the guide member is brought down along the inner wall of the cover member.

[0032] This arrangement makes it easy to position the wagon main body in order to cause the guide member to move along the inner wall of the cover member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

FIG. 1 is a schematic diagram of a spun yarn take-up system of an embodiment of the present invention.

FIG. 2 is a perspective view of a yarn bring-down apparatus.

FIG. 3 is a schematic diagram of the yarn bring-down apparatus which has been positioned.

FIG. 4 is a schematic diagram of the yarn bring-down apparatus when a guide member has been brought down.

FIG. 5 is a schematic diagram of the yarn bring-down apparatus when a yarn bring-down member has been brought down.

FIG. 6 is a cross section taken at the VI-VI line in FIG. 5.

FIG. 7 shows the spun yarn take-up system before the guide member is brought down.

FIG. 8 shows the spun yarn take-up system when the guide member has been brought down.

FIG. 9 shows the spun yarn take-up system immediately before the yarn bring-down member is brought down.

FIG. 10 shows the spun yarn take-up system when the yarn bring-down member has been brought down.

FIG. 11 shows the spun yarn take-up system during yarn threading by a yarn threading apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Outline)

[0034] The following will describe an embodiment of the present invention. FIG. 1 is a schematic diagram of a spun yarn take-up system of the present embodiment. The spun yarn take-up system 1 is divided into a first floor (lower floor) and a second floor (upper floor) by a partition floor 2. As main components, the spun yarn take-up system 1 includes a spinning apparatus 3, a spun yarn take-up apparatus 4, a yarn bring-down apparatus 5, a yarn threading apparatus 6, and a controller 7. The spinning apparatus 3, a part of the spun yarn take-up apparatus 4, and the yarn bring-down apparatus 5 are provided on the second floor, whereas the remaining part of the spun yarn take-up apparatus 4 and the yarn threading apparatus 6 are provided on the first floor. The yarn bring-down apparatus 5 is allowed to be freely movable on the second floor. On this account, the layout of the yarn bring-down apparatus 5 shown in FIG. 1 is a mere example. The controller 7 is configured to control the whole operation of the spun yarn take-up system 1. To be more specific, for example, the controller 7 controls the spun yarn take-up apparatus 4 and sends a yarn threading instruction to the yarn threading apparatus 6.

[0035] In the spun yarn take-up system 1 of the present embodiment, a plurality of spinning apparatuses 3 and a plurality of spun yarn take-up apparatuses 4 are lined up in the direction orthogonal to the plane of FIG. 1. In the partition floor 2, a plurality of openings 2a are formed in the direction orthogonal to the plane of FIG. 1. Each opening 2a allows yarns Y spun out from each spinning apparatus 3 provided on the second floor to pass there-through. Below the periphery of each opening 2a, a tubular cover member 8 is provided to protrude downward from the partition floor 2, in order to prevent yarn shaking or the like. Above the periphery of each opening 2a, a tubular drop prevention wall 9 is provided to protrude upward from the partition floor 2, in order to prevent the yarn bring-down apparatus 5 or the like from dropping from the second floor.

[0036] For convenience, the up-down direction in FIG. 1 will be referred to as an up-down direction of the spun yarn take-up system 1, the left-right direction in FIG. 1 will be referred to as a front-rear direction of the spun yarn take-up system 1, and the direction orthogonal to the plane of FIG. 1 will be referred to as a left-right direction of the spun yarn take-up system 1.

(Spinning Apparatus)

[0037] The spinning apparatus 3 is provided on the second floor, and a spinning pack 10 with a spinneret 10a is attached to the spinning apparatus 3. As molten

polymer which is supplied from a polymer supplier (not illustrated) formed of a gear pump or the like and is hot is pushed out from the spinneret 10a, synthetic-fiber yarns Y are spun out from the spinneret 10a.

(Spun Yarn Take-Up Apparatus)

[0038] The spun yarn take-up apparatus 4 is configured to take up the yarns Y spun out from the spinning apparatus 3 and forms packages P by winding the yarns Y onto bobbins B, respectively. The spun yarn take-up apparatus 4 includes members such as a cooling unit 11, an oil guide 12, a yarn regulating guide 13, a yarn holding unit 14, a take-up unit 15, and a winding device 16. The cooling unit 11, the oil guide 12, and the yarn regulating guide 13 are provided on the second floor, whereas the yarn holding unit 14, the take-up unit 15, and the winding device 16 are provided on the first floor.

[0039] The cooling unit 11 is provided immediately below the spinning apparatus 3. The yarns Y spun out from the spinneret 10a are solidified as they are cooled by gas supplied to the cooling unit 11 while passing through the cooling unit 11. Below the cooling unit 11, the oil guide 12 and the yarn regulating guide 13 are provided. The oil guide 12 is configured to apply oil to the yarns Y spun out from the spinning apparatus 3. The yarn regulating guide 13 below the oil guide 12 is provided for regulating the yarn path of the yarns Y to which oil is applied at the oil guide 12.

[0040] The yarn holding unit 14 is fixedly provided at a position immediately below the opening 2a of the partition floor 2. When a trouble or the like occurs at a device (e.g., the take-up unit 15 and the winding device 16) on the downstream, this yarn holding unit 14 cuts the yarns Y spun out from the spinning apparatus 3 and temporarily sucks and retains them until the trouble or the like is resolved. As the yarns Y spun out from the spinning apparatus 3 are sucked and retained by the yarn holding unit 14, the yarns Y are not sent to the take-up unit 15 and the winding device 16 which are on the downstream side. This allows the operator to perform operations such as trouble shooting of the take-up unit 15 and the winding device 16.

[0041] The take-up unit 15 is configured to take up the yarns Y coming down from the second floor through the opening 2a which is formed through the partition floor 2. The take-up unit 15 includes two godet rollers 19 and 20. Each of the two godet rollers 19 and 20 is rotationally driven by a motor which is not illustrated. By the two godet rollers 19 and 20, the take-up unit 15 sends the yarns Y to the winding device 16. Among the two godet rollers 19 and 20, the godet roller 19 on the upstream is provided at a position substantially immediately below the yarn holding unit 14. In the meanwhile, the godet roller 20 on the downstream is arranged to be movable between a position for yarn placement close to the godet roller 19 (i.e., a position indicated by two-dot chain lines in FIG. 1) and a position for yarn production immediately above

the winding device 16 (i.e., a position indicated by full lines in FIG. 1).

[0042] The winding device 16 includes members such as a turret 21, two bobbin holders 22, a traverse unit 23, and a contact roller 24. By the turret 21, the two bobbin holders 22 are rotatably supported. As the turret 21 rotates, the positions of the two bobbin holders 22 are changed upside down. To each bobbin holder 22, bobbins B are attached. The traverse unit 23 includes traverse guides 23a which correspond to the respective bobbins B attached to the bobbin holder 22. As each traverse guide 23a reciprocates, the yarn Y is wound onto the bobbin B while being traversed about a fulcrum guide 25, with the result that a package P is formed. The contact roller 24 makes contact with the packages P formed on the upper bobbin holder 22 to apply contact pressure to each package P.

(Yarn Bring-Down Apparatus)

[0043] The following will describe the yarn bring-down apparatus 5. FIG. 2 is a perspective view of the yarn bring-down apparatus 5. FIG. 3 is a schematic diagram of the positioned yarn bring-down apparatus 5. FIG. 4 is a schematic diagram of the yarn bring-down apparatus 5 when the guide member has been brought down. FIG. 5 is a schematic diagram of the yarn bring-down apparatus 5 when a yarn bring-down member has been brought down. FIG. 6 is a cross section taken at the VI-VI line in FIG. 5. The yarn bring-down apparatus 5 is provided for bringing the yarns Y spun out from the spinning apparatus 3 down to the first floor at the time of yarn threading before the start of the production of packages P.

[0044] The yarn bring-down apparatus 5 includes members such as a wagon main body 30, a yarn bring-down member 31, a guide member 32, and a suction gun 33. The yarn bring-down apparatus 5 is structured such that the members are mounted on the wagon main body 30. Wheels 34 and an operation member 35 are attached to the wagon main body 30. As an operator operates the operation member 35, the yarn bring-down apparatus 5 is movable on the partition floor 2.

[0045] The yarn bring-down member 31 includes a supporting portion 31a which extends in the up-down direction and a holding portion 31b attached to a lower end portion of the supporting portion 31a. In the holding portion 31b, two hooking portions 31c are formed so that a slit which is open downward is provided, in order to allow yarns Y to be hooked by them. The two hooking portions 31c are spaced apart from each other in the horizontal direction over the supporting portion 31a. As described later, the yarns Y are brought down to the first floor in such a way that the yarn bring-down member 31 is brought down while the yarns Y are hooked and retained by the two hooking portions 31c.

[0046] An upper end portion of the yarn bring-down member 31 is connected to a wire 36. Furthermore, to a

plate-shaped supporting member 37 extending from the floor surface of the wagon main body 30, a first reel 38 is rotatably attached to wind the wire 36. The first reel 38 is rotationally driven by a first motor 39. Furthermore, a pin member 40 on which the wire 36 is hooked is attached to the supporting member 37, and hence the path of the wire 36 when the yarn bring-down member 31 is moved up or down is determined by the pin member 40. As the first reel 38 is rotated in the direction in which the wire 36 is drawn out, the yarn bring-down member 31 below the pin member 40 moves down. Meanwhile, as the first reel 38 is rotated in the direction in which the wire 36 is wound, the yarn bring-down member 31 moves up.

[0047] The guide member 32 guides the yarn bring-down member 31 in the up-down direction when the yarn bring-down member 31 moves up or down. The guide member 32 is formed of a chain-type cableveyor (registered trademark) in which small elements 32a are rotatably connected to one another, and is flexible and woundable. As shown in FIG. 6, each of the small elements 32a of the guide member 32 is C-shaped in cross section and open rightward (i.e., toward the yarn bring-down member 31). On the back surface (opposing the guide member 32) of the supporting portion 31a of the yarn bring-down member 31, engaging portions 31d (see, e.g., FIG. 3) are formed to be lined up in the up-down direction. The yarn bring-down member 31 moves up or down with the guidance of the guide member 32, as each engaging portion 31d of the yarn bring-down member 31 moves in the up-down direction in the internal space of the small element 32a of the guide member 32, while being engaged with that small element 32a.

[0048] To the supporting member 37, a second reel 41 is rotatably attached to the supporting member 37 in order to wind the guide member 32. The second reel 41 is rotationally driven by a second motor 42. Furthermore, a pin member 43 on which the guide member 32 is hooked is attached to the supporting member 37, and hence the path of the guide member 32 when the guide member 32 is moved up or down is determined by the pin member 43. As the second reel 41 is rotated in the direction in which the guide member 32 is drawn out, the guide member 32 below the pin member 43 moves down. Meanwhile, as the second reel 41 is rotated in the direction in which the guide member 32 is wound, the guide member 32 moves up. To the first motor 39 and the second motor 42, power is supplied from an unillustrated battery mounted on the wagon main body 30.

[0049] At a part of the guide member 32 where the guide member 32 is in contact with the pin member 43 and bended, the internal space of the small element 32a is open upward, allowing the engaging portion 31d of the yarn bring-down member 31 to enter or leave the internal space of the small element 32a. In FIG. 2, the small element 32a is not shown in the vicinity of the pin member 43 in order to show the pin member 43.

[0050] To position the guide member 32, as shown in FIG. 3 to FIG. 5, a positioning mechanism is formed by

an engaging member 44 provided at a lower end portion of the guide member 32 and a positioning member 26 attached to a lower end portion of the inner wall of a cover member 8. As shown in FIG. 6, the engaging member 44 is shaped to be engaged with the positioning member 26 from above. With this arrangement, the guide member 32 is temporarily fixed by taking down the guide member 32 and causing the engaging member 44 to be engaged with the positioning member 26.

[0051] When yarns are brought down by the yarn bring-down apparatus 5, to begin with, the yarn bring-down apparatus 5 is provided in the vicinity of an opening 2a which is formed below a target spinning apparatus 3. In so doing, as FIG. 3 shows, the yarn bring-down apparatus 5 is provided so that a contact portion 30a formed at a front end portion of the wagon main body 30 of the yarn bring-down apparatus 5 makes contact with a drop prevention wall 9 formed around the opening 2a. With this, the yarn bring-down apparatus 5 is positioned in the left-right direction in FIG. 3. In the present embodiment, a marker is provided at a suitable part of the partition floor 2 in order to help the positioning in the direction orthogonal to the plane of FIG. 3. To put it differently, the yarn bring-down apparatus 5 is positioned by causing the contact portion 30a of the wagon main body 30 to be in contact with the drop prevention wall 9 and moving the yarn bring-down apparatus 5 to the position indicated by the marker.

[0052] After the yarn bring-down apparatus 5 is positioned, the guide member 32 is brought down as shown in FIG. 4. As described above, as the yarn bring-down apparatus 5 is suitably positioned, the engaging member 44 attached to the lower end portion of the guide member 32 is smoothly engaged with the positioning member 26 when the guide member 32 is brought down, with the result that the guide member 32 is fixed. Subsequently, the yarn bring-down member 31 is brought down along the guide member 32 to position the holding portion 31b at a position below the lower end of the cover member 8 as shown in FIG. 5. As a result, it becomes able to pass the yarns Y (not illustrated in FIG. 5) held by the holding portion 31b to the yarn threading apparatus 6 or the yarn holding unit 14. The details of the series of actions will be described later.

[0053] The suction gun 33 is provided to suck and retain the yarns Y spun out from the spinning apparatus 3 when the yarn bring-down is carried out. While the suction gun 33 of the present embodiment is fixed to the wagon main body 30, the suction gun 33 may be detachable to the wagon main body 30. The suction gun 33 is connected to a suction hose 33a. Meanwhile, in the vicinity of each opening 2a, a sucking adaptor 2b is provided to be connected to an unillustrated sucking power source of the spun yarn take-up system 1. As the suction hose 33a of the suction gun 33 is connected to the sucking adaptor 2b, a suction force is generated at a suction port at the leading end of the suction gun 33. The yarns Y sucked by the suction gun 33 are wasted to an unillustrated waste

yarn box through a suction hose 33b which is different from the suction hose 33a.

(Yarn Threading Apparatus)

[0054] The yarn threading apparatus 6 is a yarn threading robot controlled by a program. The yarn threading apparatus 6 is arranged to be movable in the left-right direction (i.e., the direction orthogonal to the plane of FIG. 1) and has a yarn threading arm 6a which has a multi-joint section to be freely movable in a three-dimensional manner. Although not illustrated, a cutter for cutting the yarns Y and a sucking section for sucking the yarns Y cut by the cutter are provided at a leading end portion of the yarn threading arm 6a. When a yarn threading instruction instructing yarn threading onto a spun yarn take-up apparatus 4 among the spun yarn take-up apparatuses 4 lined up in the left-right direction is received from the controller 7, the yarn threading apparatus 6 moves to a position in front of that spun yarn take-up apparatus 4 and performs yarn threading onto the two godet rollers 19 and 20 of the take-up unit 15 and onto the winding device 16.

(Flow of Yarn Bring-Down and Yarn Threading)

[0055] Lastly, the flow of yarn bring-down, yarn threading, and the like, which are performed at the start of the production of yarns Y by the spun yarn take-up apparatus 4, will be described with reference to FIG. 7 to FIG. 11. FIG. 7 shows the spun yarn take-up system 1 before the guide member 32 is brought down. FIG. 8 shows the spun yarn take-up system 1 when the guide member 32 has been brought down. FIG. 9 shows the spun yarn take-up system 1 immediately before the yarn bring-down member 31 is brought down. FIG. 10 shows the spun yarn take-up system 1 when the yarn bring-down member 31 has been brought down. FIG. 11 shows the spun yarn take-up system 1 during yarn threading by the yarn threading apparatus 6.

[0056] When yarn threading is performed at a spun yarn take-up apparatus 4, the operator moves the yarn bring-down apparatus 5 to that spun yarn take-up apparatus 4 as shown in FIG. 3 and FIG. 7. As described above, the yarn bring-down apparatus 5 is suitably positioned so that the engaging member 44 is engaged with the positioning member 26 when the guide member 32 is brought down later. In the positioned yarn bring-down apparatus 5, the two hooking portions 31c of the yarn bring-down member 31 are lined up in the front-rear direction.

[0057] Subsequently, while causing the yarns Y spun out from the spinning apparatus 3 to be sucked and retained by the suction gun 33, the operator threads the yarns Y sucked by the suction gun 33 onto the oil guide 12 and the yarn regulating guide 13. Soon before or after this operation, the controller 7 sends a yarn threading instruction to the yarn threading apparatus 6 to move the

yarn threading apparatus 6 to the position corresponding to the spun yarn take-up apparatus 4.

[0058] Subsequently, as shown in FIG. 4 and FIG. 8, the operator draws the guide member 32 out from the second reel 41 by driving the second motor 42 and takes down the guide member 32. As a result, the guide member 32 passes through the opening 2a and moves further down, and eventually reaches the position where the engaging member 44 is engaged with the positioning member 26. As the engaging member 44 is engaged with the positioning member 26, vibrations of the guide member 32 are prevented and hence the yarn bring-down member 31 is stably moved up and down along the guide member 32.

[0059] Subsequently, as shown in FIG. 9, the operator hooks the yarns Y on a yarn threading tool T and moves the yarns Y, so as to place a part of each yarn Y between the suction gun 33 and the yarn threading tool T at a position directly under the holding portion 31b of the yarn bring-down member 31. To be more specific, the yarn path is adjusted to cause the part of each yarn Y between the suction gun 33 and the yarn threading tool T to enter the two hooking portions 31c when the yarn bring-down member 31 is brought down.

[0060] Subsequently, as shown in FIG. 5 and FIG. 10, the operator draws the wire 36 out from the first reel 38 by driving the first motor 39 and brings down the yarn bring-down member 31. At this stage, the yarns Y are hooked on the two hooking portions 31c of the yarn bring-down member 31, and are retained by the holding portion 31b. In the present embodiment, the yarn bring-down apparatus 5 is positioned so that the two hooking portions 31c are lined up in the front-rear direction. For this reason, when the yarn bring-down member 31 is brought down, the yarn path from the yarn regulating guide 13 to the suction gun 33 via the holding portion 31b of the yarn bring-down apparatus 5 is V-shaped and open in the front-rear direction as shown in FIG. 10.

[0061] When the yarn bring-down member 31 is brought down to the lowest position, the yarn threading apparatus 6 causes the yarn threading arm 6a to make contact with the yarns Ya between the yarn regulating guide 13 and the holding portion 31b of the yarn bring-down apparatus 5, from the front side of the spun yarn take-up apparatus 4. Then the yarns Ya are cut, sucked, and retained. In this connection, because the yarns Ya on the upstream of the holding portion 31b are spaced apart from the yarns Yb on the downstream of the holding portion 31b in the front-rear direction as described above, it is possible to prevent the yarns Yb, which are different in the yarn running direction from the yarns Ya, from being cut, sucked and retained by the yarn threading apparatus 6 together with the yarns Ya.

[0062] When the yarns Y are sucked and retained by the yarn threading arm 6a, as shown in FIG. 11, the yarn threading apparatus 6 moves the yarn threading arm 6a to place the yarns Y onto the godet rollers 19 and 20 of the take-up unit 15 in order. After the hand-over of the

yarns Y to the yarn threading apparatus 6, the operator moves up the yarn bring-down member 31 and the guide member 32 in order so that these members are returned to the wagon main body 30.

[Advantageous Effects]

[0063] As described above, the yarn bring-down apparatus 5 of the present embodiment includes the wagon main body 30 configured to be movable on the second floor (upper floor) and the yarn bring-down member 31 which is provided in the wagon main body 30 and is capable of moving down to the first floor (lower floor) while retaining the yarns Y spun out from the spinning apparatus 3. With this arrangement, because the yarn bring-down member 31 is provided in the wagon main body 30 which is movable on the second floor, yarn bring-down can be done at a suitable location by moving the wagon main body 30. On this account, when a plurality of spun yarn take-up apparatuses 4 are lined up, yarn bring-down at each spun yarn take-up apparatus 4 is possible by moving the wagon main body 30, and no dedicated apparatus is required for each spun yarn take-up apparatus 4. It is therefore possible to restrain the cost of the system including the maintenance cost.

[0064] In the present embodiment, on the yarn bring-down member 31, a plurality of hooking portions 31c are formed to be spaced apart from each other in a direction intersecting with the up-down direction (i.e., in the front-rear direction) and each to be able to hook the yarns Y. As the yarns Y are hooked on the hooking portions 31c, it is possible, above the hooking portions 31c, to cause the yarns Ya upstream of the hooking portions 31c to be spaced apart from the yarns Yb on the downstream. On this account, the yarns Y are certainly handed over only from the yarns Ya on the upstream side, when the yarns Y are handed over at the first floor.

[0065] In the present embodiment, because each of the hooking portions 31c forms a slit which is open downward, the yarns Y are hooked on the hooking portions 31c when the yarn bring-down member 31 is brought down, and hence the yarns are easily retained by the yarn bring-down member 31.

[0066] In the present embodiment, the yarn bring-down member 31 is connected to the wire 36 and the wagon main body 30 is provided with the first reel 38 by which the wire 36 is wound. As the wire 36 is drawn out from the first reel 38, the yarn bring-down member 31 is brought down. Furthermore, the apparatus is small in size because the wire 36 is wound on the first reel 38 in cases other than the yarn bring-down.

[0067] In the present embodiment, the first motor 39 (first driving unit) for rotationally driving the first reel 38 is provided in the wagon main body 30. The yarn bring-down member 31 is therefore automatically moved up or down by driving the first motor 39, and this reduces the burden on the operator. Furthermore, as the first motor 39 functions as a brake, the wire 36 is not unintentionally

drawn out by the weight of the yarn bring-down member 31, and hence the yarn bring-down member 31 is stably brought down.

[0068] In the present embodiment, the guide member 32 which is configured to guide the yarn bring-down member 31 in the up-down direction is provided in the wagon main body 30. This allows the yarn bring-down member 31 to be brought down along the guide member 32, and hence the yarn bring-down member 31 is stably brought down to a desired location.

[0069] In the present embodiment, the guide member 32 is flexible and woundable, and the wagon main body 30 is provided with the second reel 41 by which the guide member 32 is wound. As the guide member 32 is drawn out from the second reel 41, the guide member 32 is brought down. Furthermore, the apparatus is small in size because the guide member 32 is wound on the second reel 41 in cases other than the yarn bring-down.

[0070] In the present embodiment, the second motor 42 (second driving unit) for rotationally driving the second reel 41 is provided in the wagon main body 30. The guide member 32 is therefore automatically moved up or down by driving the second motor 42, and this reduces the burden on the operator. Furthermore, as the second motor 42 functions as a brake, the guide member 32 is not unintentionally drawn out by the weight of the guide member 32, and hence the guide member 32 is stably brought down.

[0071] In the present embodiment, the wagon main body 30 is provided with the suction gun 33 (suction member) by which the yarns Y spun out from the spinning apparatus 3 are sucked. As the suction gun 33 sucks the yarns Y, it is easy to cause the yarn bring-down member 31 to retain the yarns Y.

[0072] In the present embodiment, the positioning member 26 (positioning portion) is provided on the first floor to position the guide member 32. At the lower end portion of the guide member 32, the engaging member 44 (engaging portion) which is positioned by being engaged with the positioning member 26 is provided. With this arrangement, the accuracy of the descending position where the yarn bring-down member 31 is brought down along the guide member 32 is improved because the guide member 32 is positioned. This makes it possible to accurately hand over the yarns Y on the first floor.

[0073] In the present embodiment, the opening 2a allowing the yarns Y to pass therethrough is formed in the partition floor 2 provided between the second floor and the first floor, the tubular cover member 8 is provided at the periphery of the opening 2a to protrude downward from the partition floor 2, and the positioning member 26 is provided on the inner wall of the cover member 8. With this arrangement, the guide member 32 moves along the inner wall of the cover member 8 when the guide member 32 is brought down, with the result that the engaging member 44 is easily engaged with the positioning member 26.

[0074] In the present embodiment, the drop prevention

wall 9 is provided at the periphery of the opening 2a to protrude upward from the partition floor 2, and the contact portion 30a is formed at the front end portion of the wagon main body 30 to be able to make contact with the drop prevention wall 9. As the wagon main body 30 is positioned so that the contact portion 30a is in contact with the drop prevention wall 9, the guide member 32 is brought down along the inner wall of the cover member 8. It is therefore easy to position the wagon main body 30 in order to cause the guide member 32 to move along the inner wall of the cover member 8.

[Other embodiments]

[0075] For example, in the embodiment above, in order to improve the workability of the yarn bring-down, the yarn bring-down apparatus 5 is arranged to include the guide member 32 and the suction gun 33. The guide member 32 and the suction gun 33, however, may be omitted.

[0076] In the embodiment above, the first motor 39 configured to rotationally drive the first reel 38 and the second motor 42 configured to rotationally drive the second reel 41 are provided. Alternatively, the first motor 39 and the second motor 42 may not be provided, and the first reel 38 and the second reel 41 may be manually rotated by the operator.

[0077] In the embodiment above, the guide member 32 is temporarily fixed as the engaging member 44 is engaged with the positioning member 26. Such a positioning mechanism, however, is not prerequisite.

[0078] In the embodiment above, the yarns Y brought down by the yarn bring-down apparatus 5 are handed over to the yarn threading apparatus 6. Alternatively, the yarns Y brought down by the yarn bring-down apparatus 5 may be handed over to the yarn holding unit 14. Alternatively, the yarns Y brought down by the yarn bring-down apparatus 5 may be handed over to a suction gun held by an operator on the first floor.

[0079] In the embodiment above, the pin member 40 by which the path of the wire 36 is determined and the pin member 43 by which the path of the guide member 32 is determined are fixed components. Alternatively, not limited to the fixed components, each of these pin members may be a rotating body including a bearing or the like. When the pin member is a rotating body, the amount of friction against the wire 36 and the guide member 32 is decreased and the product life is elongated.

[0080] In the embodiment above, the yarn bring-down apparatus 5 is connected to the wire 36 and the first reel 38 provided in the wagon main body 30 winds the wire 36. This, however, is not limited to the wire on condition that the first reel 38 is able to wind the same.

[0081] In the embodiment above, the guide member 32 by which the yarn bring-down member 31 is guided along the up-down direction is provided in the wagon main body 30. Alternatively, the guide member 32 may be provided on the cover member 8 and the drop pre-

vention wall 9, as long as the yarn bring-down member 31 is guided in the up-down direction. When the guide member 32 is provided for each spun yarn take-up apparatus 4, the second reel 41, the second motor 42, and the engaging member 44 are unnecessary in the yarn bring-down apparatus 5, with the result that the yarn bring-down apparatus 5 is light in weight and small in size. On this account, handling of the yarn bring-down apparatus 5 by the operator and positioning of the yarn bring-down apparatus 5 when the yarn bring-down is carried out are easily done, with the result that the cost of the system including the maintenance cost is restrained as compared to known systems, and the efficiency in yarn production is improved.

[0082] In the embodiment above, a marker is provided at a suitable location of the partition floor 2 in order to help the positioning of the yarn bring-down apparatus 5 in the front-rear direction. In this regard, instead of the marker, a guider such as a guide rail and a positioning pin may be provided for positioning. With the guider, the positioning of the yarn bring-down apparatus 5 is further accurately done.

[0083] In the embodiment above, in the positioned yarn bring-down apparatus 5, the two hooking portions 31c of the yarn bring-down member 31 are lined up in the front-rear direction. Alternatively, the hooking portions 31c may be lined up in a direction such as the left-right direction and an oblique direction instead of the front-rear direction, as long as the yarns Y held by the holding portion 31b can be handed over to the yarn threading apparatus 6 and the yarn holding unit 14.

[0084] In the embodiment above, the yarn bring-down apparatus 5 is positioned in the left-right direction in such a way that the contact portion 30a formed at the front end portion of the wagon main body 30 of the yarn bring-down apparatus 5 makes contact with the drop prevention wall 9 formed around the opening 2a, from the left. In this regard, from which side the contact portion 30a makes contact with the drop prevention wall 9 may be suitably changed. In other words, no matter from which side, the positioning in one direction in the horizontal plane is possible as long as the contact portion 30a makes contact with the drop prevention wall 9. For example, the yarn bring-down member 31 is stably brought down to a predetermined location when the yarn bring-down apparatus 5 makes contact with the drop prevention wall 9 in the front-rear direction so that the positioning is carried out in the front-rear direction.

[0085] In the embodiment above, in the vicinity of each opening 2a, the sucking adaptor 2b is provided to be connected to an unillustrated sucking power source of the spun yarn take-up system 1. Alternatively, a sucking adaptor 2b may be provided for a plurality of spun yarn take-up apparatuses 4 in a shared manner.

Claims

1. A yarn bring-down apparatus which is provided in a spun yarn take-up system configured to take up, on a lower floor, yarns spun out from a spinning apparatus provided on an upper floor, the yarn bring-down apparatus being configured to bring down the yarns from the upper floor to the lower floor and comprising:
 - a wagon main body configured to be movable on the upper floor; and
 - a yarn bring-down member which is provided in the wagon main body and is capable of moving down to the lower floor while retaining the yarns spun out from the spinning apparatus.
2. The yarn bring-down apparatus according to claim 1, wherein, the yarn bring-down member includes a plurality of hooking portions which are spaced apart from each other in a direction intersecting with the up-down direction and are each able to hook the yarns.
3. The yarn bring-down apparatus according to claim 2, wherein, each of the hooking portions forms a slit which is open downward.
4. The yarn bring-down apparatus according to any one of claims 1 to 3, wherein,
 - the yarn bring-down member is connected to a wire, and
 - a first reel for winding the wire is provided in the wagon main body.
5. The yarn bring-down apparatus according to claim 4, wherein, a first driving unit is provided in the wagon main body to rotationally drive the first reel.
6. The yarn bring-down apparatus according to any one of claims 1 to 5, wherein, a guide member for guiding the yarn bring-down member in the up-down direction is provided in the wagon main body.
7. The yarn bring-down apparatus according to claim 6, wherein, the guide member is flexible and woundable, and
 - a second reel for winding the guide member is provided in the wagon main body.
8. The yarn bring-down apparatus according to claim 7, wherein, a second driving unit is provided in the wagon main body to rotationally drive the second reel.
9. The yarn bring-down apparatus according to any one of claims 1 to 8, wherein, a suction member is provided in the wagon main body to suck the yarns spun out from the spinning apparatus.

10. A spun yarn take-up system configured to take up, on a lower floor, yarns spun out from a spinning apparatus provided on an upper floor, the spun-yarn take-up system comprising a yarn bring-down apparatus configured to bring down the yarns spun out from the spinning apparatus from the upper floor to the lower floor, the yarn bring-down apparatus including:
- a wagon main body configured to be movable on the upper floor; and
 - a yarn bring-down member which is provided in the wagon main body and is capable of moving down to the lower floor while retaining the yarns spun out from the spinning apparatus.
11. The spun yarn take-up system according to claim 10, wherein, a guide member which is capable of moving up and down is provided in the wagon main body to guide the yarn bring-down member in an up-down direction.
12. The spun yarn take-up system according to claim 11, wherein, a positioning portion is provided on the lower floor to position the guide member, and an engaging portion which is positioned by being engaged with the positioning portion is provided at a lower end portion of the guide member.
13. The spun yarn take-up system according to claim 12, wherein, an opening allowing the yarns to pass therethrough is formed in a partition floor provided between the upper floor and the lower floor, and a tubular cover member is provided at the periphery of the opening to protrude downward from the partition floor, and the positioning portion is provided on the inner wall of the cover member.
14. The spun yarn take-up system according to claim 13, wherein, a drop prevention wall is provided at the periphery of the opening to protrude upward from the partition floor and a contact portion is formed at a front end portion of the wagon main body to be able to make contact with the drop prevention wall, and as the wagon main body is positioned so that the contact portion is in contact with the drop prevention wall, the guide member is brought down along the inner wall of the cover member.

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FIG.1

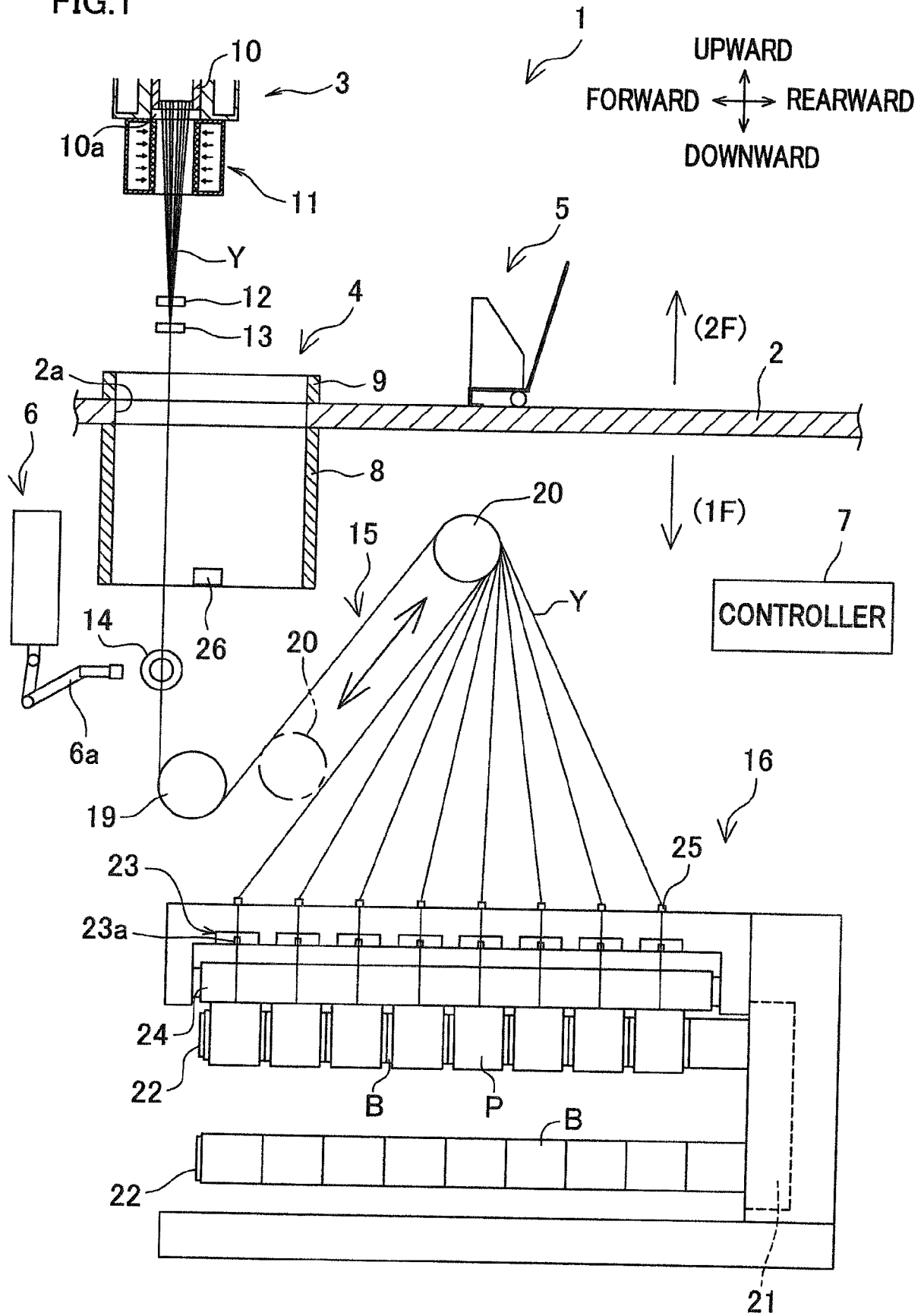


FIG.2

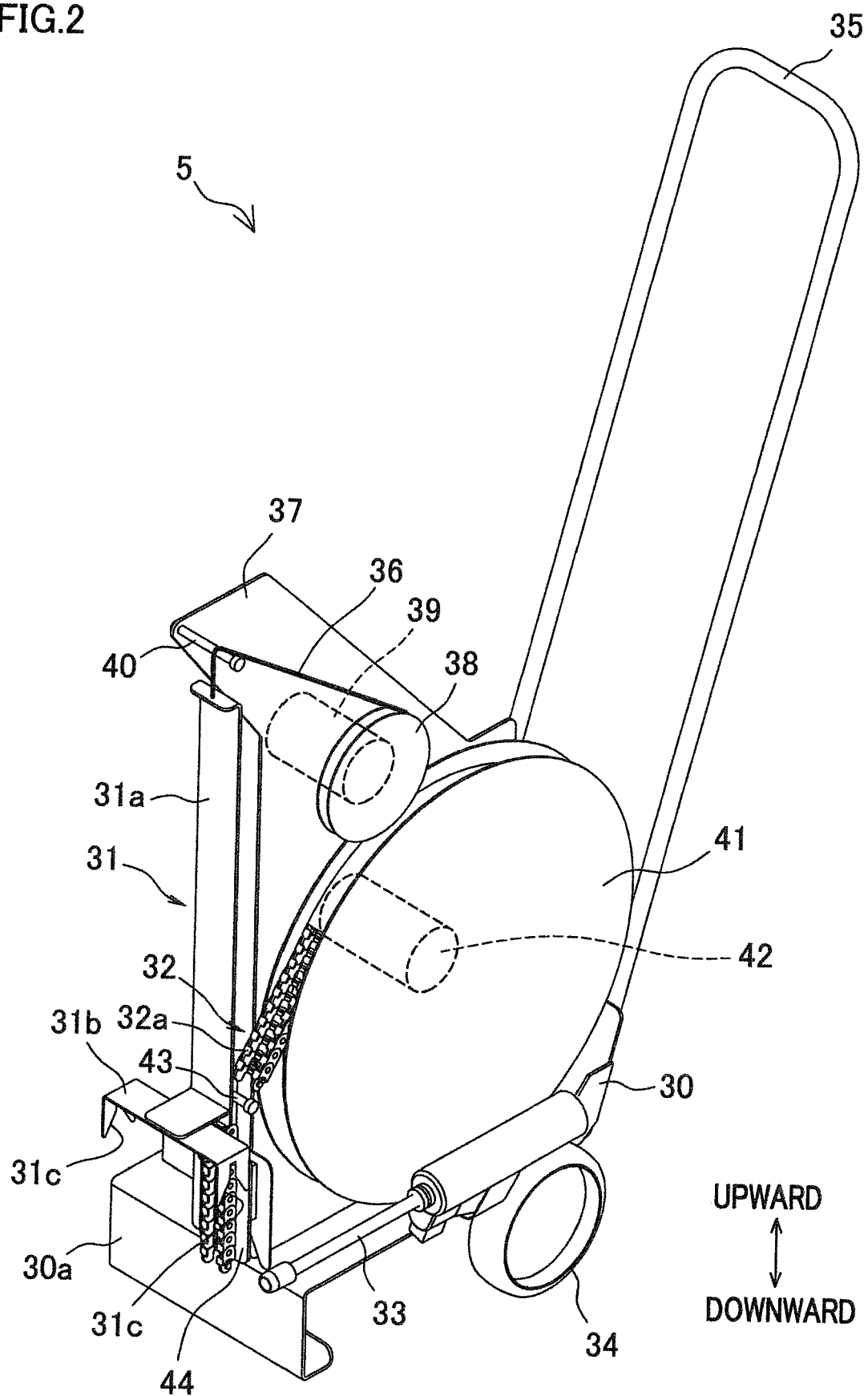


FIG.3

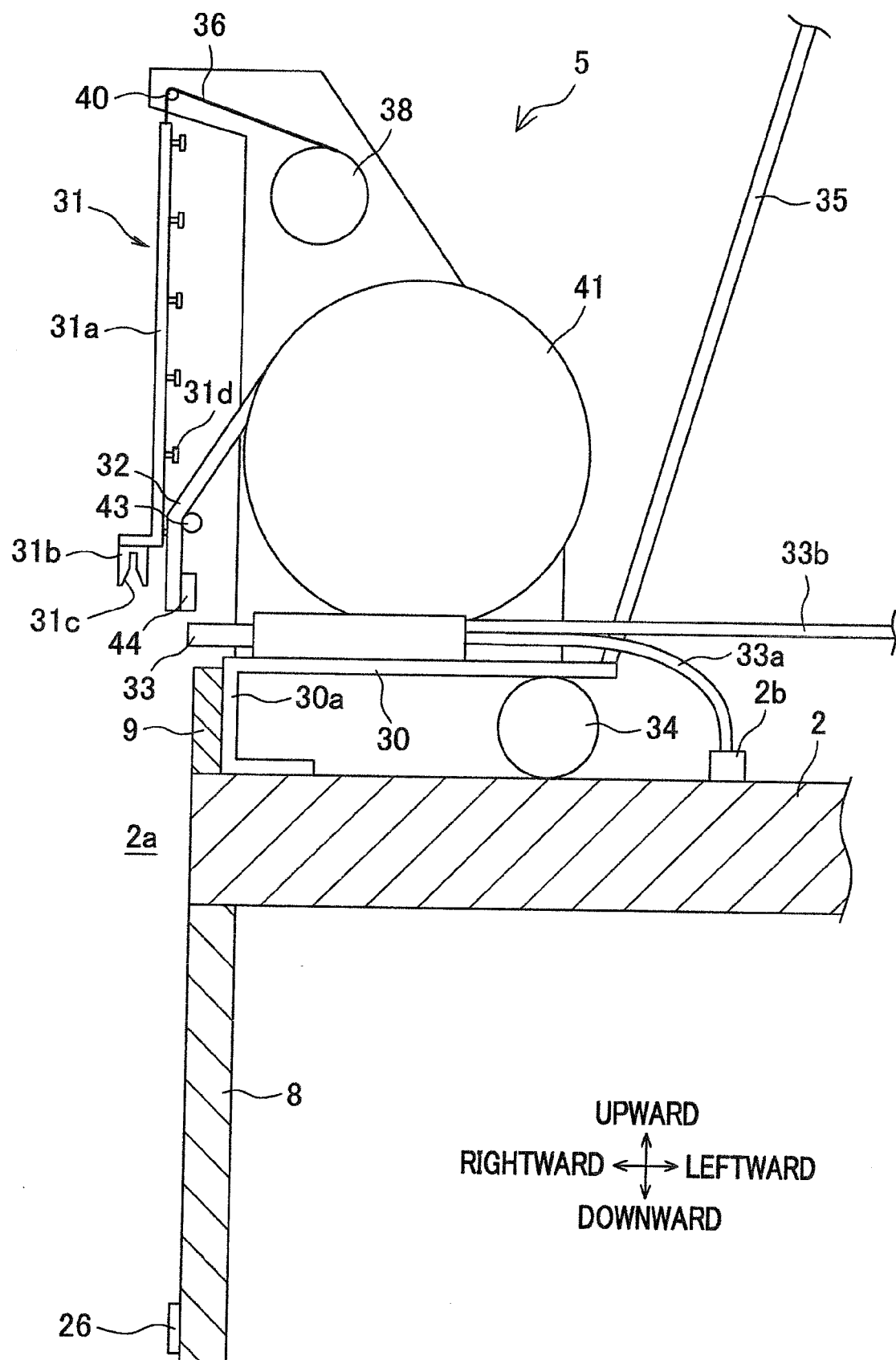


FIG.4

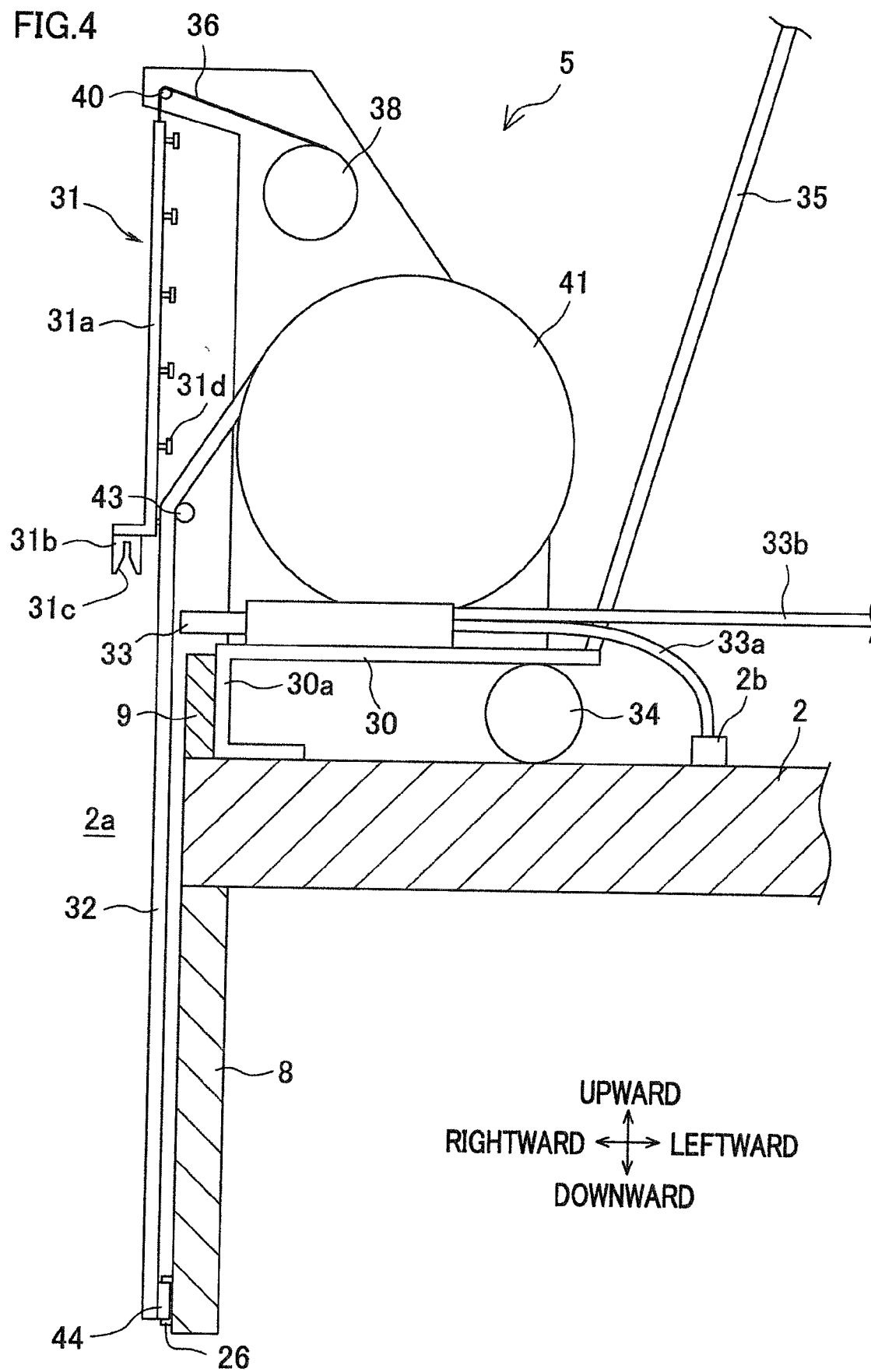


FIG.5

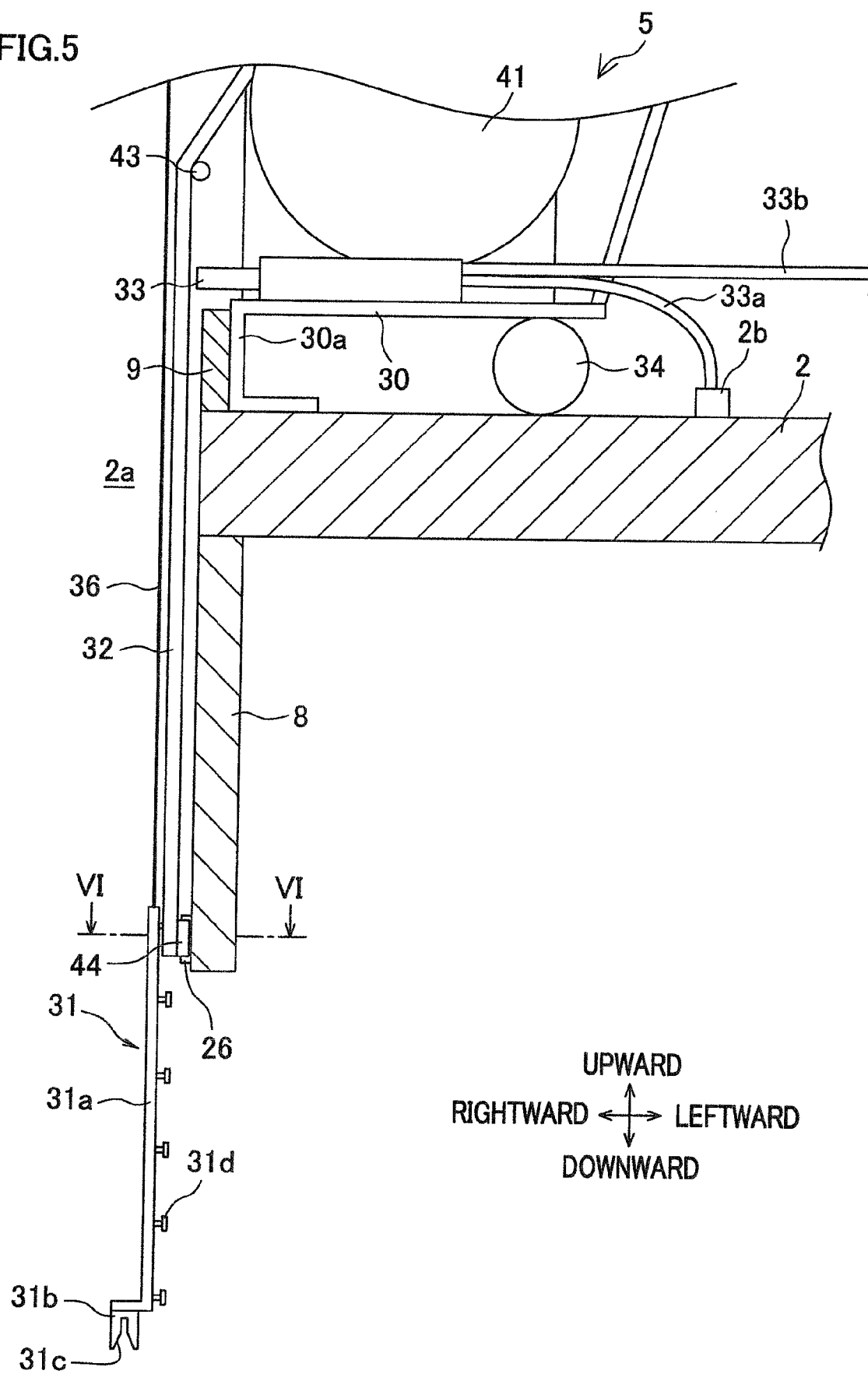


FIG.6

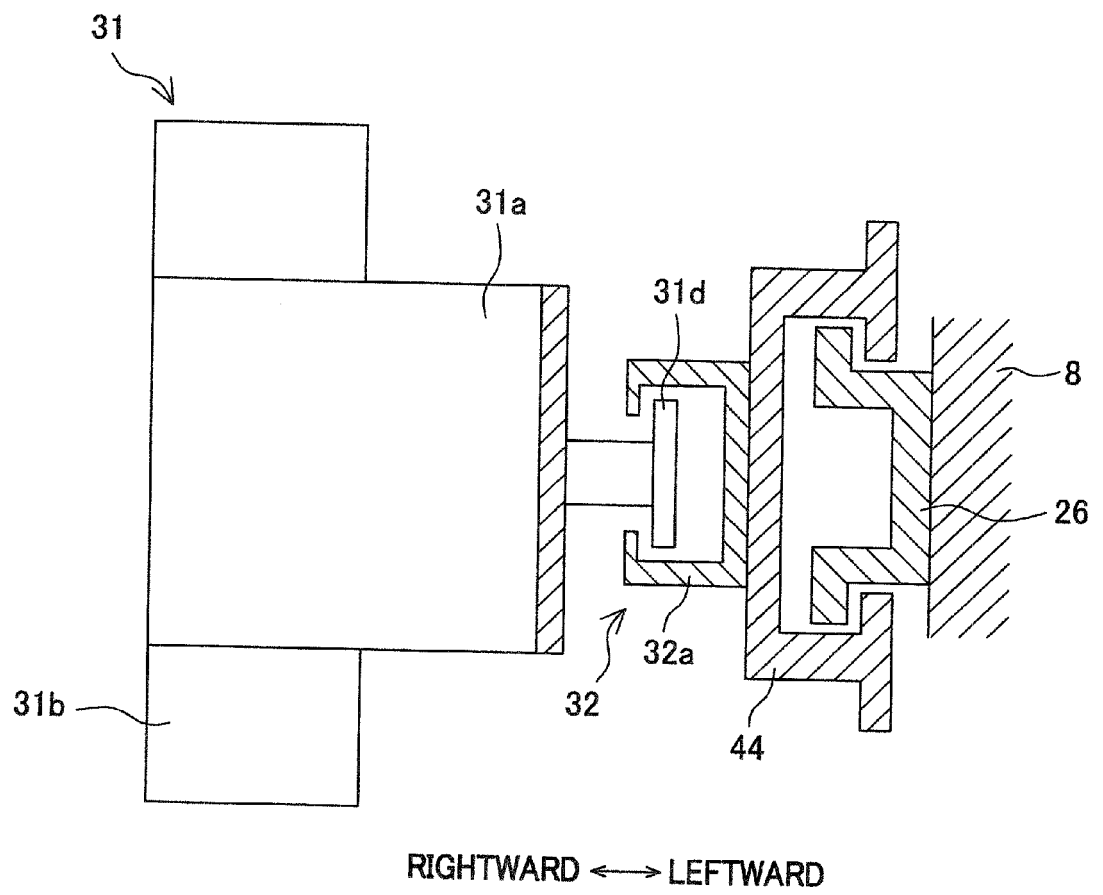


FIG.7

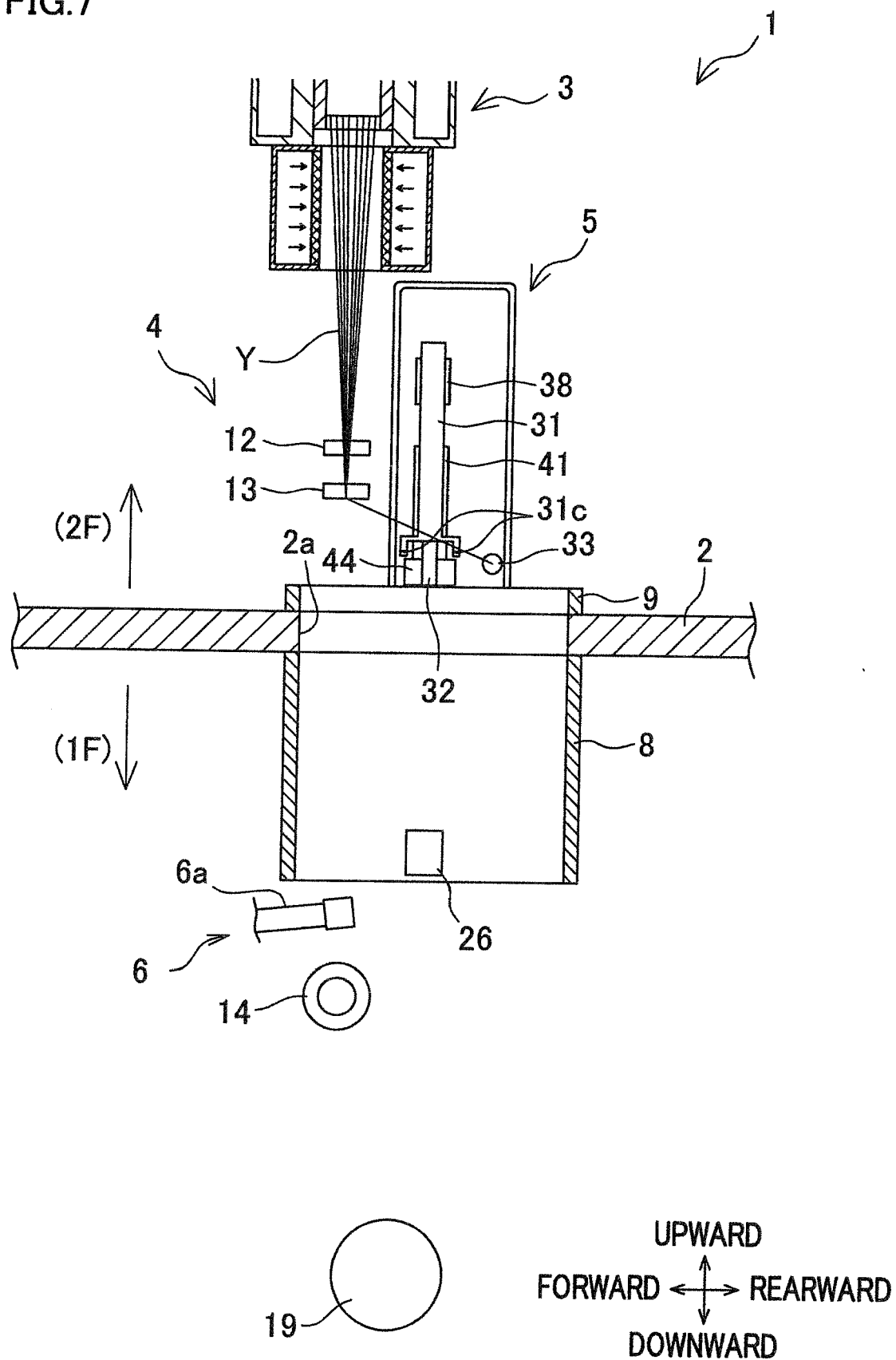


FIG.8

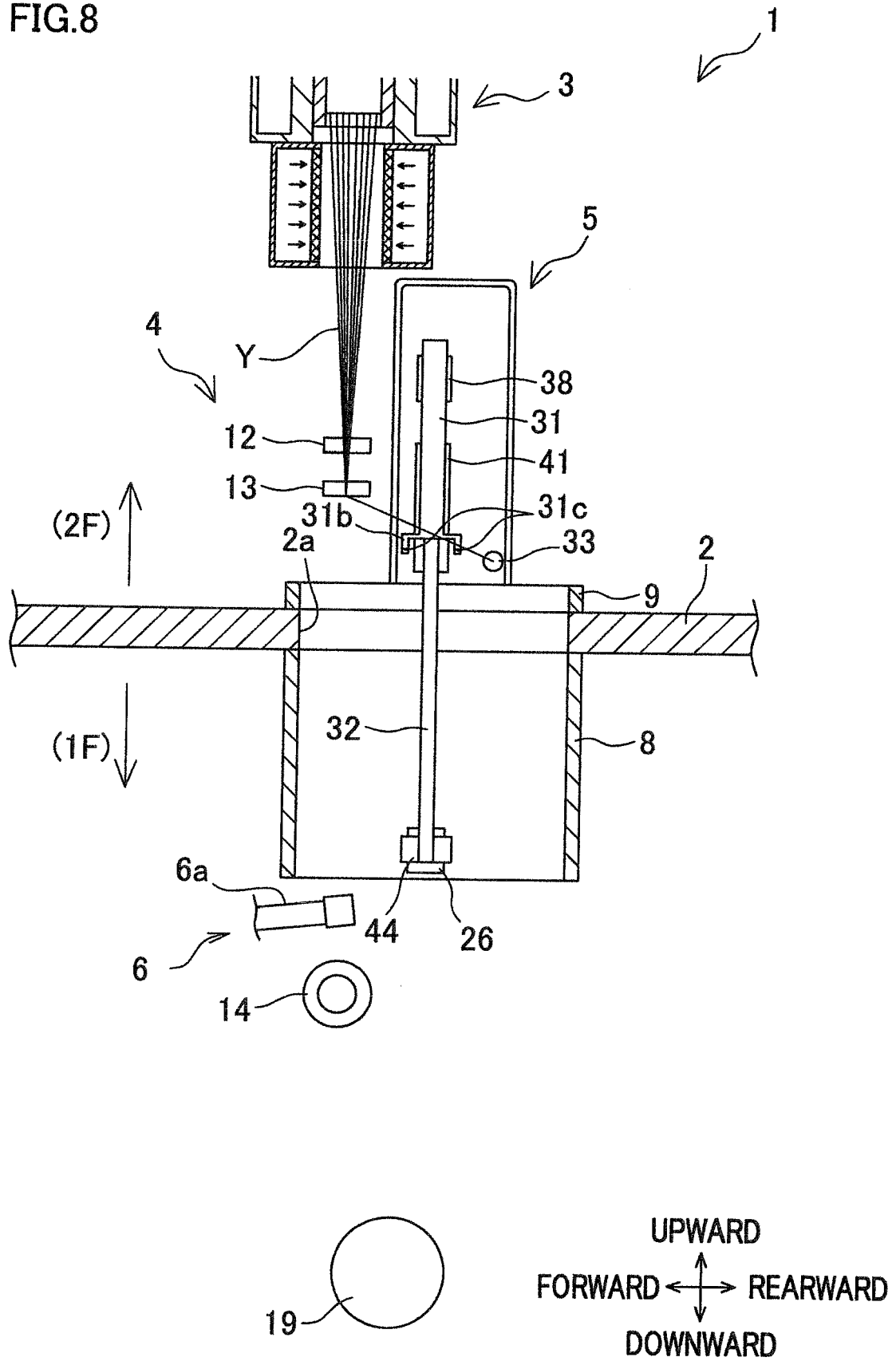


FIG.9

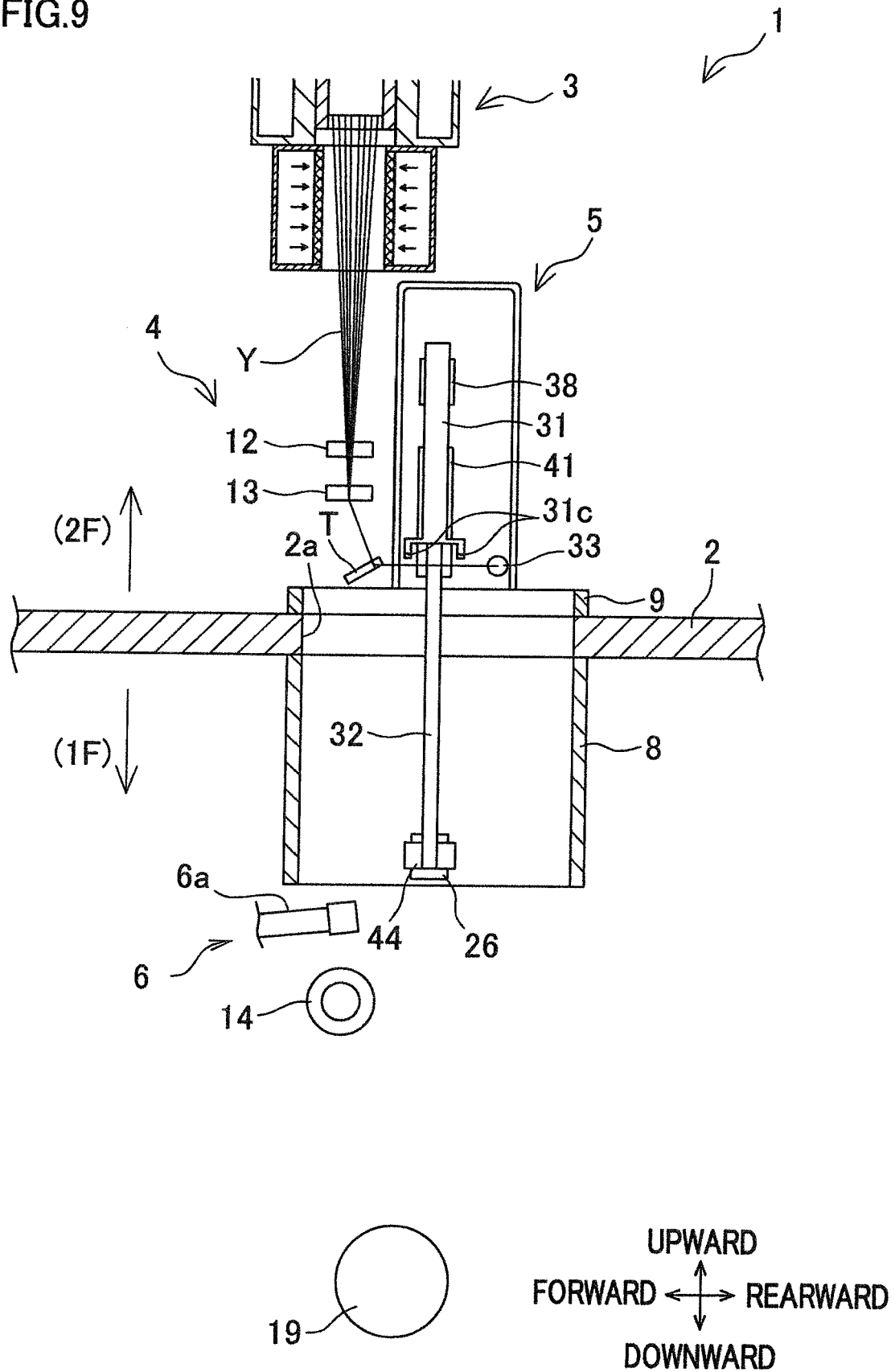


FIG.10

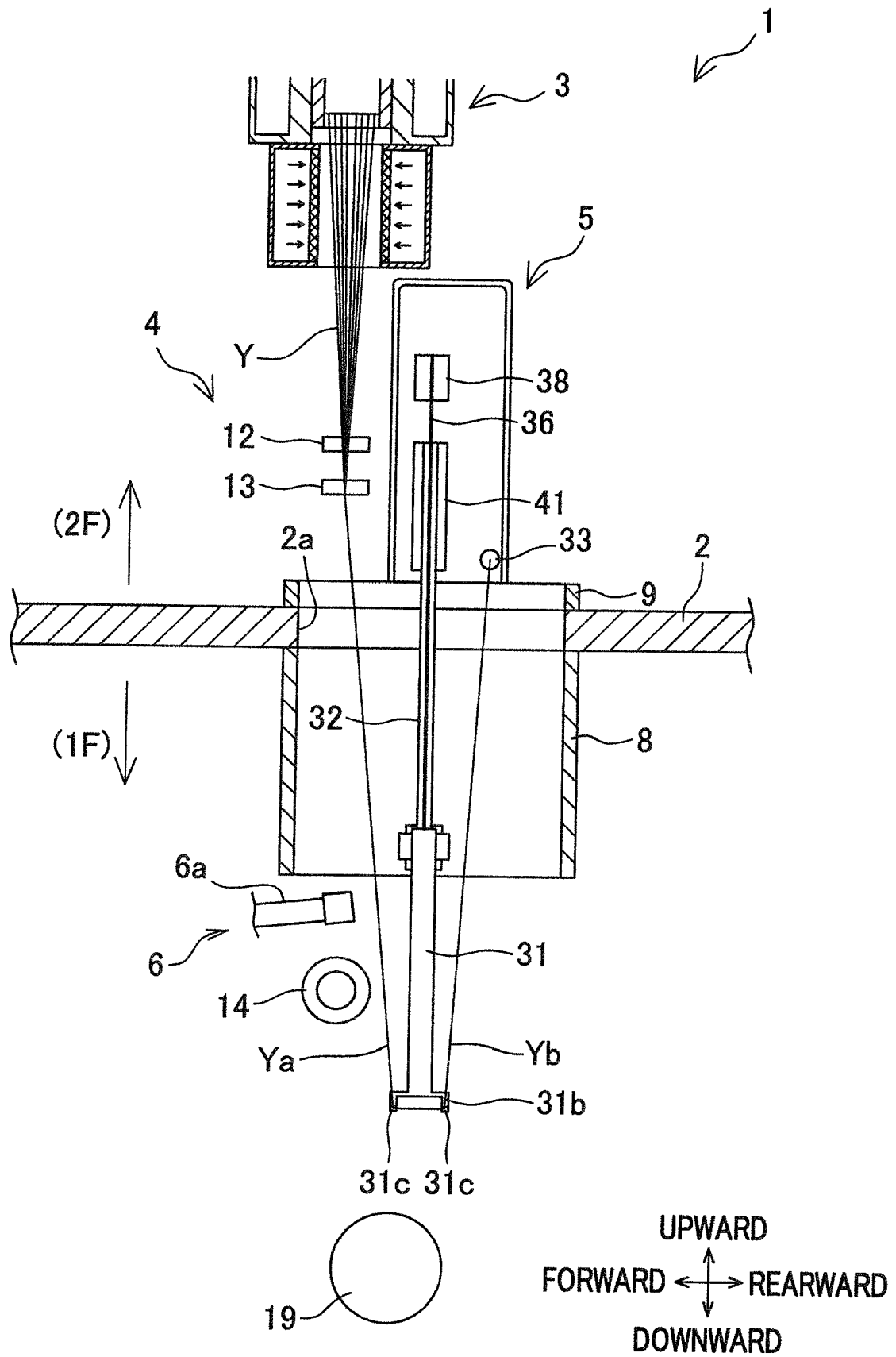
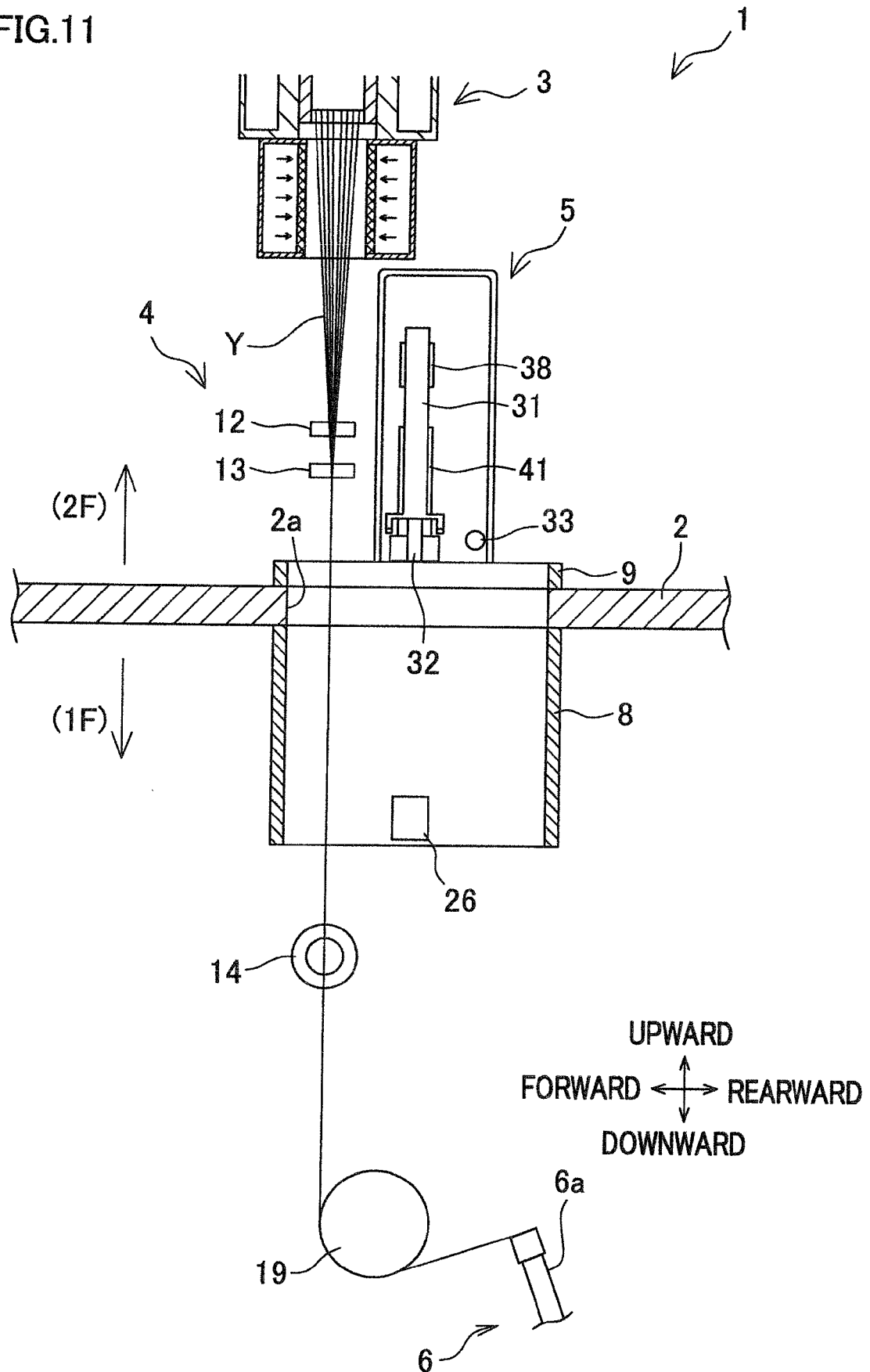


FIG.11





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Place of search The Hague		Date of completion of the search 11 September 2018	Examiner Malik, Jan
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