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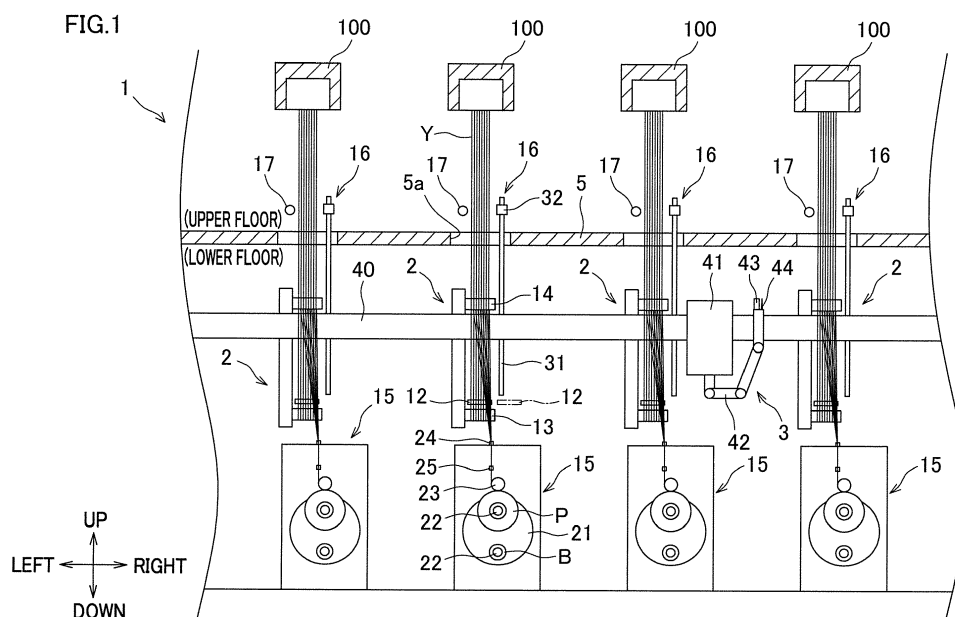
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(54) **SPUN YARN TAKE-UP SYSTEM**

(57) An object of the present invention is, without deteriorating the work efficiency of an operator on the upper floor, to provide a spun yarn take-up system which enable a valve of a yarn sucking unit on the upper floor being closed promptly.

A spun yarn take-up system 1 comprising spun yarn take-up apparatuses 2 each of which is configured to wind a yarn Y spun out from a spinning device 100 provided on the upper floor to a winding device 15, each of the spun yarn take-up apparatuses 2 including a yarn

sucking unit 17 provided on the upper floor and a yarn bring-down apparatus 16 which brings yarns Y held by the yarn sucking unit 17 down to the lower floor from the upper floor. In at least one of the spun yarn take-up apparatuses 2, after yarns Y brought down to the lower floor by the yarn bring-down apparatus 16 are delivered to a yarn threading robot 3 on the lower floor, a valve of the yarn sucking unit 17 of the at least one of the spun yarn take-up apparatuses 2 is closed automatically.



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a spun yarn take-up system which includes spun yarn take-up apparatuses each of which is configured to wind a yarn spun out from a spinning apparatus provided on the upper floor by a winding device provided on the lower floor.

[0002] For example, a spun yarn take-up system recited in Patent Literature 1 (WO2015/198698) includes spun yarn take-up apparatuses each of which is configured to wind a yarn spun out from a spinning apparatus provided on the upper floor by a winding device provided on the lower floor. To begin with, an operator on the upper floor retains yarns spun out from the spinning apparatus by using a yarn sucking unit provided on the upper floor, when yarn threading is performed at each of the spun yarn take-up apparatuses. Then the yarns held by the yarn sucking unit are brought down to the lower floor by a yarn bring-down apparatus, and are held by a yarn holding unit provided on the lower floor. Thereafter, at a suitable timing, an operator on the lower floor receives, by a suction gun, yarns held by the yarn holding unit, and performs yarn threading to the winding device and members provided on the path to the winding device by handling the suction gun properly.

SUMMARY OF THE INVENTION

[0003] A yarn holding unit provided on the lower floor recited in Patent Literature 1 is configured to hold yarns by the sucking force, and yarns may not be successfully delivered from the yarn bring-down apparatus to the yarn holding unit depending on the magnitude of the sucking force or the tension of the yarns. On this account, preferably, yarns brought down to the lower floor by the yarn bring-down apparatus are delivered directly to the operator (or a yarn threading robot) on the lower floor in order to ensure the delivery of the yarns on the lower floor.

[0004] When yarns brought down to the lower floor of the spun yarn take-up apparatus are directly delivered to the operator or the yarn threading robot, a valve of the yarn sucking unit on the upper floor needs to be closed as soon as the delivery of the yarns on the lower floor finishes, in order to avoid the yarn sucking unit on the upper floor from being wastefully driven. However, an operator on the upper floor typically leaves the yarn bring-down apparatus after activating the yarn bring-down apparatus, because the work efficiency is deteriorated if the operator is on standby until the finish of the delivery on the lower floor. Therefore the valve of the yarn sucking unit on the upper floor tends to be kept open for long time even after the delivery of yarns on the lower floor finishes. Because of this, yarn bring-down may not be performed at other spun yarn take-up apparatuses due to the lack of the sucking force of the yarn sucking units of the other spun yarn take-up apparatuses.

[0005] The present invention has been done in consideration of these problems, and an object of the invention is to provide a spun yarn take-up system which is able to swiftly close a valve of a yarn sucking unit on the upper floor without deteriorating the work efficiency of an operator on the upper floor.

[0006] A first aspect of the present invention is a spun yarn take-up system comprising spun yarn take-up apparatuses each of which is configured to wind yarns spun out from a spinning device provided on an upper floor by a winding device provided on a lower floor, each of the spun yarn take-up apparatuses including: a yarn sucking unit provided on the upper floor; and a yarn bring-down apparatus which brings the yarns held by the yarn sucking unit down to the lower floor from the upper floor, the spun yarn take-up system comprising a sending unit which sends a delivery complete signal indicating that, in at least one of the spun yarn take-up apparatuses, the yarns brought down to the lower floor by the yarn bring-down apparatus are delivered to a yarn threading robot or an operator on the lower floor; and a valve controlling unit which closes a valve of the yarn sucking unit of the at least one of the spun yarn take-up apparatuses, upon receiving the delivery complete signal from the sending unit.

[0007] Referring to the first aspect of the present invention, the sending unit sends the delivery complete signal after the completion of the delivery of the yarn on the lower floor. The valve controlling unit closes the valve of the yarn sucking unit when receiving the delivery complete signal. On this account, the valve of the yarn sucking unit is closed automatically after the completion of the delivery of the yarn, without keeping an operator on the upper floor on standby until the finish of the delivery of the yarn on the lower floor. Therefore, the valve of the yarn sucking unit on the upper floor can be closed immediately without deteriorating the work efficiency of an operator on the upper floor.

[0008] A second aspect of the present invention is a spun yarn take-up system comprising spun yarn take-up apparatuses each of which is configured to wind yarns spun out from a spinning device provided on an upper floor by a winding device provided on a lower floor, each of the spun yarn take-up apparatuses including: a yarn sucking unit provided on the upper floor; and a yarn bring-down apparatus which brings the yarns held by the yarn sucking unit down to the lower floor from the upper floor, the spun yarn take-up system comprising: a sending unit which sends a delivery complete signal indicating that, in at least one of the spun yarn take-up apparatuses, the yarns brought down to the lower floor by the yarn bring-down apparatus are delivered to a yarn threading robot or an operator on the lower floor; and a notification unit which notifies an operator on the upper floor of completion of delivery of the yarns in the at least one of the spun yarn take-up apparatuses, upon receiving the delivery complete signal from the sending unit.

[0009] Referring to the second aspect of the present

invention, the sending unit sends the delivery complete signal after the finish of the delivery of the yarns on the lower floor, and an operator on the upper floor is notified of the finish of the delivery of the yarns on the lower floor, by the notification unit. On this account, because the notification unit is activated when the delivery of the yarns finishes, the operator on the upper floor is swiftly notified of the finish of the delivery of the yarns, and hence the operator is not required to be on standby until the finish of the delivery of the yarns on the lower floor. Therefore, the valve of the yarn sucking unit on the upper floor can be closed immediately without deteriorating the work efficiency of an operator on the upper floor.

[0010] In the present invention, when the yarn threading robot starts a predetermined operation, the sending unit preferably sends the delivery complete signal.

[0011] As a result, the sending unit never fails to send the delivery complete signal, because the sending unit sends the delivery complete signal automatically when the yarn threading robot performs the predetermined operation. Therefore, the valve of the yarn sucking unit is reliably closed.

[0012] In the present invention, preferably, the yarn threading robot comprises a cutter for cutting the yarns brought down to the lower floor by the yarn bring-down apparatus as receiving the yarns, and the sending unit sends the delivery complete signal when the yarn threading robot cuts the yarns by a cutter.

[0013] Typically, the yarn threading robot is configured to suck the yarns which are cut by the cutter, by the suction. In other words, the delivery of the yarns on the lower floor is completed, substantially at the same time as or immediately after the yarns are cut by the cutter. Therefore, with the structure as described above, the valve of the yarn sucking unit can be closed further promptly, because the delivery complete signal is sent substantially at the same time as the yarns Y are delivered.

[0014] In the present invention, the sending unit preferably send the delivery complete signal after a predetermined time is passed since the yarn threading robot starts an operation for cutting the yarns by the cutter.

[0015] The yarn threading robot may need time to suck all of the yarns by the suction after the yarn threading robot starts the operation for cutting yarns by the cutter. For that reason, as described above, the elapse of the predetermined time is waited for, before the delivery complete signal is sent. It is therefore possible to send the delivery complete signal certainly after the completion of the delivery of the yarns on the lower floor.

[0016] In the present invention, preferably, a central controller which controls the spun yarn take-up apparatuses and the yarn threading robot is provided, and the central controller sends the delivery complete signal as the sending unit.

[0017] Because the central controller functions as the sending unit, it is unnecessary to additionally provide a sending unit. Cost reduction is therefore achieved. Furthermore, because the central controller typically has a

better processing capability than other controlling units, data transmission is performed smoothly and the cooperation with other apparatuses is easy.

[0018] In the present invention, preferably, the yarn threading robot sends the delivery complete signal as the sending unit.

[0019] Because the yarn threading robot functions as the sending unit, it is unnecessary to additionally provide a sending unit. Cost reduction is therefore achieved. In this case, the central controller can be omitted, and the yarn threading robot can directly communicate with another controlling unit.

[0020] In the present invention, preferably, a calling unit for calling the yarn threading robot is provided on the upper floor.

[0021] Because the calling unit is provided on the upper floor, an operator on the upper floor can leave the post of duty after performing yarn bring-down and calling the yarn threading robot. Therefore, the work efficiency of an operator on the upper floor is improved.

[0022] In the present invention, preferably, an operating unit which is operated by the operator on the lower floor in yarn threading sends the delivery complete signal as the sending unit.

[0023] As such, because the operating unit operated by the operator functions as the sending unit when the yarn threading is performed, it is unnecessary to additionally provide a sending unit. Cost reduction is therefore achieved.

[0024] In the present invention, preferably, each of the spun yarn take-up apparatuses includes: a yarn regulating guide to which the yarns are threaded first on the lower floor, the yarn regulating guide being moved in the yarn threading; and a guide operating unit which is provided to move the yarn regulating guide as the operating unit, and a signal which is sent by the guide operating unit in order to move the yarn regulating guide is used as the delivery complete signal.

[0025] With this, at a timing of the threading of the yarns to the yarn regulating guide first on the lower floor, the delivery complete signal may be sent. As a result, because the delivery complete signal is sent as soon as the yarn is delivered to the operator on the lower floor, the valve of the yarn sucking unit on the upper floor can be closed more immediately.

[0026] In the present invention, preferably, each of the spun yarn take-up apparatuses includes: a godet roller to which the yarns are threaded at a yarn threading position, the godet roller being moved to a winding position after the yarns are threaded to the godet roller; and a godet roller operating unit which is provided to move the godet roller from the yarn threading position to the winding position, as the operating unit, and a signal sent from the godet roller operating unit in order to move the godet roller from the yarn threading position to the winding position is used as the delivery complete signal.

[0027] With this, at a timing of the finish of the threading of the yarns to the godet roller, the delivery complete

signal may be sent.

[0028] In the present invention, preferably, the winding device of each of the spun yarn take-up apparatuses includes: fulcrum guides which function as fulcrum guides which function as fulcrums when the yarns are traversed; and a yarn threading operating unit which is, as the operating unit, operated by the operator on the lower floor when the yarns are threaded to the fulcrum guides, and a signal sent from the yarn threading operating unit when the yarn threading operating unit is operated by the operator is used as the delivery complete signal.

[0029] With this, when the yarns are threaded to the fulcrum guides, the delivery complete signal may be sent.

[0030] In the present invention, preferably, the fulcrum guides are arranged to be adjacent to each other when the yarns are threaded to the fulcrum guides, and the fulcrum guides are arranged to be apart from each other after the yarns are threaded to the fulcrum guides, the yarn threading operating unit is provided at least for arranging the fulcrum guides to be apart from each other, and a signal sent from the yarn threading operating unit in order to arrange the fulcrum guides to be apart from each other is used as the delivery complete signal.

[0031] With this, at a timing of the finish of the threading of the yarns to the fulcrum guides, the delivery complete signal may be sent.

[0032] In the present invention, preferably, the winding device of each of the spun yarn take-up apparatuses further includes a yarn threading guide which threads the yarns to the fulcrum guides as the yarn threading guide in a state in which the yarns are threaded to the yarn threading guide moves, the yarn threading operating unit is provided for moving the yarn threading guide, and a signal sent from the yarn threading operating unit in order to move the yarn threading guide is used as the delivery complete signal.

[0033] With this, at a timing of the finish of the threading of the yarns to the yarn threading guide, the delivery complete signal may be sent.

[0034] In the present invention, preferably, the winding device of each of the spun yarn take-up apparatuses includes, as the operating unit, a winding operating unit which is provided to cause the winding device to start winding of the yarns, and a signal sent from the winding operating unit in order to cause the winding device to start the winding of the yarns is used as the delivery complete signal.

[0035] With this, at a timing of the start of the winding of the yarns to the winding device, the delivery complete signal may be sent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

FIG. 1 is a schematic diagram of a spun yarn take-up system related to the first embodiment.

FIG. 2 is a schematic diagram of a spun yarn take-

up apparatus related to the first embodiment.

FIG. 3 is a block diagram showing an electric structure of the spun yarn take-up system related to the first embodiment.

FIG. 4(a) shows a state of a fulcrum guide in winding, and FIG. 4(b) shows a state of the fulcrum guide when yarn threading is performed.

FIG. 5 is a perspective view of the yarn bring-down apparatus.

FIG. 6 shows yarn bring-down and yarn threading.

FIG. 7 shows yarn bring-down and yarn threading.

FIG. 8 shows yarn bring-down and yarn threading.

FIG. 9 shows yarn bring-down and yarn threading.

FIG. 10 shows yarn bring-down and yarn threading.

FIG. 11 is a schematic diagram of a spun yarn take-up apparatus related to the second embodiment.

FIG. 12 is a block diagram showing an electric structure of a spun yarn take-up system related to the second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[First Embodiment]

[0037] The following will describe a first embodiment of the present invention with reference to figures. FIG. 1 is a schematic diagram of a spun yarn take-up system related to the first embodiment. FIG. 2 is a schematic diagram of a spun yarn take-up apparatus of the first embodiment. FIG. 3 is a block diagram showing an electric structure of the spun yarn take-up system related to the first embodiment. Directions of the spun yarn take-up system 1 and a spun yarn take-up apparatus 2 are defined as shown in FIG. 1 and FIG. 2. FIG. 3 illustrates only one spun yarn take-up apparatus 2 because of the space.

(Spun Yarn Take-Up System)

[0038] A building which is provided with a spun yarn take-up system 1 is partitioned by a partition floor 5 into the lower floor (the first floor) and the upper floor (the second floor). As shown in FIG. 1, on the upper floor, spinning apparatuses 100 are aligned in the left-right direction. The spun yarn take-up system 1 winds yarns Y (to be more specific, synthetic filament yarns) spun out from each spinning apparatus 100 to bobbins B, and forms packages P. The spun yarn take-up system 1 includes spun yarn take-up apparatuses 2, a yarn threading robot 3, and a central controller 4 (shown in FIG. 3).

(Spun Yarn Take-Up Apparatus)

[0039] The spun yarn take-up apparatuses 2 are aligned in the left-right direction to correspond to the respective spinning apparatuses 100. As shown in FIG. 2, each of the spun yarn take-up apparatuses 2 includes an oil guide 11, a yarn regulating guide 12, a first godet

roller 13, a second godet roller 14, a winding device 15, a yarn bring-down apparatus 16, a yarn sucking unit 17, and a take-up controlling unit 18 (as shown in FIG. 3). Each of the spun yarn take-up apparatuses 2 is configured to wind yarns Y spun out from the respective spinning apparatus 100 by the winding device 15.

[0040] The oil guide 11 provided on the upper floor is placed below the spinning apparatus 100. The oil guides 11, which are not in FIG. 1, are aligned in the left-right direction. The number of the oil guides 11 is identical with the number (eight in the present embodiment) of the yarn Y spun out from the spinning apparatus 100. To the yarns Y spun out from the spinning apparatus 100, oil is applied by the corresponding oil guides 11. Yarns Y to which the oil has been applied reach the lower floor through a yarn passing hole 5a formed in the partition floor 5.

[0041] The yarn regulating guide 12 provided on the lower floor is the first guide to which the yarns Y having been brought down to the lower floor are threaded. The yarn regulating guide 12 is movable between a winding position overlapped with the first godet roller 13 (see full lines in FIG. 1) and a yarn threading position which is not overlapped with the first godet roller 13 (see one-dot chain lines in FIG. 1), in the axial direction (in the left-right direction) of the first godet roller 13. The yarn regulating guide 12 is moved by a guide driving unit 51 (as shown in FIG. 3) formed of, for example, a cylinder. The yarn regulating guide 12 is moved to the yarn threading position in order to facilitate yarn threading, when the yarns are threaded to the yarn regulating guide 12. The yarn regulating guide 12 is moved back to the winding position when the yarn threading finishes.

[0042] The first godet roller 13 and the second godet roller 14 provided on the lower floor send yarns Y to the winding device 15. The first godet roller 13 and the second godet roller 14 are driven rotationally by unillustrated motors, respectively. The first godet roller 13 is placed below the yarn regulating guide 12 and in the vicinity of the yarn regulating guide 12. The second godet roller 14 is movable between a winding position (indicated by a full line in FIG. 2) above the winding device 15 and a yarn threading position (indicated by a one-dot chain line in FIG. 2) nearby the first godet roller 13. The movement of the second godet roller 14 is performed by a godet roller driving unit 52 (see FIG. 3) which is formed of, for example, a cylinder. The second godet roller 14 is moved down to the yarn threading position in order to facilitate yarn threading, when the yarn threading to the first godet roller 13 and the second godet roller 14 is performed. The second godet roller 14 is moved up to the winding position when the yarn threading finishes.

[0043] The winding device 15 provided on the lower floor winds yarns Y to bobbins B and forms packages P. The winding device 15 includes a turret 21, two bobbin holders 22, a contact roller 23, fulcrum guides 24, traverse guides 25, and a winding controlling unit 26 (see FIG. 3). The turret 21 is a disc-shaped member, and rotationally driven by an unillustrated motor. Furthermore,

the turret 21 cantilevers two bobbin holders 22 to be rotatable. As the turret 21 rotates, the positions of two bobbin holders 22 are changed upside down. To each of the bobbin holders 22, bobbins B are attached. Each of the bobbin holders 22 is rotationally driven by a bobbin holder motor 53 (as shown in FIG. 3). The contact roller 23 makes contact with packages P supported by an upper bobbin holder 22, and applies a contact pressure to the packages P.

[0044] Fulcrum guides 24 and traverse guides 25 are aligned in the front-rear direction, and correspond to each other one-to-one. After being threaded to a fulcrum guide 24, a yarn Y is threaded to the corresponding traverse guide 25. Traverse guides 25 are reciprocated in the front-rear direction by a traverse driving unit 54 (see FIG. 3) formed of, e.g., a motor. A winding controlling unit 26 controls an operation of each part of the winding device 15. The winding controlling unit 26 is able to perform yarn winding of reciprocating the traverse guides 25 in the front-rear direction by the traverse driving unit 54, while rotating the upper bobbin holder 22 by the bobbin holder motor 53. By the yarn winding, yarns Y are wound onto bobbins B while being traversed about the respective fulcrum guides 24, with the result that packages P are formed.

[0045] FIG. 4(a) shows the fulcrum guides 24 when the yarn winding is performed, and FIG. 4(b) shows the fulcrum guides 24 when the yarn threading is performed. The fulcrum guides 24 are movably attached to a guide rail 28 which extends in the front-rear direction, through sliders 27. The fulcrum guides 24 are movable between the winding positions (as shown in FIG. 2 and FIG. 4(a)) where the fulcrum guides 24 are apart from each other at regular intervals and the yarn threading positions (as shown in FIG. 4(b)) where the fulcrum guides 24 are gathered and adjacent to each other at a front end portion of the guide rail 28. The movement of the fulcrum guides 24 (sliders 27) is performed by a fulcrum guide driving unit 55 (as shown in FIG. 3) formed of, for example, a cylinder. The fulcrum guides 24 are moved to the yarn threading positions in order to facilitate the yarn threading when the yarn threading to fulcrum guides 24 is performed. The fulcrum guides 24 are moved back to the winding positions when the yarn threading finishes.

[0046] The yarn bring-down apparatus 16 is an apparatus configured to bring yarns Y spun out from the spinning apparatus 100 down to the lower floor from the upper floor. FIG. 5 is a perspective view of the yarn bring-down apparatus 16. The yarn bring-down apparatus 16 includes a guide member 31 and a moving unit 32. The guide member 31 penetrates a yarn passing hole 5a formed in the partition floor 5, and extends in the up-down direction across the lower floor and the upper floor. The moving unit 32 is supported to be movable in the up-down direction by the guide member 31. The moving unit 32 can go up and down between a standby position (indicated by a full lines in FIG. 2) on the upper floor and a delivery position (indicated by the one-dot chain lines in

FIG. 2) nearby the yarn regulating guide 12 on the lower floor. The movement of the moving unit 32 is performed by a yarn bring-down driving unit 36 (as shown in FIG. 3) formed of, for example, a motor. An operation switch 37 is provided on the upper floor to move the moving unit 32.

[0047] The moving unit 32 includes a supporting member 33, a roller 34, and a bundling guide 35. The supporting member 33 is a plate member substantially in parallel to the vertical surface. The supporting member 33 is attached to the guide member 31 to be movable in the up-down direction. The roller 34 is freely rotatable, and is supported by a side face portion of the supporting member 33 so that the rotational axis of the roller 34 is substantially horizontal. Onto the roller 34, yarns Y spun out from the spinning apparatus 100 are wound. The bundling guide 35 is a flat and U-shaped, and is attached to a side face portion of the supporting member 33 above the roller 34. Yarns Y are threaded to the bundling guide 35, before the yarns Y are wound onto the roller 34. Yarns Y are brought down to the lower floor from the upper floor in such a way that the moving unit 32 moves from the standby position on the upper floor to the delivery position on the lower floor while the yarns Y are wound onto the roller 34.

[0048] The yarn sucking unit 17 provided on the upper floor is placed nearby the passing hole 5a. The yarn sucking unit 17 sucks and holds yarns Y temporarily when the yarns Y are brought down to the lower floor by the yarn bring-down apparatus 16. The yarn sucking unit 17 is configured to generate sucking force at the suction port 17a by means of a flow of compressed fluid. The yarn sucking unit 17 is provided with an electromagnetic valve 19 (as shown in FIG. 3). The sucking force is generated at the suction port 17a when the electromagnetic valve 19 is opened, because the compressed fluid is supplied to the yarn sucking unit 17. The sucking force is not generated at the suction port 17a when the electromagnetic valve 19 is closed, because the compressed fluid is not supplied to the yarn sucking unit 17. The compressed fluid is supplied to the yarn sucking units 17 of the respective spun yarn take-up apparatuses 2 through an unillustrated common pipe.

[0049] The take-up controlling unit 18 controls an operation of each part of the spun yarn take-up apparatus 2 as shown in FIG. 3. The take-up controlling unit 18 mainly controls operations of members not included in the winding device 15, such as a guide driving unit 51, a godet roller driving unit 52, a yarn bring-down driving unit 36, and the electromagnetic valve 19, etc. The take-up controlling unit 18 receives a signal from the operation switch 37. The take-up controlling unit 18 is connected to the central controller 4 and the winding controlling unit 26 so that signals can be sent and received between them.

(Yarn Threading Robot)

[0050] A yarn threading robot 3 is provided on the lower floor as shown in FIG. 1 and FIG. 2, and is an apparatus which performs yarn threading to the spun yarn take-up apparatuses 2 automatically. The yarn threading robot 3 includes a main body 41, a robotic arm 42, a suction 43, a cutter 44, and a robot controlling unit 45 (as shown in FIG. 3). The main body 41 is supported to be movable by a guide rail 40 which extends in the left-right direction. The main body 41 is moved by a moving motor 46 (as shown in FIG. 3). The robotic arm 42 which is attached to the main body 41 can perform three-dimensional operations by being driven by an arm driving motor 47 (see FIG. 3). The suction 43 and the cutter 44 are attached to the leading end portion of the robotic arm 42. The suction 43 sucks and holds yarns Y. The cutter 44 cuts yarns Y. The cutter 44 is driven by a cutter driving unit 48 (as shown in FIG. 3) formed of, for example, a cylinder. The robot controlling unit 45 controls an operation of each part of the yarn threading robot 3. An operating panel 49 provided on the upper floor shows the position and the operating condition of the yarn threading robot 3. The operating panel 49 is used for calling the yarn threading robot 3.

(Central Controller)

[0051] As shown in FIG. 3, the central controller 4 is connected to the take-up controlling unit 18 of each of the spun yarn take-up apparatuses 2 and robot controlling unit 45 so that signals can be sent and received between the central controller 4 and the take-up controlling unit 18 of each spun yarn take-up apparatus 2 and between the central controller 4 and the robot controlling unit 45. The central controller 4 controls the spun yarn take-up apparatuses 2 and the yarn threading robot 3. Furthermore, the central controller 4 is connected to the operating panel 49 so that signals can be sent and received between the central controller 4 and the operating panel 49. When an input is made to the operating panel 49 to move the yarn threading robot 3 to one spun yarn take-up apparatus 2, a calling signal is sent from the operating panel 49 to the central controller 4. Subsequently, the central controller 4 having received the calling signal sends a command to the robot controlling unit 45 to move the yarn threading robot 3 to the one spun yarn take-up apparatus 2.

(Yarn Threading Process)

[0052] In one spun yarn take-up apparatus 2, when yarn winding by the winding device 15 is started (restarted), for example, at the start of the production of a package or after the occurrence of yarn breakage, etc., it is necessary to bring yarns Y spun out from the spinning apparatus 100 on the upper floor down to the lower floor, and to thread the yarns Y to the winding device 15 and

members on the path to the winding device 15. In the present embodiment, an operator on the upper floor performs yarn bring-down by which yarns Y are brought down to the lower floor, and the yarn threading robot 3 on the lower floor performs yarn threading on the lower floor. The following describes a series of processes of yarn bring-down and yarn threading with reference to FIG. 6 to FIG. 10.

[0053] In the spun yarn take-up apparatus 2 which is a target of the yarn bring-down and the yarn threading, before the yarn bring-down is performed, the electromagnetic valve 19 of the yarn sucking unit 17 is opened and the moving unit 32 of the yarn bring-down apparatus 16 is arranged to be on standby at the standby position on the upper floor, by the take-up controlling unit 18. In this regard, these preparations may be done by an operator on the upper floor.

[0054] To begin with, an operator on the upper floor guides yarns Y spun out from the spinning apparatus 100 to the yarn sucking unit 17, as shown in FIG. 6, and causes the yarn sucking unit 17 to suck and hold the yarns Y. Subsequently, the operator on the upper floor threads the yarns Y spun out from the spinning apparatus 100 to the oil guide 11, as shown in FIG. 7, and further threads the yarns Y to the bundling guide 35 and roller 34 of the yarn bring-down apparatus 16. After the yarn threading to the bundling guide 35 and the roller 34 finishes, the operator on the upper floor moves the moving unit 32 of the yarn bring-down apparatus 16 to the delivery position on the lower floor by operating an operation switch 37. As a result, the part of the yarns Y held by the sucking unit 17 is placed at the lower floor as shown in FIG. 8.

[0055] Then the operator on the upper floor operates the operating panel 49 in order to move the yarn threading robot 3 to a spun yarn take-up apparatus 2 which is the target of the yarn threading. The central controller 4 having received a calling signal from the operating panel 49 sends a command to move the yarn threading robot 3 to the target spun yarn take-up apparatus 2. The yarn threading robot 3 having received the command moves to the target spun yarn take-up apparatus 2.

[0056] The yarn threading robot 3 having arrived at the target spun yarn take-up apparatus 2 brings the suction 43 and the cutter 44 close to the yarns Y by moving the robotic arm 42. To be more specific, the suction 43 and the cutter 44 are brought close to the yarns Y, on the upstream side of the moving unit 32 of the yarn bring-down apparatus 16 in the yarn running direction. As the yarns Y in this state are cut by the cutter 44, the yarns Y are sucked and held by the suction 43 as shown in FIG. 9. Consequently, the yarns Y spun out from the spinning apparatus 100 are delivered to the yarn threading robot 3 from the yarn bring-down apparatus 16. After the yarns Y are delivered to the yarn threading robot 3, the moving unit 32 is moved back to the standby position on the upper floor at a suitable timing.

[0057] The yarn threading robot 3 having received the yarns Y performs yarn threading to the yarn regulating

guide 12, the first godet roller 13, the second godet roller 14, and the fulcrum guides 24 in order. In this regard, the yarn regulating guide 12, the second godet roller 14, and fulcrum guides 24 are moved to the yarn threading positions respectively before the yarn threading robot 3 performs yarn threading. While these movements are done by the take-up controlling unit 18, they may be done by operator on the lower floor.

[0058] The yarn threading robot 3 threads the yarns Y held at the suction 43 to the yarn regulating guide 12, the first godet roller 13, and the second godet roller 14 in order as shown in FIG. 10. The yarn regulating guide 12 are moved back to the winding position after the yarn threading to the yarn regulating guide 12 finishes. In the second godet roller 14, the second godet roller 14 may be moved back to the winding position after the yarn threading to the second godet roller 14. However, in the present embodiment, the second godet roller 14 is moved back after the yarn threading to fulcrum guides 24 finishes, as described below.

[0059] Subsequently, the yarn threading robot 3 performs yarn threading to the fulcrum guides 24 (as shown in the FIG. 4(b)) at the yarn threading positions. For details of this process, for example, see Japanese Laid-Open Patent Publication No. 2018-66088, etc. After the yarn threading to the fulcrum guides 24 finishes, the second godet roller 14 is moved back to the winding position, and the fulcrum guides 24 are moved back to the winding positions (as shown in FIG. 4(a)). Then the yarn threading robot 3 moves the suction 43 to a predetermined position below the upper bobbin holder 22, and makes the yarns Y contact with bobbins B. Thereafter, the winding controlling unit 26 performs yarn winding. When the yarn winding starts, the yarns Y are threaded to the traverse guides 25 in the process of the reciprocation of the traverse guides 25 in the front-rear direction. Furthermore, the yarns Y are cut when yarns Y are caught by unillustrated slits formed in bobbins B, and wound onto the bobbins B. In this way, the series of processes of yarn bring-down and yarn threading finishes.

[0060] In order to properly perform the yarn threading, the take-up controlling unit 18 and the winding controlling unit 26 need to operate each part at a proper timing in accordance with the state of the progress of the yarn threading by the yarn threading robot 3. The timing may be determined in accordance with the elapsed time from the start of the yarn threading by the yarn threading robot 3. In addition to that, each time the yarn threading robot 3 finishes predetermined operation, the yarn threading robot 3 may send a signal indicating the finish to the take-up controlling unit 18 and the winding controlling unit 26. Furthermore, each part of the spun yarn take-up apparatus 2 and the winding device 15 may be provided with a sensor, etc., which is able to detect yarns Y are threaded to the each part of the spun yarn take-up apparatus 2 and the winding device 15.

(Auto Shutdown of the Yarn Sucking Unit)

[0061] As described above, the yarn sucking unit 17 of each of the spun yarn take-up apparatuses 2 is configured to be supplied with the compressed fluid from the common pipe. Because of this, when the electromagnetic valve 19 of the yarn sucking unit 17 of one spun yarn take-up apparatus 2 is kept open, the compressed fluid is not sufficiently supplied to the yarn sucking unit 17 of another spun yarn take-up apparatus 2. As a result, the yarn bring-down may not be performed due to the lack of the sucking force. Meanwhile, the work efficiency of the operator on the upper floor is deteriorated if an operator on the upper floor needs to be on standby until the finish of the delivery of the yarns Y on the lower floor in order to close the electromagnetic valve 19. Therefore, in the present embodiment, in one spun yarn take-up apparatus 2, the electromagnetic valve 19 is configured to close automatically when the yarn bring-down apparatus 16 delivers yarns Y to the yarn threading robot 3. The following will describe the details.

[0062] In the spun yarn take-up apparatus 2, the central controller 4 sends a cutting command to the robot controlling unit 45 when the delivery of the yarns Y is performed on the lower floor. Furthermore, the central controller 4 sends a delivery complete signal which indicates the completion of the delivery of the yarn Y, to the yarn take-up controlling unit 18. The signal is sent after a predetermined time is passed from the output of the cutting command (for example, three seconds later). To put it differently, the central controller 4 works as a "sending unit" of the present invention, in the present embodiment. The robot controlling unit 45 cuts yarns Y by the cutter 44 upon receiving the cutting command. The take-up controlling unit 18 having received the delivery complete signal from the central controller 4 closes the electromagnetic valve 19.

[0063] In this connection, the central controller 4 may send the cutting command and the delivery complete signal, substantially at the same time. However, with this arrangement, yarns Y may not be delivered properly, because the electromagnetic valve 19 may be closed while not all of the yarns Y are cut by the cutter 44 or sucked and held by the suction 43 yet. Therefore, in the present embodiment, the central controller 4 is configured to send the delivery complete signal after sending the cutting command, in other words, after a predetermined time is passed from the start of the operation for cutting the yarns Y with the cutter 44 by the yarn threading robot 3. Because of this, it is ensured that the electromagnetic valve 19 is not closed while not all of the yarns Y are delivered yet.

(Effects)

[0064] In the first embodiment, the central controller 4 (sending unit) sends the delivery complete signal after the completion of the delivery of the yarn Y on the lower

floor. The take-up controlling unit 18 (a valve controlling unit) closes the electromagnetic valve 19 of the yarn sucking unit 17 when receiving the delivery complete signal from the central controller 4 (sending unit). On this account, the electromagnetic valve 19 of the yarn sucking unit 17 is closed automatically after the completion of the delivery of the yarn Y, without keeping an operator on the upper floor on standby until the finish of the delivery of the yarn Y. Therefore, the electromagnetic valve 19 of the yarn sucking unit 17 on the upper floor can be swiftly closed without deteriorating the work efficiency of the operator on the upper floor.

[0065] In the first embodiment, the central controller 4 sends the delivery complete signal when the yarn threading robot 3 performs a predetermined operation (an operation for cutting yarns Y by the cutter 44). As a result, the central controller 4 never fails to send the delivery complete signal, because the central controller 4 sends the delivery complete signal automatically when the yarn threading robot 3 performs the predetermined operation. Therefore, the electromagnetic valve 19 of the yarn sucking unit 17 is reliably closed.

[0066] In the first embodiment, the central controller 4 sends the delivery complete signal when the yarn threading robot 3 cuts yarns Y by the cutter 44. The yarn threading robot 3 is configured to suck the yarns Y which are cut by the cutter 44, by the suction 43. In other words, the delivery of the yarns Y on the lower floor is completed, substantially at the same time as or immediately after the yarns Y are cut by the cutter 44. Therefore, with the structure as described above, the electromagnetic valve 19 of the yarn sucking unit 17 can be closed further promptly, because the delivery complete signal is sent substantially at the same time as the yarns Y are delivered.

[0067] In the first embodiment, the central controller 4 sends the delivery complete signal after a predetermined time is passed from the start of the operation for cutting yarns Y with the cutter 44 by the yarn threading robot 3. The yarn threading robot 3 may need time to suck all of the yarns Y by the suction 43 after the yarn threading robot 3 starts the operation for cutting yarns Y by the cutter 44. For that reason, as described above, the elapse of the predetermined time is waited for, before the delivery complete signal is sent. It is therefore possible to send the delivery complete signal certainly after the completion of the delivery of the yarns Y on the lower floor.

[0068] In the first embodiment, the central controller 4 sends the delivery complete signal, as the sending unit of the present invention. Because the central controller 4 functions as the sending unit, it is unnecessary to additionally provide a sending unit. Cost reduction is therefore achieved. Furthermore, because the central controller 4 typically has a better processing capability than other controlling units (the take-up controlling unit 18 or the robot controlling unit 45, etc.), data transmission is performed smoothly and the cooperation with other apparatuses is easy.

[0069] In the first embodiment, the operating panel 49

(the calling unit) for calling the yarn threading robot 3 is provided on the upper floor. Because the operating panel 49 is provided on the upper floor, an operator on the upper floor can leave the post of duty after performing yarn bring-down and calling the yarn threading robot 3. Therefore, the work efficiency of an operator on the upper floor is improved.

<Second Embodiment>

[0070] The following will describe a second embodiment of the present invention with reference to FIG. 11 and FIG. 12. In the second embodiment, the same arrangements as those in the first embodiment and the effects thereof are omitted, and arrangements different from the first embodiment are mainly described. FIG. 11 is a schematic diagram of a spun yarn take-up apparatus 2 related to the second embodiment. FIG. 12 is a block diagram showing an electric structure of a spun yarn take-up system 1 related to the second embodiment.

[0071] Yarn bring-down in the present embodiment is basically the same as the yarn bring-down in the first embodiment. However, in the present embodiment, a great difference from the first embodiment is that yarn threading is performed not by a yarn threading robot but by an operator on the lower floor. Furthermore, a valve of a yarn sucking unit 17 in the present embodiment is not opened and closed automatically by a take-up controlling unit 18 as described in the first embodiment, but opened and closed by an operator on the upper floor manually. Therefore, a notification unit 65 is provided on the upper floor to notify an operator on the upper floor of the finish of the delivery of the yarn Y on the lower floor of the spun yarn take-up apparatus 2. The notification unit 65 notifies an operator on the upper floor of the finish of the delivery of the yarn Y on the lower floor by, for example, light or sound.

[0072] In the present embodiment, the spun yarn take-up apparatus 2 is provided with a guide operating unit 61, a godet roller operating unit 62, a fulcrum guide operating unit 63, and a winding operating unit 64. These operating units 61 to 64 are corresponding to "operating units" in the present invention. These operating units 61 to 64 are operated when an operator on the lower floor performs yarn threading. The guide operating unit 61 is the operating unit for moving a yarn regulating guide 12 between a winding position and a yarn threading position. The godet roller operating unit 62 is the operating unit for moving a second godet roller 14 between the winding position and the yarn threading position. The fulcrum guide operating unit 63 provided at a winding device 15 is the operating unit for moving fulcrum guides 24 between the winding positions and the yarn threading positions. The fulcrum guide operating unit 63 is one example of a "yarn threading operating unit" of the present invention. The winding operating unit 64 provided at the winding device 15 is the operating unit for driving members such as a bobbin holder motor 53 and a traverse

driving unit 54, etc., in order to cause the winding device 15 to start winding.

[0073] To begin with, an operator on the lower floor threads yarns Y to the yarn regulating guide 12 at the yarn threading position, after the operator receives, by a suction gun, the yarns Y brought down to the lower floor by a yarn bring-down apparatus 16. The operator on the lower floor operates the guide operating unit 61 and moves the yarn regulating guide 12 back to the winding position, after the finish of the threading yarns Y to the yarn regulating guide 12. Subsequently, the operator on the lower floor threads the yarns Y to the first godet roller 13 and to the second godet roller 14 at the yarn threading position, and further threads the yarns Y to the fulcrum guides 24 at the yarn threading positions. The operator on the lower floor operates the godet roller operating unit 62 to move the second godet roller 14 back to the winding position, and operates the fulcrum guide operating unit 63 to move the fulcrum guides 24 back to the winding positions, after the finish of the yarn threading of the yarns Y to the fulcrum guides 24. Thereafter, the operator on the lower floor moves a suction gun to a predetermined position below the upper bobbin holder 22. Then the operator on the lower floor operates the winding operating unit 64 in order to cause the winding device 15 to start winding.

[0074] When an operator on the lower floor performs yarn threading, as described above, the operator is supposed to operate operating units 61 to 64 in that process. To put it differently, when those operating units 61 to 64 have been operated, it is understood that the yarns Y have already been delivered from the yarn bring-down apparatus 16 to the operator on the lower floor. Therefore, in the present embodiment, one of the operating units 61 to 64 functions as a "sending unit" of the present invention, and a signal sent from the sending unit is used as a "delivery complete signal" of the present invention.

[0075] To be more specific, when the guide operating unit 61 functions as the sending unit, a signal which is sent when the operator on the lower floor operates the guide operating unit 61 to move the yarn regulating guide 12 back to the winding position is used as the delivery complete signal. When the godet roller operating unit 62 functions as the sending unit, a signal which is sent when the operator on the lower floor operates the godet roller operating unit 62 to move the second godet roller 14 to the winding position is used as the delivery complete signal. When the fulcrum guide operating unit 63 functions as the sending unit, a signal which is sent when the operator on the lower floor operates the fulcrum guide operating unit 63 to move fulcrum guides 24 back to the winding positions is used as the delivery complete signal. When the winding operating unit 64 functions as the sending unit, a signal which is sent when the operator on the lower floor operates the winding operating unit 64 to cause the winding device 15 to start winding is used as the delivery complete signal.

[0076] In any case, upon receiving the delivery com-

plete signal, the take-up controlling unit 18 notifies an operator on the upper floor of the finish of the delivery of the yarns Y on the lower floor by switching the notification unit 65 to a predetermined notification mode (in which, light flickers or sound is output, etc.). Subsequently, the operator on the upper floor can close the valve of the yarn sucking unit 17 immediately after being notified that the delivery of the yarns Y has been completed on the lower floor, by the notification mode of the notification unit 65.

(Effects)

[0077] In the second embodiment, one of the operating units 61 to 64 (sending unit) sends the delivery complete signal after the finish of delivery of the yarns Y on the lower floor, and an operator on the upper floor is notified of the finish of delivery of the yarns Y on the lower floor, by the notification unit 65. On this account, because the notification unit 65 is activated when the delivery of the yarns Y finishes, the operator on the upper floor is swiftly notified of the finish of the delivery of the yarns Y, and hence the operator is not required to be on standby until the finish of the delivery of the yarns Y on the lower floor. Therefore, the electromagnetic valve of the yarn sucking unit 17 on the upper floor can be closed immediately without deteriorating the work efficiency of an operator on the upper floor.

[0078] In the second embodiment, one of the operating units 61 to 64, operated by an operator on the lower floor when the yarn threading, sends the delivery complete signal as the sending unit of the present invention. As such, because one of the operating units 61 to 64 operated by the operator functions as the sending unit when the yarn threading is performed, it is unnecessary to additionally provide a sending unit. Cost reduction is therefore achieved.

[0079] In the second embodiment, when the signal sent by the guide operating unit 61 to move the yarn regulating guide 12 is used as the delivery complete signal, the delivery complete signal can be sent at a timing when the yarns Y are threaded to the first yarn regulating guide 12 on the lower floor. As a result, because the delivery complete signal is sent as soon as the yarn Y is delivered to the operator on the lower floor, the valve of the yarn sucking unit 17 on the upper floor can be closed more immediately.

[0080] In the second embodiment, when the signal sent by the godet roller operating unit 62 to move the second godet roller 14 from the yarn threading position to the winding position is used as the delivery complete signal, the delivery complete signal can be sent at a timing of the finish of the threading of the yarn Y to the second godet roller 14.

[0081] In the second embodiment, when the signal sent by the fulcrum guide operating unit 63 (the yarn threading operating unit) in response to an operation by an operator on the lower floor is used as the delivery

complete unit, the delivery complete signal can be sent when the yarns Y are threaded to the fulcrum guides 24.

[0082] In the second embodiment, the signal sent by the fulcrum guide operating unit 63 to set fulcrum guides 24 apart from each other is used as the delivery complete signal, the signal can be sent at a timing of the finish of the threading of the yarn Y to fulcrum guides 24. In this regard, when an operator on the lower floor operates the fulcrum guide operating unit 63 to set fulcrum guides 24 to be adjacent to each other, the signal sent by the fulcrum guide operating unit 63 at that moment can be used as the delivery complete signal.

[0083] In the second embodiment, when the signal sent by the winding operating unit 64 to cause the winding device 15 to start winding is used as the delivery signal, the delivery complete signal can be sent at a timing of the start of the yarn Y by the winding device 15.

[Other Embodiments]

[0084] The following will describe modifications of each of the above-described embodiments.

[0085] In the first embodiment described above, the electromagnetic valve 19 of the yarn sucking unit 17 is configured to close automatically after the delivery complete signal is sent from the central controller 4. Alternatively, instead of the automatic closing of the electromagnetic valve 19, a notification unit (the operating panel 49 may be used as a notification unit) may be provided on the upper floor, and this notification unit is activated when the delivery complete signal is output from the central controller 4.

[0086] In the second embodiment described above, the notification unit 65 provided on the upper floor is activated when one of the operating units 61 to 64 is operated by the operator on the lower floor and the delivery complete signal is sent. Alternatively, instead of providing with the notification unit 65, the electromagnetic valve of the yarn sucking unit 17 may be closed automatically when the operator on the lower floor operates one of the operating units 61 to 64.

[0087] In the first embodiment described above, the central controller 4 works as a sending unit of the present invention. In the second embodiment, one of the operating units 61 to 64 works as the sending unit of the present invention. Alternatively, a member other than the central controller 4 and the operating units 61 to 64 may be configured to work as the sending unit. For example, in the first embodiment, the yarn threading robot 3 (robot controlling unit 45) may be configured to send the delivery complete signal. In this case, the central controller 4 can be omitted, and the yarn threading robot 3 can directly communicate with another controlling unit (a take-up controlling unit 18). In the second embodiment, a dedicated operating unit which is operated after the finish of the delivery of the yarn Y may be provided on the lower floor, and the delivery signal may be sent from this operating unit.

[0088] In the first embodiment described above, the delivery complete signal is sent when the yarn threading robot 3 cuts yarns Y by the cutter 44. Alternatively, the delivery complete signal may be sent when the yarn threading robot 3 performs another operation.

[0089] In the first embodiment described above, yarns Y are cut in such a way that the cutter 44 is driven by the cutter driving unit 48. Alternatively, as described in, for example, Japanese Laid-Open Patent Publication No. 2012-127011, Japanese Laid-Open Patent Publication No. 2017-82376, and WO2015/198698, etc., a structure in which a cutter is not driven and a member which is not a cutter is driven so that yarns guided to the cutter are cut may be employed.

[0090] In the second embodiment described above, the notification unit 65 notifying the finish of the delivery of the yarn Y is provided on the upper floor. However, the notification unit 65 is not necessarily structured in this way. For example, a terminal device which is portable for an operator on the upper floor may be adapted as the notification unit.

[0091] In each of the above-described embodiments, the fulcrum guides 24 are configured to be movable between the winding positions and the yarn threading positions. Alternatively, a yarn threading guide for threading yarns to fulcrum guides may be provided as recited in, for example, Japanese Laid-Open Patent Publication No. 2012-188784 and WO2018/134048, etc. To be more specific, the fulcrum guides are fixed to be apart from each other, and yarns are threaded to the fulcrum guides in order as the yarn threading guide in a state which the yarns are threaded to the yarn threading guide moves. The yarn threading guide is driven by a yarn threading operating unit operated by an operator on the lower floor. In this case, a signal sent by the yarn threading operating unit to move the yarn threading guide may be used as the delivery complete signal.

[0092] The electric structure of each embodiment (see FIG. 3 and FIG. 12) described above may be modified. For example, the take-up controlling unit 18 and the winding controlling unit 26 may not be different units. The take-up controlling unit 18 and the winding controlling unit 26 may be integrated. Furthermore, the robot controlling unit 45 and the operation panel 49 may be connected to be able to send and receive signals between them. The central controller 4 may be configured to directly control the electromagnetic valve 19 and the notification unit 65 of each of the spun yarn take-up apparatuses 2.

[0093] In each embodiment described above, the yarn regulating guide 12 is moved by the guide driving unit 51. Alternatively, the yarn regulating guide 12 may be moved manually. Alternatively, the yarn regulating guide 12 may be immovable. In these cases, the guide operating unit 61 in the second embodiment is unnecessary.

[0094] In each embodiment described above, two godet rollers 13 and 14, are provided. However, the number of the godet rollers may not be two. While the

second godet roller 14 is moved by the godet roller driving unit 52, the second godet roller 14 may be moved manually. Alternatively, the second godet roller 14 may be immovable. In these cases, the godet roller operating unit 62 in the second embodiment is unnecessary.

Claims

1. A spun yarn take-up system (1) comprising spun yarn take-up apparatuses (2) each of which is configured to wind yarns (Y) spun out from a spinning device (100) provided on an upper floor by a winding device (15) provided on a lower floor, each of the spun yarn take-up apparatuses (2) including:
 - a yarn sucking unit (17) provided on the upper floor; and
 - a yarn bring-down apparatus (16) which brings the yarns (Y) held by the yarn sucking unit (17) down to the lower floor from the upper floor,
 the spun yarn take-up system (1) comprising: a sending unit (3,4,61,62,63,64) which sends a delivery complete signal indicating that, in at least one of the spun yarn take-up apparatuses (2), the yarns (Y) brought down to the lower floor by the yarn bring-down apparatus (16) are delivered to a yarn threading robot (3) or an operator on the lower floor; and
 - a valve controlling unit (18) which closes a valve (19) of the yarn sucking unit (17) of the at least one of the spun yarn take-up apparatuses (2), upon receiving the delivery complete signal from the sending unit (3, 4, 61, 62, 63, 64).
2. A spun yarn take-up system (1) comprising spun yarn take-up apparatuses (2) each of which is configured to wind yarns (Y) spun out from a spinning device (100) provided on an upper floor by a winding device (15) provided on a lower floor, each of the spun yarn take-up apparatuses (2) including:
 - a yarn sucking unit (17) provided on the upper floor; and
 - a yarn bring-down apparatus (16) which brings the yarns (Y) held by the yarn sucking unit (17) down to the lower floor from the upper floor,
 the spun yarn take-up system (1) comprising: a sending unit (3,4,61,62,63,64) which sends a delivery complete signal indicating that, in at least one of the spun yarn take-up apparatuses (2), the yarns (Y) brought down to the lower floor by the yarn bring-down apparatus (16) are delivered to a yarn threading robot (3) or an operator on the lower floor; and
 - a notification unit (65) which notifies an operator

- on the upper floor of completion of delivery of the yarns (Y) in the at least one of the spun yarn take-up apparatuses (2), upon receiving the delivery complete signal from the sending unit (3,4,61,62,63,64). 5
3. The spun yarn take-up system (1) according to claim 1 or 2, wherein, the sending unit (3,4) sends the delivery complete signal when the yarn threading robot (3) performs a predetermined operation. 10
4. The spun yarn take-up system (1) according to claim 3, wherein, the yarn threading robot (3) includes a cutter (44) which cuts the yarns (Y) when receiving the yarns (Y) which are brought down to the lower floor by the yarn bring-down apparatus (16), and the sending unit (3,4) sends the delivery complete signal when the yarn threading robot (3) cuts the yarns (Y) by the cutter (44). 15
5. The spun yarn take-up system (1) according to claim 4, wherein, the sending unit (3,4) sends the delivery complete signal after a predetermined time is passed since the yarn threading robot (3) starts an operation for cutting the yarns (Y) by the cutter (44). 20
6. The spun yarn take-up system (1) according to any one of claims 3 to 5, further comprising a central controller (4) which is configured to control the spun yarn take-up apparatuses (2) and the yarn threading robot (3), the central controller (4) sending the delivery complete signal as the sending unit. 30
7. The spun yarn take-up system (1) according to any one of claims 3 to 5, wherein, the yarn threading robot (3) sends the delivery complete signal as the sending unit. 35
8. The spun yarn take-up system (1) according to any one of claims 1 to 7, wherein, a calling unit (49) for calling the yarn threading robot (3) is provided on the upper floor. 40
9. The spun yarn take-up system (1) according to claim 1 or 2, wherein, an operating unit which is operated by the operator on the lower floor in yarn threading sends the delivery complete signal as the sending unit (61, 62, 63, 64). 45
10. Each of the spun yarn take-up apparatuses (2) including: 50
- a yarn regulating guide (12) to which the yarns (Y) are threaded first on the lower floor, the yarn regulating guide (12) being moved in the yarn threading; and
- a guide operating unit (61) which is provided to move the yarn regulating guide (12) as the operating unit, and
- a signal sent from the guide operating unit (61) in order to move the yarn regulating guide (12) is used as the delivery complete signal.
11. Each of the spun yarn take-up apparatuses (2) including:
- a godet roller (14) to which the yarns (Y) are threaded at a yarn threading position, the godet roller (14) being moved to a winding position after the yarns (Y) are threaded to the godet roller (14); and
- a godet roller operating unit (62) which is provided to move the godet roller (14) from the yarn threading position to the winding position, as the operating unit, and
- a signal sent from the godet roller operating unit (62) in order to move the godet roller (14) from the yarn threading position to the winding position is used as the delivery complete signal.
12. The spun yarn take-up system (1) according to claim 9, wherein, the winding device (15) of each of the spun yarn take-up apparatuses (2) includes:
- fulcrum guides (25) which function as fulcrums when the yarns (Y) are traversed; and
- a yarn threading operating unit (63) which is, as the operating unit, operated by the operator on the lower floor when the yarns (Y) are threaded to the fulcrum guides (25), and
- a signal sent from the yarn threading operating unit (63) when the yarn threading operating unit (63) is operated by the operator on the lower floor is used as the delivery complete signal.
13. The spun yarn take-up system (1) according to claim 12, wherein, the fulcrum guides (25) are arranged to be adjacent to each other when the yarns (Y) are threaded to the fulcrum guides (25), and the fulcrum guides (25) are arranged to be apart from one another after the yarns (Y) are threaded to the fulcrum guides (25),
- the yarn threading operating unit (63) is provided at least for arranging the fulcrum guides (25) to be apart from each other, and
- a signal sent from the yarn threading operating unit (63) in order to arrange the fulcrum guides (25) to be apart from each other is used as the delivery complete signal.
14. The spun yarn take-up system (1) according to claim 12, wherein, the winding device (15) of each of the spun yarn take-up apparatuses (2) further includes a yarn threading guide which threads the yarns (Y) to the fulcrum guides (25) as the yarn threading guide

in a state in which the yarns (Y) are threaded to the yarn threading guide moves, the yarn threading operating unit is provided for moving the yarn threading guide, and a signal sent from the yarn threading operating unit in order to move the yarn threading guide is used as the delivery complete signal. 5

15. The spun yarn take-up system (1) according to claim 9, wherein, the winding device (15) of each of the spun yarn take-up apparatuses (2) includes, as the operating unit, a winding operating unit (64) which is provided to cause the winding device (15) to start winding of the yarns (Y), and a signal sent from the winding operating unit (64) in order to cause the winding device (15) to start the winding of the yarns (Y) is used as the delivery complete signal. 10 15

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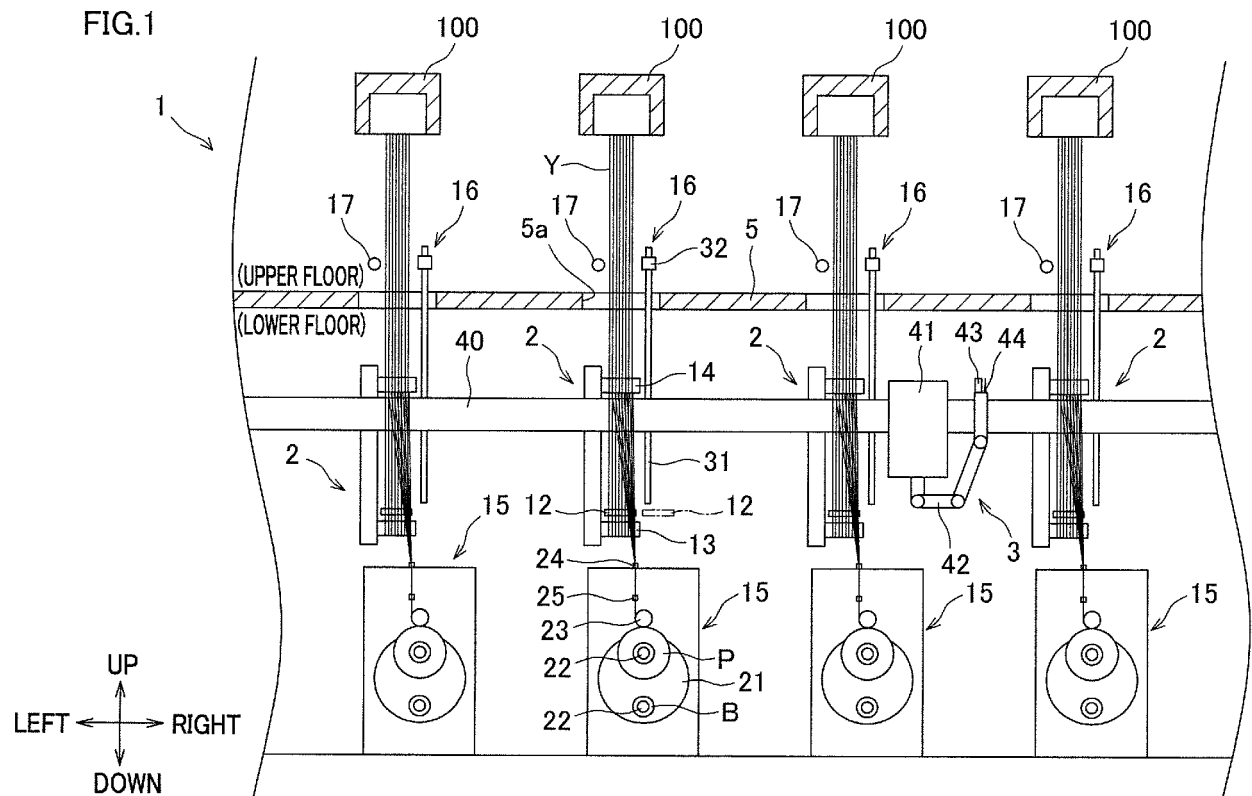


FIG.2

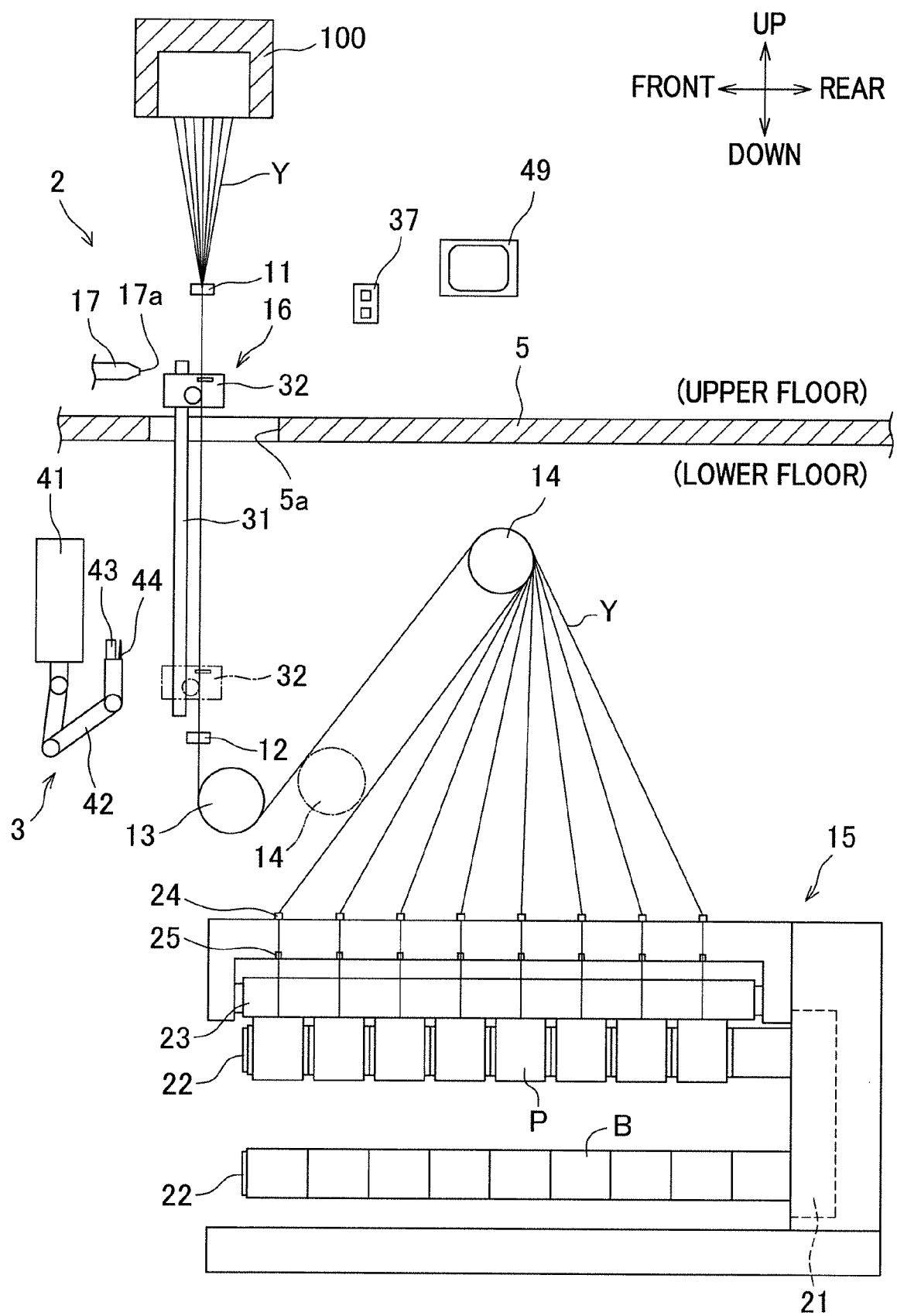


FIG.3

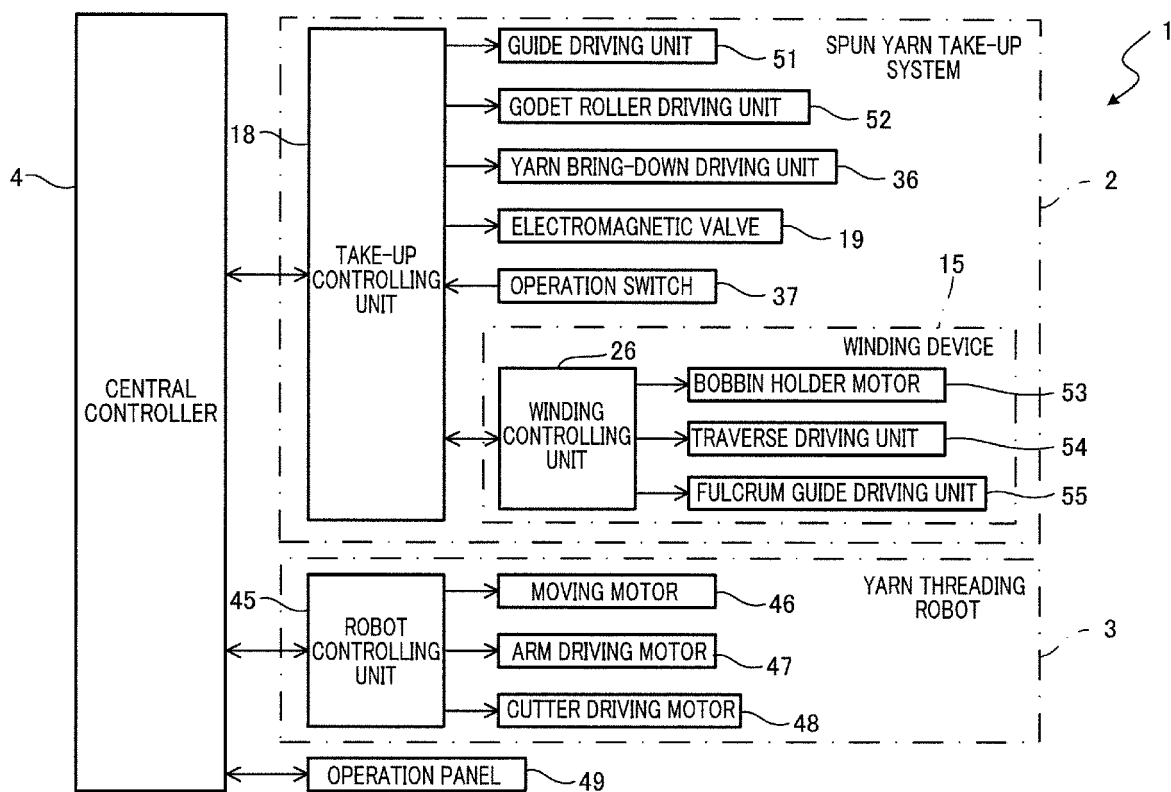
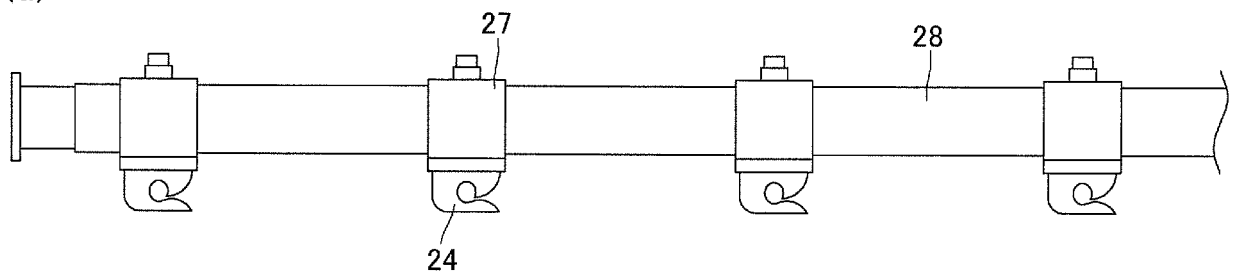
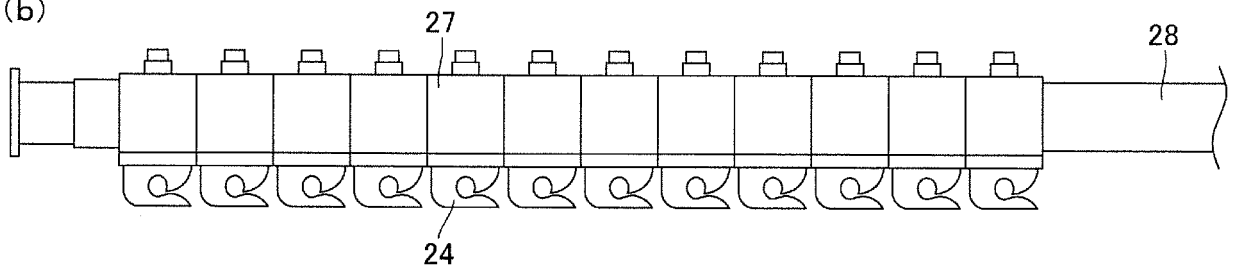


FIG.4

(a)



(b)



FRONT $\longleftrightarrow$ REAR

FIG.5

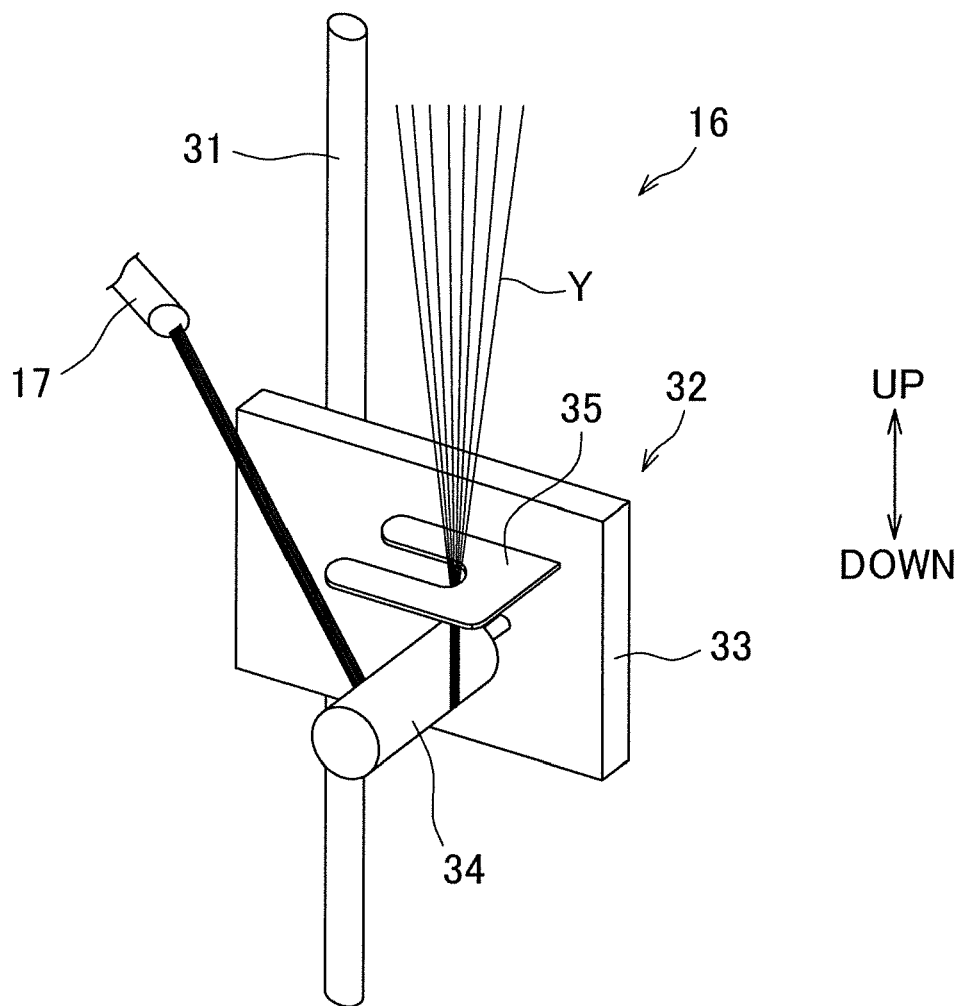


FIG.6

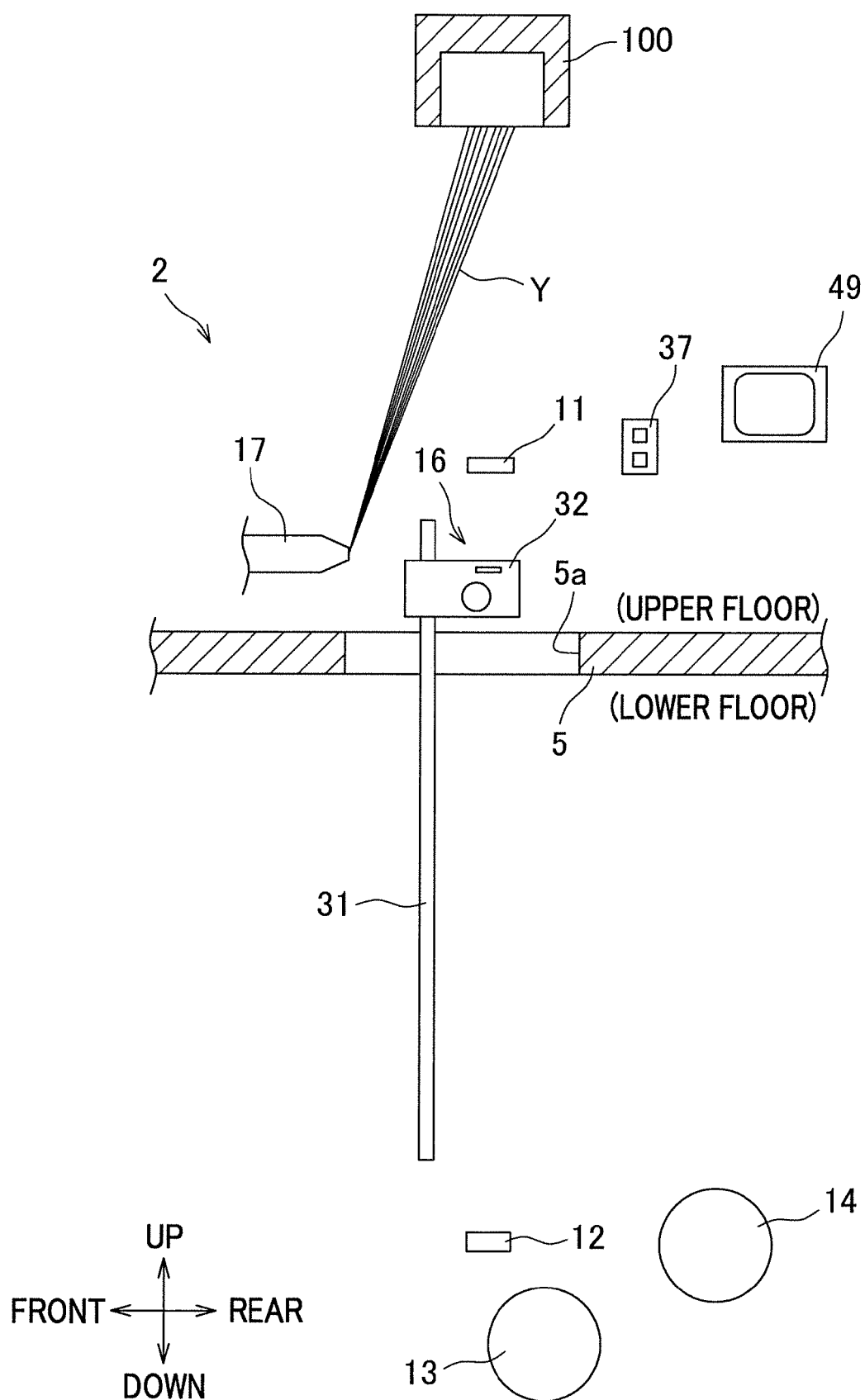


FIG.7

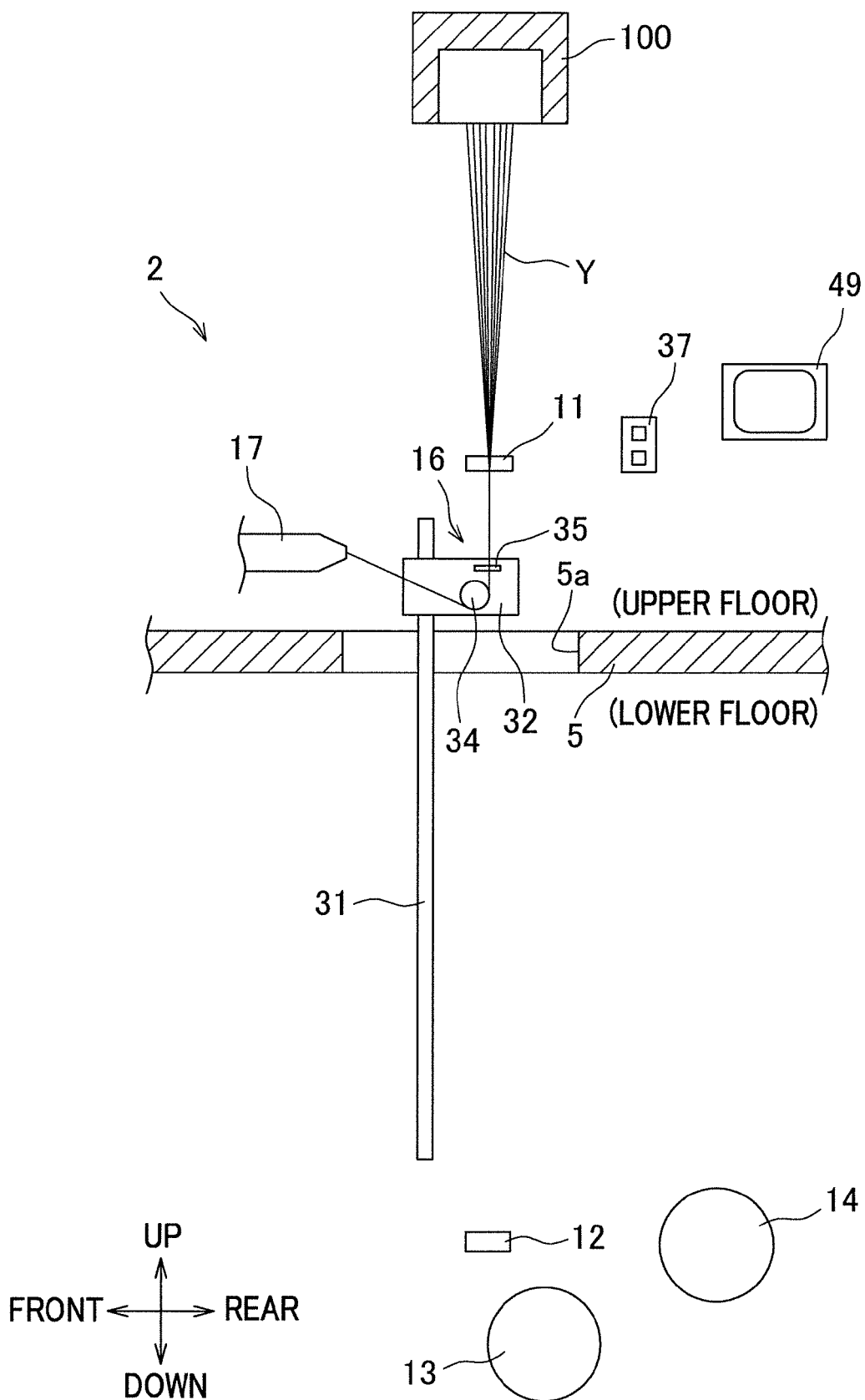


FIG.8

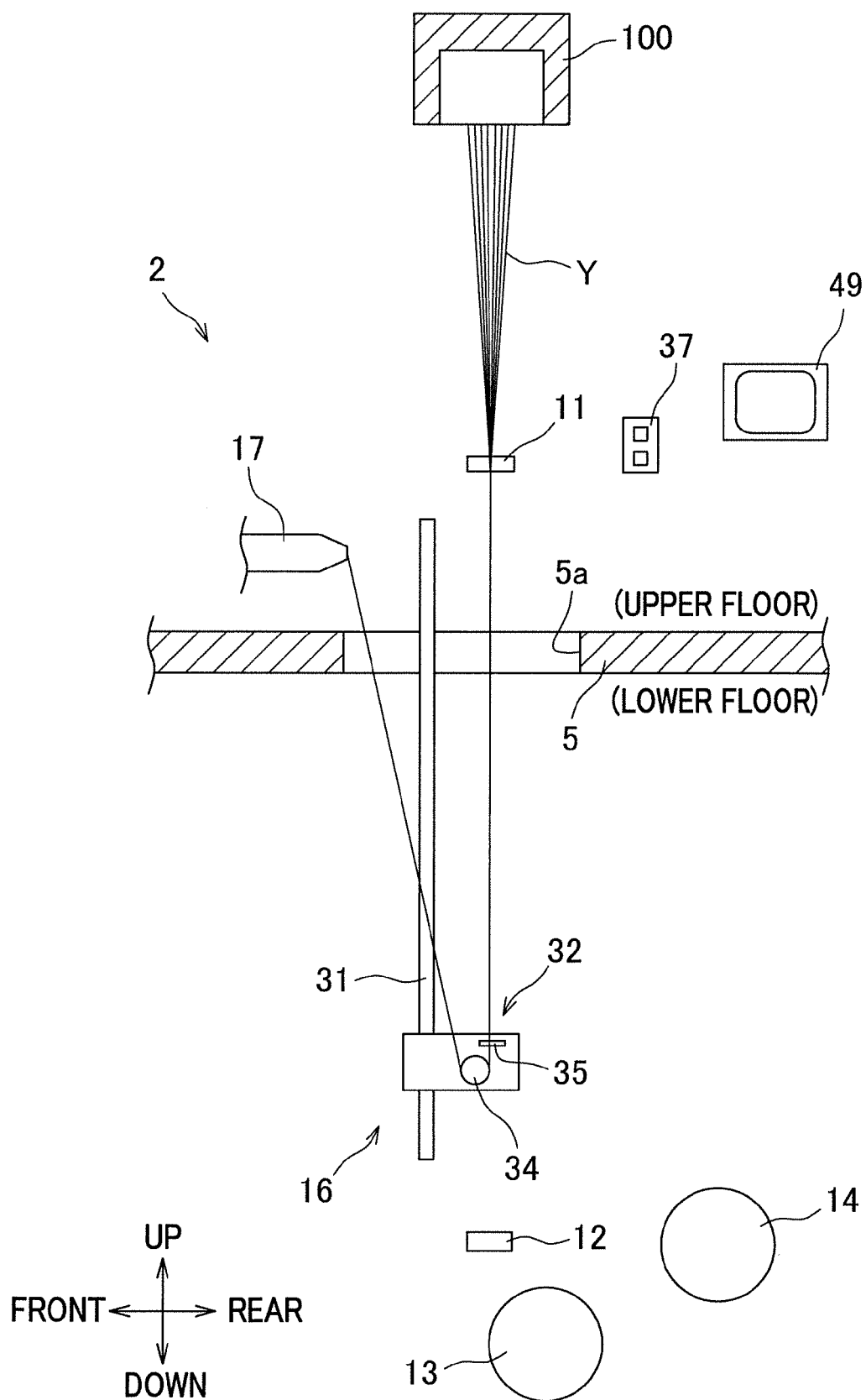


FIG.9

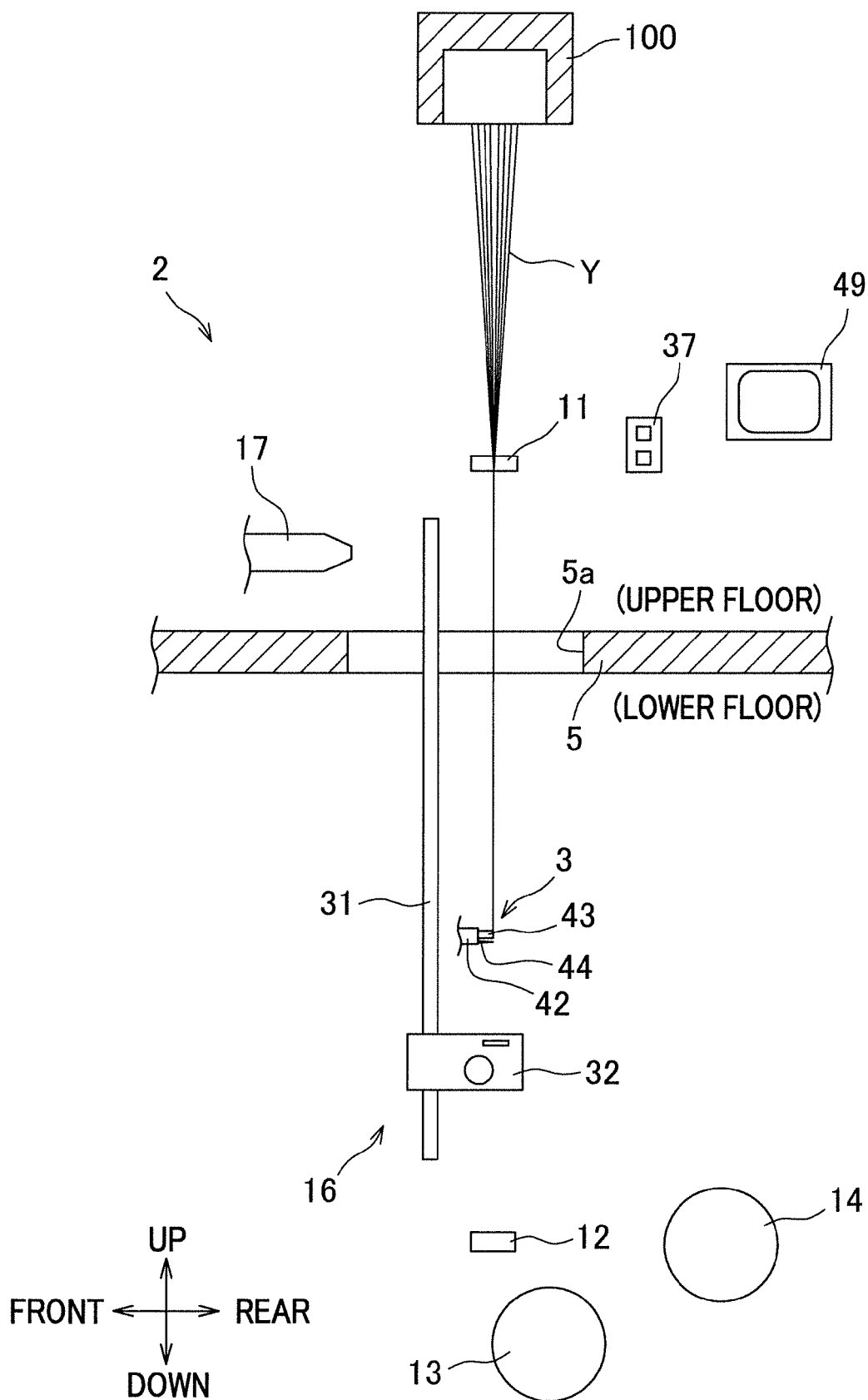


FIG.10

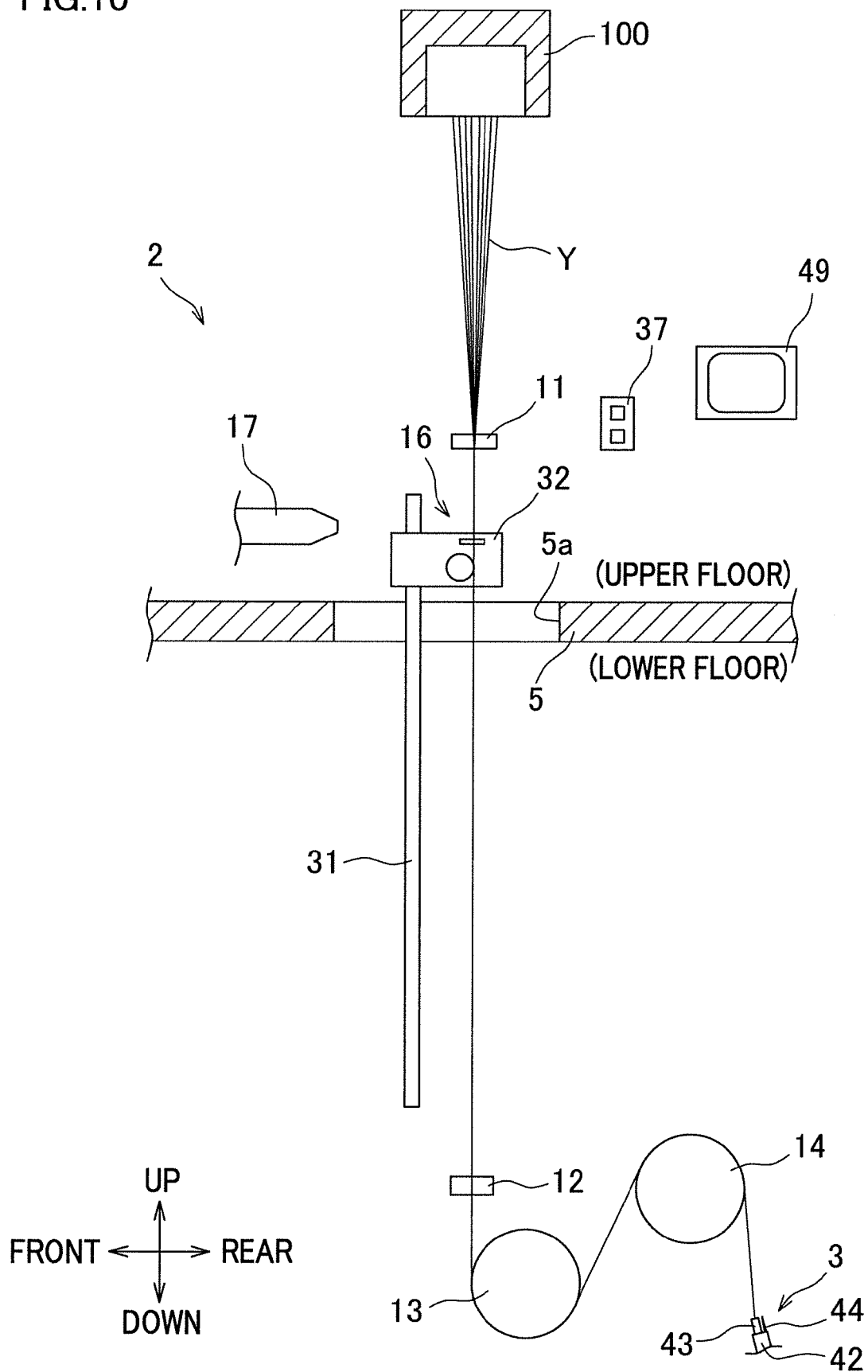


FIG.11

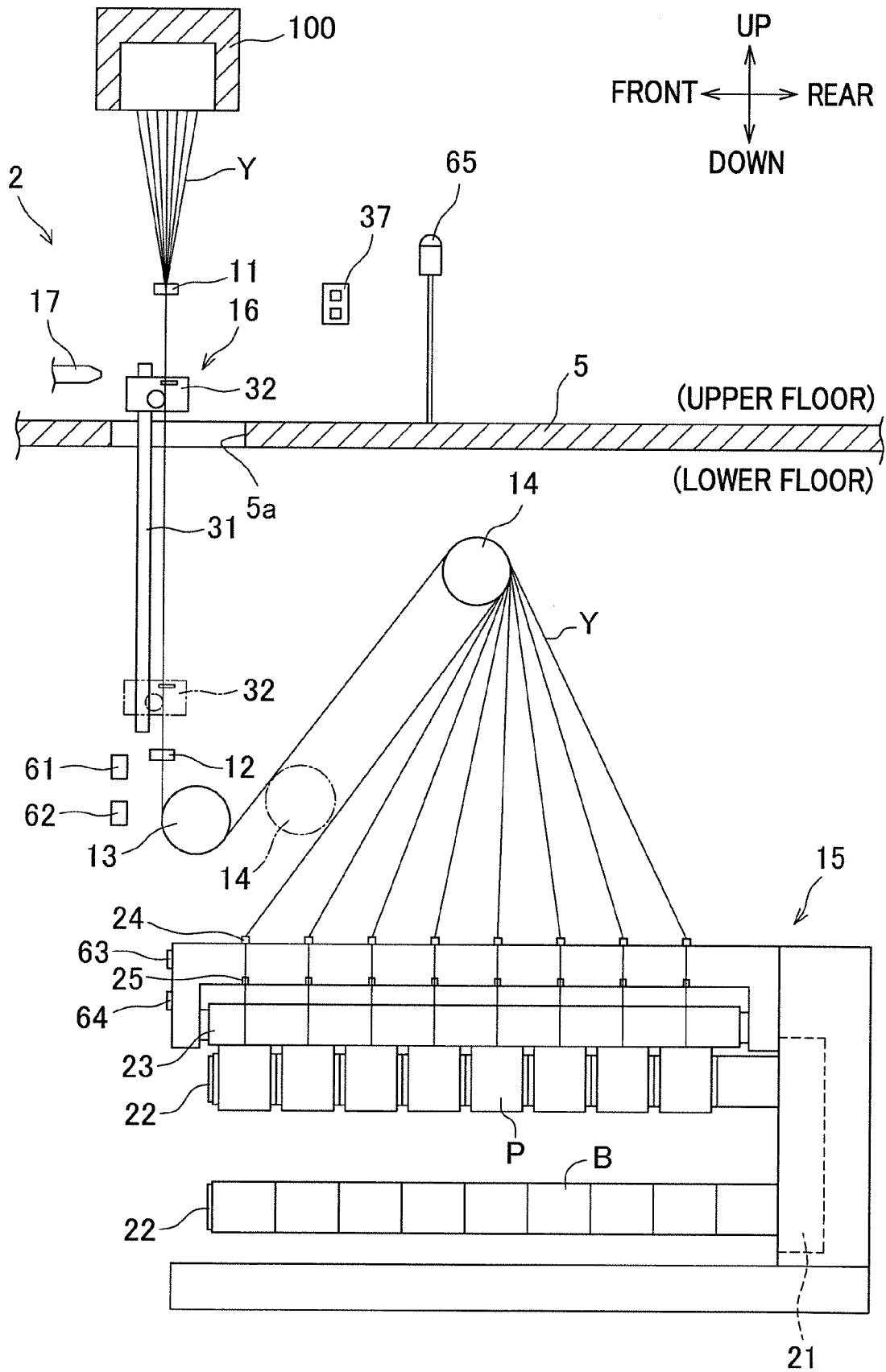
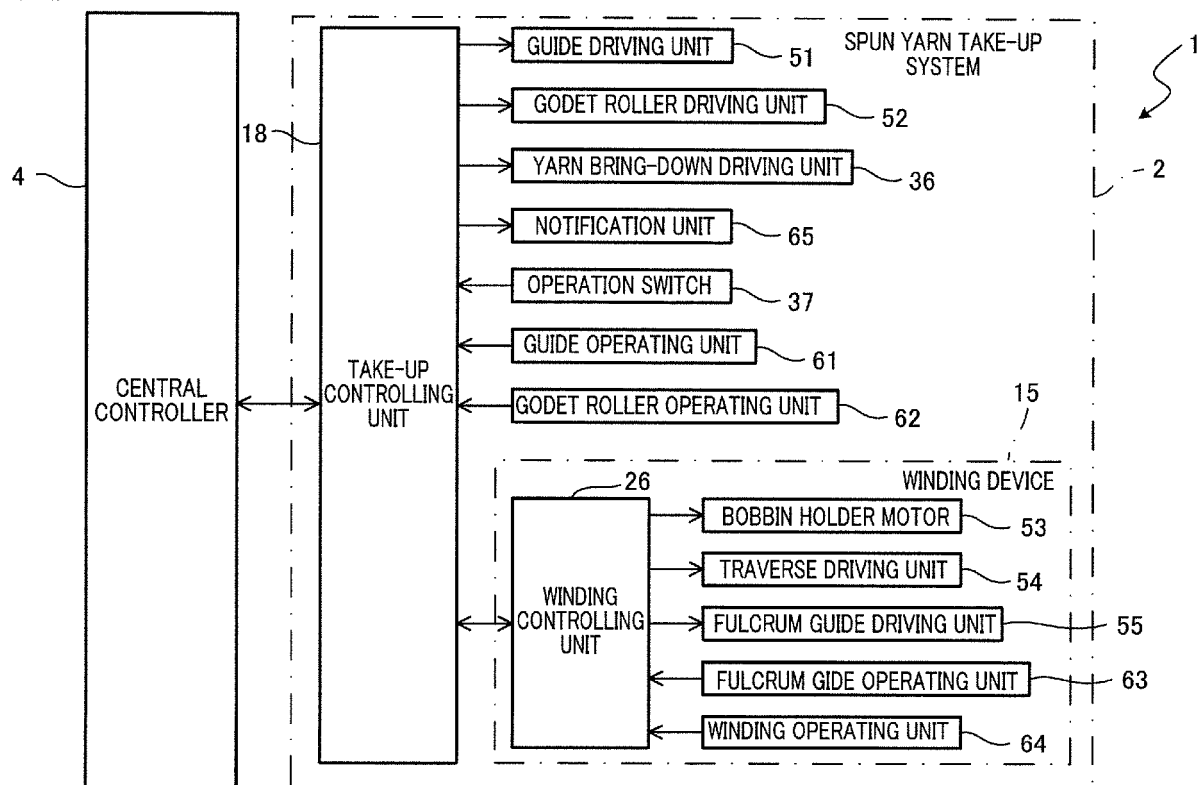


FIG.12





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			B65H D01D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 August 2020	Examiner Pussemier, Bart
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