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(71) Applicant: **Murata Machinery, Ltd.**
Kyoto-shi,
Kyoto 601-8326 (JP)

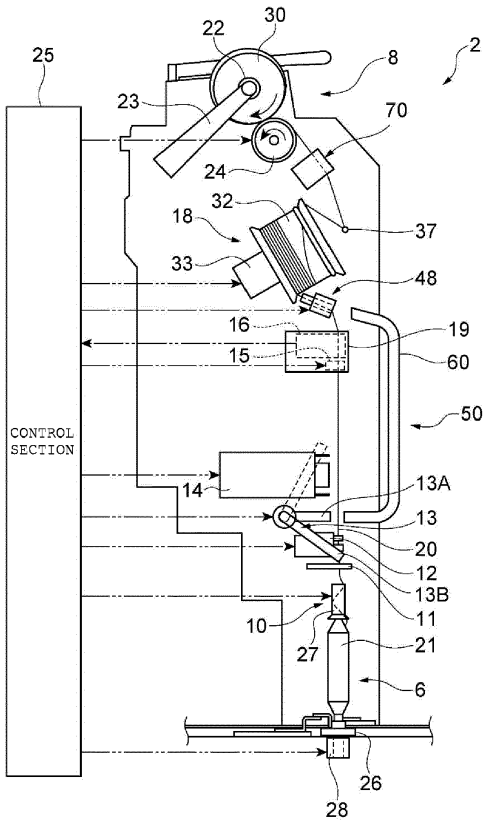
(72) Inventor: **JINYAMA, Tatsuo**
Kyoto, 612-8686 (JP)

(74) Representative: **Jordan, Volker Otto Wilhelm**
Weickmann & Weickmann
Patent- und Rechtsanwälte PartmbB
Postfach 860 820
81635 München (DE)

(54) YARN WINDING MACHINE

(57) A winding unit 2 includes a yarn supplying section 6, a yarn accumulating device 18, a yarn joining device 14, a downstream yarn blow-feeding section 48, a first catching section 13A that catches a yarn end of the yarn 20 on the yarn accumulating device 18 side blown and fed by the downstream yarn blow-feeding section 48 and guides the yarn 20 to the yarn joining device 14, and a second catching section 13B that catches a yarn end of the yarn 20 on the yarn supplying bobbin 21 side and guides the yarn 20 to the yarn joining device 14.

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn winding machine.

2. Description of the Related Art

[0002] As a conventional yarn winding machine, for example, a yarn winding machine described in JP 2017-57075 A is known. The yarn winding machine described in JP 2017-57075 A includes: a yarn supplying section in which a yarn supplying bobbin is supported; a yarn accumulating device that unwinds a yarn from the yarn supplying bobbin supported by the yarn supplying section and winds the unwound yarn; a yarn joining device that joins a yarn end of the yarn on the yarn supplying bobbin side and a yarn end of the yarn on the yarn accumulating device; a downstream yarn blow-feeding section that blows and feeds a yarn end of the yarn on the yarn accumulating device side toward a downstream side in a travelling direction at a time of winding of the yarn; a first catching section that catches a yarn end of the yarn on the yarn accumulating device side blown and fed by the downstream yarn blow-feeding section, and guides the yarn to the yarn joining device; and a second catching section that catches a yarn end of the yarn on the yarn supplying bobbin side and guides the yarn to the yarn joining device.

[0003] In the yarn winding machine described in JP 2017-57075 A, the second catching section is arranged downstream of the first catching section in the travelling direction at a time of winding of the yarn.

[0004] The second catching section catches a yarn blown and fed from an upstream side in the travelling direction of the yarn by an upstream yarn blow-feeding section, and guides the yarn to the yarn joining device by advancing and retreating the second catching section with respect to a yarn path with an advancing and retreating drive section.

[0005] In a conventional yarn winding machine, in order to avoid entanglement of a yarn on the yarn supplying bobbin side and a yarn on the yarn accumulating device side, a yarn end of the yarn on the yarn accumulating device side is caught by the first catching section and guided to the yarn joining device, and then the yarn on the yarn supplying bobbin side is caught by the second catching section. Therefore, the second catching section is on standby until the first catching section guides the yarn to the yarn joining device. In the yarn winding machine, shortening of a cycle time of a yarn joining operation is demanded in order to improve production efficiency. In order to shorten the cycle time of the yarn joining operation, a time during which the first catching section and the second catching section are on standby needs to be reduced.

BRIEF SUMMARY OF THE INVENTION

[0006] An object of one aspect of the present invention is to provide a yarn winding machine capable of shortening a cycle time of a yarn joining operation.

[0007] A yarn winding machine according to one aspect of the present invention includes: a yarn supplying section in which a yarn supplying bobbin is supported; a yarn accumulating device that unwinds a yarn from the yarn supplying bobbin supported by the yarn supplying section and winds the unwound yarn; a package forming section that draws out a yarn accumulated in the yarn accumulating device and winds the yarn as a package; a yarn joining device that joins the yarn on the yarn supplying bobbin side and the yarn on the yarn accumulating device side; a blow-feeding section that blows and feeds the yarn on the yarn accumulating device side toward a downstream side in a travelling direction at a time of winding of the yarn; a first catching section that catches the yarn on the yarn accumulating device side blown and fed by the blow-feeding section, to guide the yarn to the yarn joining device; and a second catching section that catches the yarn on the yarn supplying bobbin side and guides the yarn to the yarn joining device, in which the second catching section is swingably arranged between a first position for catching of the yarn on the yarn supplying bobbin side on an upstream side in the travelling direction with respect to a position where the first catching section catches the yarn on the yarn accumulating device side, and a second position for guiding of the caught yarn to the yarn joining device.

[0008] In the yarn winding machine according to one aspect of the present invention, the second catching section catches a yarn at the first position, and guides the yarn to the yarn joining device at the second position. The first position is a position where a yarn on the yarn supplying bobbin side is caught upstream of a position where the first catching section catches the yarn on the yarn accumulating device side, in the travelling direction at a time of winding of the yarn. Thus, in the yarn winding machine, since the second catching section catches the yarn on the yarn supplying bobbin side on the upstream side of the first catching section, the yarn caught by the first catching section and the yarn caught by the second catching section are not entangled at the time of catching. Therefore, in the yarn winding machine, the second catching section does not need to be on stand by while the first catching section catches and guides the yarn. Consequently, in the yarn winding machine, a standby time of the first catching section and the second catching section can be reduced. As a result, in the yarn winding machine, a cycle time of a yarn joining operation can be shortened.

[0009] In one embodiment, the first catching section and the second catching section may be configured as an integrated catching device. In this configuration, the

configuration can be simplified, and space saving can be achieved.

[0010] In one embodiment, the catching device may further include a first connecting section connected to a negative pressure source, and a second connecting section connected to a negative pressure source, in which the first catching section and the first connecting section may form a first airflow path for suction air, the second catching section and the second connecting section may form a second airflow path for suction air, and the first airflow path and the second airflow path may be independent of each other. In this configuration, it is possible to avoid entanglement of a yarn caught by the first catching section and a yarn caught by the second catching section.

[0011] In one embodiment, the catching device may further include: a swing section that is swingably provided and connected to the second catching section, and causes the second catching section to swing; and a drive section that drives the swing section, in which the swing section may be provided with a flow rate control section that controls circulation and interruption of the suction air flowing through the first airflow path between the first catching section and the first connecting section, and the flow rate control section may perform circulation or interruption of the suction air in accordance with a swing position of the swing section. In this configuration, one drive section can drive the second catching section and control a flow rate of the suction air by the flow rate control section. Therefore, the configuration can be simplified.

[0012] In one embodiment, the flow rate control section may interrupt the suction air when the second catching section is located at the first position, and may circulate the suction air when the second catching section is located at a position other than the first position. In this configuration, when the second catching section is located at the first position, no suction airflow is generated in the first catching section. Therefore, it is possible to avoid suctioning and catching of a yarn on the yarn supplying bobbin side by the first catching section.

[0013] According to one aspect of the present invention, a cycle time of the yarn joining operation can be shortened.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a schematic front view illustrating an overall configuration of an automatic winder according to an embodiment;

FIG. 2 is a schematic side view illustrating a winding unit according to an embodiment;

FIG. 3 is a perspective view illustrating a catching device;

FIG. 4 is a perspective view illustrating a state in which a second catching section is located at a catching position in the catching device; and

FIG. 5 is a perspective view illustrating a state in which a first catching section is located at a guiding position in the catching device.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. Note that the same reference numerals are denoted on the same or equivalent components in the description of the drawings, and the redundant description will be omitted. "Upstream" and "downstream" respectively refer to upstream and downstream in a travelling direction of a yarn.

[0016] As illustrated in FIG. 1, an automatic winder 1 includes a plurality of winding units (yarn winding machines) 2 arranged side by side, a machine control device 3, a yarn supplying bobbin supplying device 4, a doffing device 5, and a blower box (not illustrated).

[0017] The machine control device 3 is configured to be able to communicate with each winding unit 2. An operator of the automatic winder 1 can intensively manage the plurality of winding units 2 by appropriately operating the machine control device 3. The machine control device 3 controls operations of the yarn supplying bobbin supplying device 4 and the doffing device 5.

[0018] The yarn supplying bobbin supplying device 4 sets yarn supplying bobbins 21 one by one on a conveyance tray 26. The yarn supplying bobbin supplying device 4 supplies the yarn supplying bobbin 21 set on the conveyance tray 26 to each of the plurality of winding units 2.

[0019] When a package 30 is fully wound (in a state in which a prescribed amount of a yarn 20 is wound) in the winding unit 2, the doffing device 5 travels to a position of the winding unit 2 and detaches the fully-wound package 30. The doffing device 5 sets a winding bobbin 22 around which the yarn 20 is not wound, into the winding unit 2 from which the package 30 is removed.

[0020] Next, a configuration of the winding unit 2 will be described. As illustrated in FIG. 2, the winding unit 2 includes a yarn supplying section 6, a yarn accumulating device 18, a package forming section 8, and a wax applying device 70. In the winding unit 2, the yarn 20 of the yarn supplying bobbin 21 of the yarn supplying section 6 is unwound, the unwound yarn 20 is temporarily accumulated by the yarn accumulating device 18, and then the package forming section 8 draws out the yarn accumulated in the yarn accumulating device 18 and winds the yarn 20 around the winding bobbin 22 to form the package 30.

[0021] The yarn supplying section 6 is configured to support the yarn supplying bobbin 21 set on the conveyance tray 26 at a predetermined position, and unwind the yarn 20 from the yarn supplying bobbin 21. When all the yarn 20 is unwound from the yarn supplying bobbin 21, the yarn supplying section 6 discharges a core tube of the yarn supplying bobbin 21 around which the yarn 20

is not wound, and receives supply of a new yarn supplying bobbin 21 from the yarn supplying bobbin supplying device 4.

[0022] The yarn accumulating device 18 is arranged between the yarn supplying section 6 and the package forming section 8. The yarn accumulating device 18 is arranged at a position upstream in the travelling direction of the yarn 20 with respect to the wax applying device 70. The yarn accumulating device 18 winds and temporarily accumulates the yarn 20 unwound in the yarn supplying section 6. The yarn accumulating device 18 supplies the accumulated yarn 20 to the package forming section 8. The yarn accumulating device 18 includes a yarn accumulating roller 32 on which the yarn 20 can be wound, and a roller drive motor 33 that rotatably drives the yarn accumulating roller 32. The roller drive motor 33 rotates the yarn accumulating roller 32 in a winding direction of the yarn 20 from the yarn supplying section 6. Further, the roller drive motor 33 can also rotate the yarn accumulating roller 32 in a direction opposite to the winding direction.

[0023] The package forming section 8 includes a cradle 23 that can be provided with the winding bobbin 22, and a traverse drum 24 that drives the winding bobbin 22 while traversing the yarn 20. The package forming section 8 constitutes a winding section. The cradle 23 rotatably supports the winding bobbin 22 (or the package 30). The cradle 23 is configured to allow an outer peripheral surface of the supported package 30 to be brought into contact with an outer peripheral surface of the traverse drum 24.

[0024] By being rotatably driven by a drive source (an electric motor or the like) (not illustrated), and rotating in a state of being in contact with an outer peripheral surface of the winding bobbin 22 or the package 30, the traverse drum 24 is driven to rotate the winding bobbin 22. This allows the yarn 20 accumulated in the yarn accumulating device 18 to be unwound and drawn out, and wound around the winding bobbin 22. A traverse groove (not illustrated) is formed on the outer peripheral surface of the traverse drum 24, and the yarn 20 can be traversed at a predetermined width by the traverse groove. The above configuration allows the yarn 20 to be wound around the winding bobbin 22 while being traversed, to form the package 30 of a predetermined shape.

[0025] The wax applying device 70 is arranged between the yarn accumulating device 18 and the package forming section 8. The wax applying device 70 applies wax to the yarn 20 travelling from the yarn accumulating device 18 toward the package forming section 8.

[0026] The winding unit 2 includes various devices in a yarn travelling path from the yarn supplying section 6 to the package forming section 8 via the yarn accumulating device 18. Specifically, a yarn path (the yarn travelling path) of the yarn 20 includes, in order from the yarn supplying section 6 on the upstream side toward the yarn accumulating device 18 on the downstream side, an unwinding assisting device 10, a lower yarn feeler 11, a tension applying section 12, a catching device 13, a yarn joining device 14, a yarn monitoring device 16, and a downstream yarn blow-feeding section 48 are arranged.

[0027] The unwinding assisting device 10 assists in unwinding of the yarn 20 by bringing a movable member 27 into contact with a balloon that is formed above the yarn supplying bobbin 21 when the yarn 20 unwound from the yarn supplying bobbin 21 is swung around, and thus in appropriately controlling a size of the balloon.

[0028] The lower yarn feeler 11 is arranged at a position close to the unwinding assisting device 10 on the downstream side of the unwinding assisting device 10. The lower yarn feeler 11 defines the presence or absence of the yarn 20 supplied from the unwinding assisting device 10.

[0029] The tension applying section 12 applies a predetermined tension on the travelling yarn 20. The tension applying section 12 applies a predetermined tension on the yarn 20 on the basis of a tension of the yarn 20 detected by a tension sensor (not illustrated). The tension applying section 12 is configured as a gate type in which movable comb teeth are arranged with respect to fixed comb teeth, and applies a predetermined resistance by causing the yarn 20 to travel between the comb teeth. The movable comb teeth are configured to be movable by, for example, a solenoid such that the comb teeth are in a meshed state or a released state. Thus, the tension applying section 12 can adjust the tension to be applied to the yarn 20. Note that the configuration of the tension applying section 12 is not particularly limited, and may be, for example, a tension applying section of a disk type.

[0030] The catching device 13 is arranged downstream of the tension applying section 12. The catching device 13 includes a first catching section 13A and a second catching section 13B. In the present embodiment, the first catching section 13A and the second catching section 13B are integrated and configured as one component. Each of the first catching section 13A and the second catching section 13B is connected to a negative pressure source (not illustrated).

[0031] The first catching section 13A is configured as a tubular member in which an opening is formed at a distal end portion. The first catching section 13A generates a suction airflow at a time of yarn joining, and suctions and catches the yarn 20 on the yarn accumulating device 18 side.

[0032] The second catching section 13B is configured as a tubular member in which an opening is formed at a distal end portion. The second catching section 13B is swingably provided. The second catching section 13B swings between a catching position (a first position) (a position indicated by a solid line in FIG. 2) for catching the yarn 20 supplied from the unwinding assisting device 10, and a guiding position (a second position) (a position indicated by a broken line in FIG. 2) for guiding the yarn 20 to the yarn joining device 14. The catching position may also be a standby position of the second catching section 13B.

[0033] At the catching position, the second catching section 13B suctions and catches a yarn end from the yarn supplying bobbin 21 by generating a suction airflow on the distal end side in a state of being close to the yarn path on the downstream side of the lower yarn feeler 11. When the yarn 20 is cut with a cutter 15, the second catching section 13B suctions and catches a yarn end of the cut yarn 20 on the yarn supplying bobbin 21 side. Further, the second catching section 13B may be configured to suction and remove fly waste and the like attached to the travelling yarn 20, by generating a suction airflow on the distal end side.

[0034] There is arranged an auxiliary blow-feeding section 28 that blows and feeds a yarn end to a position downstream of the lower yarn feeler 11 (a distal end of the second catching section 13B) in a case immediately after a new yarn supplying bobbin 21 is supplied to the yarn supplying section 6, when the yarn 20 is to be caught by the second catching section 13B.

[0035] The auxiliary blow-feeding section 28 forms, at a distal end portion of the yarn supplying bobbin 21, an airflow to blow and feed the yarn 20 of the yarn supplying bobbin 21 toward the lower yarn feeler 11, by ejecting compressed air into the conveyance tray 26 and the yarn supplying bobbin 21 formed in a hollow shape. When the newly supplied yarn supplying bobbin 21 is supported by the yarn supplying section 6, a yarn end on the yarn supplying bobbin 21 side can be reliably fed toward the lower yarn feeler 11 side by operating the auxiliary blow-feeding section 28.

[0036] The yarn joining device 14 joins the disconnected yarn 20. When the yarn 20 between the yarn supplying bobbin 21 and the yarn accumulating device 18 is disconnected, such as at a time of yarn cutting in which the yarn monitoring device 16 detects a yarn defect and the yarn 20 is cut by the cutter 15, at a time of yarn breakage in which the yarn 20 being unwound from the yarn supplying bobbin 21 is broken, or at a time of replacement of the yarn supplying bobbin 21, the yarn joining device 14 joins the yarn 20 on the yarn supplying bobbin 21 side and the yarn 20 on the yarn accumulating device 18 side. The yarn joining device 14 is arranged at a position slightly retreated from the yarn path. The yarn joining device 14 can connect introduced yarn ends to bring the yarn 20 into a continuous state. As the yarn joining device 14, a device using a fluid such as compressed air or a mechanical device can be used.

[0037] The yarn monitoring device 16 detects a yarn defect such as slub and mixing of a foreign substance, by monitoring a thickness and the like of the yarn 20 with an appropriate sensor. At a position close to the yarn monitoring device 16 on the upstream side of the yarn monitoring device 16, the cutter 15 is arranged. The cutter 15 immediately cuts the yarn 20 when the yarn monitoring device 16 detects a yarn defect. The cutter 15 and the yarn monitoring device 16 are accommodated in a common housing 19. The housing 19 that accommodates the yarn monitoring device 16 is arranged downstream of the yarn joining device 14.

[0038] The downstream yarn blow-feeding section 48 is an air sucker device arranged at a position close to the yarn accumulating device 18 on the upstream side of the yarn accumulating device 18. By ejecting compressed air, the downstream yarn blow-feeding section 48 forms an airflow to suction and then blow off a yarn end that is on the yarn accumulating device 18 side and present on a surface of the yarn accumulating roller 32, to feed the yarn end to the first catching section 13A. Specifically, the downstream yarn blow-feeding section 48 includes a thin tubular guide member (not illustrated) that allows the yarn 20 to internally pass through, and a yarn guiding member 60 that is a curved tubular member. At one end of the guide member, a blow-out port of the yarn 20 is formed. The yarn guiding member 60 is arranged to be close to the blow-out port of the downstream yarn blow-feeding section 48. Openings are individually formed at both ends of the yarn guiding member 60 in a longitudinal direction.

[0039] The yarn guiding member 60 is arranged in a state in which an opening on one end side faces the blow-out port of the downstream yarn blow-feeding section 48 and an opening on another end side faces the first catching section 13A. Inside the yarn guiding member 60, a guiding path is formed. The guiding path connects the openings at both ends of the yarn guiding member 60 so as to detour around the yarn monitoring device 16, the yarn joining device 14, and the like. The downstream yarn blow-feeding section 48, the yarn guiding member 60, and the first catching section 13A constitute an accumulation-side yarn end catching device 50.

[0040] When the yarn 20 is disconnected between the yarn supplying bobbin 21 and the yarn accumulating device 18, the downstream yarn blow-feeding section 48 catches the yarn 20 on the yarn accumulating device 18 side and blows it off to the guiding path of the yarn guiding member 60, and draws out the yarn 20 along the guiding path to cause the yarn 20 to be caught by the first catching section 13A. Since a penetrating slit (not illustrated) is formed over the entire length of the yarn guiding member 60, the yarn 20 can be pulled out from the inside of the yarn guiding member 60 while the yarn 20 is caught by the first catching section 13A. Thus, the yarn 20 on the yarn accumulating device 18 side can be blown and fed by the downstream yarn blow-feeding section 48 and guided toward the yarn joining device 14.

[0041] Each winding unit 2 includes a control section 25. The control section 25 includes hardware such as a CPU, a ROM, and a RAM (not illustrated). The RAM stores software such as a control program. The control section 25 controls each configuration of the winding unit 2 by cooperation of hardware and software. The control section 25 is configured to be able to communicate with the machine control device 3. This allows intensive control of an operation of the plurality of winding units 2 arranged in the automatic winder 1, in the machine control device 3.

[0042] Next, the catching device 13 will be described in detail with reference to FIGS. 3, 4, and 5. FIGS. 3 and 4 illustrate a state in which the second catching section 13B is located at the catching position. FIG. 5 illustrates a state in which the second catching section 13B is located at the guiding position.

[0043] As illustrated in FIGS. 3, 4, and 5, the catching device 13 includes the first catching section 13A, the second catching section 13B, a main body section 13C, a swing section 13D, a first connecting section 13E, and a second connecting section 13F.

[0044] As described above, the first catching section 13A is configured as a tubular member in which an opening is formed at the distal end portion. The first catching section 13A is formed integrally with the main body section 13C.

[0045] As described above, the second catching section 13B is configured as a tubular member in which an opening is formed at the distal end portion. The second catching section 13B includes a straight portion and a bent portion, and has a substantially U shape.

[0046] At a distal end of the second catching section 13B, a clamp section 13G is provided. The clamp section 13G nips the yarn 20 suctioned by the second catching section 13B, between the distal end of the second catching section 13B. The clamp section 13G releases the nipping of the yarn 20 when the second catching section 13B is located at the catching position and the guiding position, and nips the yarn 20 when the second catching section 13B moves from the catching position to the guiding position. The clamp section 13G is opened by contacting a first contact section 13H or a second contact section 131, to release the nipping of the yarn 20. The first contact section 13H is arranged at a position where the clamp section 13G contacts it when the second catching section 13B is located at the catching position. The first contact section 13H is installed on a frame (not illustrated) by a bracket B1. The second contact section 131 is arranged at a position where the clamp section 13G contacts it when the second catching section 13B is located at the guiding position. The second contact section 131 is installed on a frame (not illustrated) by a bracket B2.

[0047] The main body section 13C is configured as a tubular member. The main body section 13C is fixed to a base main body B. One end of the main body section 13C in a longitudinal direction is fixed to the base main body B. The main body section 13C is fixed to the base main body B so as to protrude from one surface of the base main body B in a direction orthogonal to the one surface. The first catching section 13A is provided on a side surface of the main body section 13C. The first catching section 13A is arranged so as to protrude toward the yarn path side and face obliquely upward when viewed in a longitudinal direction (an extending direction) of the main body section 13C.

[0048] The swing section 13D is configured as a cylindrical member. The swing section 13D is accommodated in the main body section 13C. The swing section 13D is driven by a drive motor (drive section) 13J. Another end of the swing section 13D is connected to an output shaft of the drive motor 13J via a pulley and a belt (not illustrated) . The drive motor 13J is, for example, a stepping motor. The drive motor 13J is fixed to the base main body B. An operation of the drive motor 13J is controlled by the control section 25. Another end of the swing section 13D is connected to the second catching section 13B. As a result, the second catching section 13B swings along with the swing of the swing section 13D.

[0049] The swing section 13D is provided with a flow rate control section 13K and a communication section 13L. The flow rate control section 13K and the communication section 13L are provided independently in the swing section 13D. Between the flow rate control section 13K and the communication section 13L, a partition wall is provided. The flow rate control section 13K controls circulation and interruption of suction air flowing through an airflow path between the first catching section 13A and the first connecting section 13E. The flow rate control section 13K functions as a shutter that performs circulation and interruption of the suction air. The flow rate control section 13K is formed in, for example, a groove shape in which a part of the swing section 13D is cut out.

[0050] The flow rate control section 13K performs circulation and interruption of the suction air in accordance with a swing position of the swing section 13D, that is, in accordance with a position of the second catching section 13B. As illustrated in FIG. 5, the flow rate control section 13K causes the suction air to circulate between the first catching section 13A and the first connecting section 13E when the second catching section 13B is located at a position other than the catching position (for example, the guiding position). As a result, a suction airflow is generated at a distal end of the first catching section 13A. As illustrated in FIG. 4, the flow rate control section 13K suppresses circulation of the suction air (reduces the suction air) between the first catching section 13A and the first connecting section 13E when the second catching section 13B is located at the catching position. That is, the flow rate control section 13K interrupts circulation of the suction air between the first catching section 13A and the first connecting section 13E when the second catching section 13B is located at the guiding position. As a result, no suction airflow is generated at the distal end of the first catching section 13A.

[0051] The flow rate control section 13K controls circulation and interruption of suction air with swing of the swing section 13D by driving of the drive motor 13J. That is, circulation and interruption of the airflow path by the flow rate control section 13K are performed by driving the drive motor 13J.

[0052] The communication section 13L connects the second catching section 13B and the second connecting section 13F with each other. The communication section 13L connects the second catching section 13B and the second connecting section 13F with each other over the

entire movable range of the second catching section 13B. That is, the communication section 13L connects the second catching section 13B and the second connecting section 13F with each other in a state in which the second catching section 13B is located at the catching position and at the guiding position and in a state in which the second catching section 13B moves between the catching position and the guiding position. As illustrated in FIGS. 4 and 5, the communication section 13L constantly generates a suction airflow on the distal end side of the second catching section 13B.

[0053] The first connecting section 13E is configured as a tubular member. The first connecting section 13E is connected to a negative pressure source (not illustrated). The first connecting section 13E forms a first airflow path for suction air together with the first catching section 13A. When the first connecting section 13E and the first catching section 13A communicate with each other to form the first airflow path, a suction airflow is generated at a distal end of the first connecting section 13E. The first connecting section 13E is connected to a side surface of the main body section 13C. The first connecting section 13E is arranged on the same straight line as the first catching section 13A when viewed from a direction along the yarn path of the yarn 20. Thus, since the airflow path is not bent, lowering of the suction airflow can be avoided, and entanglement of the yarn 20 can be avoided in the first airflow path.

[0054] The second connecting section 13F is configured as a tubular member. The second connecting section 13F is connected to a negative pressure source (not illustrated). The second connecting section 13F forms a second airflow path for suction air together with the second catching section 13B. The first airflow path and the second airflow path are independent of each other. The second connecting section 13F is connected to a side surface of the main body section 13C. The second connecting section 13F is connected to an outer end side in a longitudinal direction of the main body section 13C with respect to the first connecting section 13E.

[0055] Next, a yarn joining operation in the winding unit 2 will be described. Hereinafter, as an example, a description is given to the yarn joining operation at a time of yarn cutting in which the yarn monitoring device 16 detects a yarn defect and the cutter 15 cuts the yarn 20.

[0056] When the yarn 20 is cut by the cutter 15, the second catching section 13B suctions and catches the yarn 20 on the yarn supplying bobbin 21 side at the catching position. At this time, the clamp section 13G is in contact with the first contact section 13H and is in an open state. When the yarn 20 is caught by the second catching section 13B, the swing section 13D swings, and the second catching section 13B moves from the catching position to the guiding position. When the second catching section 13B starts to move, the clamp section 13G is separated from the first contact section 13H, and the clamp section 13G is closed. This causes the yarn 20 to be nipped by the clamp section 13G, and the yarn 20 is held by the second catching section 13B.

[0057] Subsequently, when the second catching section 13B is located at the guiding position, the yarn 20 is guided to the yarn joining device 14. Further, when the second catching section 13B is located at the guiding position, the clamp section 13G contacts the second contact section 131. This causes the clamp section 13G to be opened, and the nipping of the yarn 20 is released.

[0058] Further, when the yarn 20 is cut by the cutter 15, the downstream yarn blow-feeding section 48 catches the yarn 20 on the yarn accumulating device 18 side and blows off the yarn 20 toward the guiding path of the yarn guiding member 60. When the second catching section 13B starts moving to the guiding position, the first catching section 13A catches the yarn 20 drawn out along the guiding path of the yarn guiding member 60. When the first catching section 13A catches the yarn 20, the yarn 20 on the yarn accumulating device 18 side is guided to the yarn joining device 14. Then, the yarn joining device 14 joins the yarn 20 guided by the first catching section 13A and the yarn 20 guided by the second catching section 13B. Thus, the yarn joining operation is completed.

[0059] As described above, in the winding unit 2 of the automatic winder 1 according to the present embodiment, the second catching section 13B catches the yarn 20 at the catching position, and guides the yarn 20 to the yarn joining device 14 at the guiding position. The catching position is a position where a yarn end of the yarn 20 on the yarn supplying bobbin 21 side is caught on the upstream side in the travelling direction at a time of winding of the yarn 20 with respect to a position where the first catching section 13A catches a yarn end of the yarn 20 on the yarn accumulating device 18 side. In this way, in the winding unit 2, the second catching section 13B catches a yarn end of the yarn 20 on the yarn supplying bobbin 21 side on the upstream side with respect to the first catching section 13A, so that the yarn 20 caught by the first catching section 13A and the yarn 20 caught by the second catching section 13B are not entangled at the time of catching. Therefore, in the winding unit 2, the second catching section 13B does not need to be on stand by while the first catching section 13A catches and guides the yarn 20. Therefore, in the winding unit 2, a waiting time of the first catching section 13A and the second catching section 13B can be reduced. As a result, in the winding unit 2, a cycle time of the yarn joining operation can be shortened.

[0060] In a conventional yarn joining device, a yarn on a yarn supplying bobbin side supplied from an unwinding assisting device is blown and fed downstream by an upstream yarn blow-feeding section (an air sucker device), and the yarn is caught by a second catching section. In this configuration, a distance between the upstream yarn blow-feeding section and the second catching section is long, and thus a problem that the yarn is not able to be caught by the second catching section may occur when the yarn is not blown up for some reason. In the winding unit 2 according to the present embodiment, the second

catching section 13B catches a yarn end of the yarn 20 on the yarn supplying bobbin 21 side on the upstream side in the travelling direction at a time of winding of the yarn 20 with respect to a position where the first catching section 13A catches a yarn end of the yarn 20 on the yarn accumulating device 18 side. That is, the second catching section 13B catches the yarn 20 at a position close to the unwinding assisting device 10. Therefore, an occurrence of a problem that the yarn 20 on the yarn supplying bobbin 21 side is not able to be caught by the second catching section 13B can be avoided.

[0061] In the winding unit 2 according to the present embodiment, the first catching section 13A and the second catching section 13B constitute a part of the catching device 13. In the catching device 13, the first catching section 13A and the second catching section 13B are integrated. In this configuration, the configuration can be simplified, and space saving can be achieved.

[0062] In the winding unit 2 according to the present embodiment, the catching device 13 includes the first connecting section 13E connected to the negative pressure source and the second connecting section 13F connected to the negative pressure source. The first catching section 13A and the first connecting section 13E form the first airflow path for suction air. The second catching section 13B and the second connecting section 13F form the second airflow path for the suction air. The first airflow path and the second airflow path are independent of each other. In this configuration, entanglement of the yarn 20 caught by the first catching section 13A and the yarn 20 caught by the second catching section 13B can be avoided.

[0063] In the winding unit 2 according to the present embodiment, the catching device 13 includes the swing section 13D that is swingably provided and connected to the second catching section 13B and causes the second catching section 13B to swing, and the drive motor 13J that drives the swing section 13D. The swing section 13D is provided with the flow rate control section 13K that controls circulation and interruption of suction air flowing through the first airflow path between the first catching section 13A and the first connecting section 13E. The flow rate control section 13K performs circulation and interruption of suction air in accordance with a swing position of the swing section 13D. In this configuration, one drive motor 13J can drive the second catching section 13B and control a flow rate of suction air by the flow rate control section 13K. Therefore, the configuration can be simplified.

[0064] In the winding unit 2 according to the present embodiment, the flow rate control section 13K interrupts suction air when the second catching section 13B is located at the catching position, and circulates the suction air when the second catching section 13B is located at a position other than the catching position. In this configuration, when the second catching section 13B is located at the catching position, no suction airflow is generated in the first catching section 13A. Therefore, suctioning and catching of a yarn end of the yarn 20 on the yarn supplying bobbin 21 side by the first catching section 13A can be avoided.

[0065] Although the embodiment of the present invention has been described above, the present invention is not necessarily limited to the above-described embodiment, and various modifications can be made without departing from the subject matter thereof.

[0066] In the above-described embodiment, a mode has been described as an example in which the first catching section 13A and the second catching section 13B are integrated in the catching device 13. However, the first catching section and the second catching section may be configured independently of each other. That is, each of the first catching section and the second catching section may be configured as a separate component.

[0067] In the above-described embodiment, the mode has been described as an example in which the catching device 13 includes the first connecting section 13E and the second connecting section 13F. However, the first catching section 13A and the second catching section 13B may be connected to one connecting section.

[0068] In addition to the above-described embodiment, a tension applying section may be further arranged between the yarn accumulating device 18 and the wax applying device 70.

Claims

1. A yarn winding machine (2) comprising:

a yarn supplying section (6) in which a yarn supplying bobbin (21) is supported;

a yarn accumulating device (18) adapted to unwind a yarn (20) from the yarn supplying bobbin (21) supported by the yarn supplying section (6) and to wind the unwound yarn (20);

a package forming section (8) adapted to draw out the yarn (20) accumulated in the yarn accumulating device (18) and to wind the yarn (20) as a package (30);

a yarn joining device (14) adapted to join the yarn (20) on the yarn supplying bobbin (21) side and the yarn (20) on the yarn accumulating device (18) side;

a blow-feeding section (48) adapted to blow and feed the yarn (20) on the yarn accumulating device (18) side to a downstream side in a travelling direction at a time of winding of the yarn (20) ;

a first catching section (13A) adapted to catch the yarn (20) on the yarn accumulating device (18) side blown and fed by the blow-feeding section (48), to guide the yarn (20) to the yarn joining device (14); and

a second catching section (13B) adapted to catch the yarn (20) on the yarn supplying bobbin (21) side and to guide the yarn (20) to the yarn

joining device (14), **characterized in that** the second catching section (13B) is swingably arranged at a first position for catching of the yarn (20) on the yarn supplying bobbin (21) side on an upstream side in the travelling direction with respect to a position where the first catching section (13A) catches the yarn (20) on the yarn accumulating device (18) side, and at a second position for guiding of the caught yarn (20) to the yarn joining device (14).

2. The yarn winding machine (2) as claimed in claim 1, wherein the first catching section (13A) and the second catching section (13B) are configured as a catching device (13) that is integrated.

3. The yarn winding machine (2) as claimed in claim 2, wherein
the catching device (13) includes:

a first connecting section (13E) connected to a negative pressure source; and
a second connecting section (13F) connected to the negative pressure source,
a first airflow path (13A, 13E) for suction air is formed by the first catching section (13A) and the first connecting section (13E),
a second airflow path (13B, 13F) for suction air is formed by the second catching section (13B) and the second connecting section (13F), and
the first airflow path (13A, 13E) and the second airflow path (13B, 13F) are independent of each other.

4. The yarn winding machine (2) as claimed in claim 3, wherein
the catching device (13) includes:

a swing section (13D) that is swingably provided and connected to the second catching section (13B), and adapted to cause the second catching section (13B) to swing; and
a drive section (13J) adapted to drive the swing section (13D),
the swing section (13D) is provided with a flow rate control section (13K) adapted to control circulation and interruption of the suction air flowing through the first airflow path (13A, 13E), between the first catching section (13A) and the first connecting section (13E), and
the flow rate control section (13K) performs circulation or interruption of the suction air in accordance with a swing position of the swing section (13D).

5. The yarn winding machine (2) as claimed in claim 4, wherein the flow rate control section (13K) interrupts the suction air when the second catching section (13B) is located at the first position, and circulates the suction air when the second catching section (13B) is located at a position other than the first position.

FIG. 1

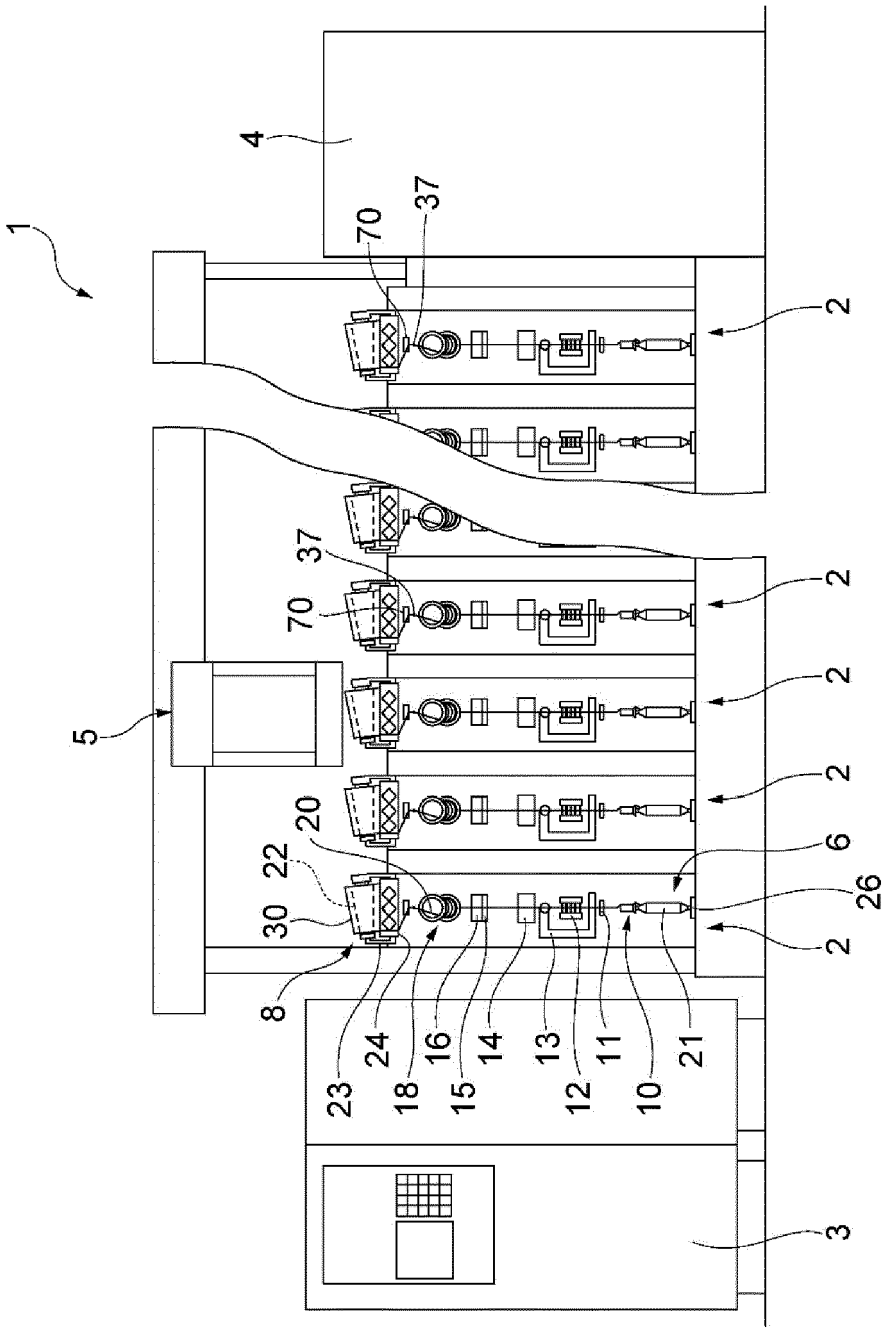
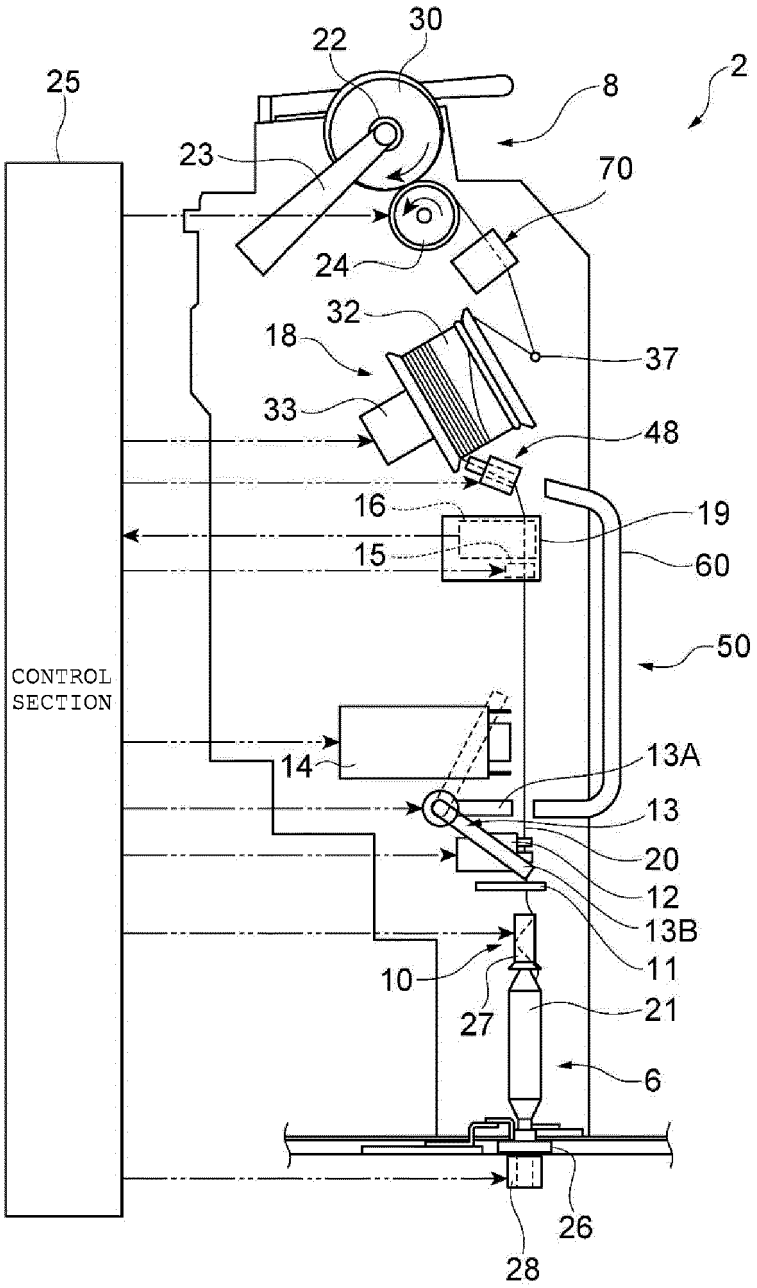


FIG. 2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CONTROL SECTION
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13A
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13B
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FIG. 3

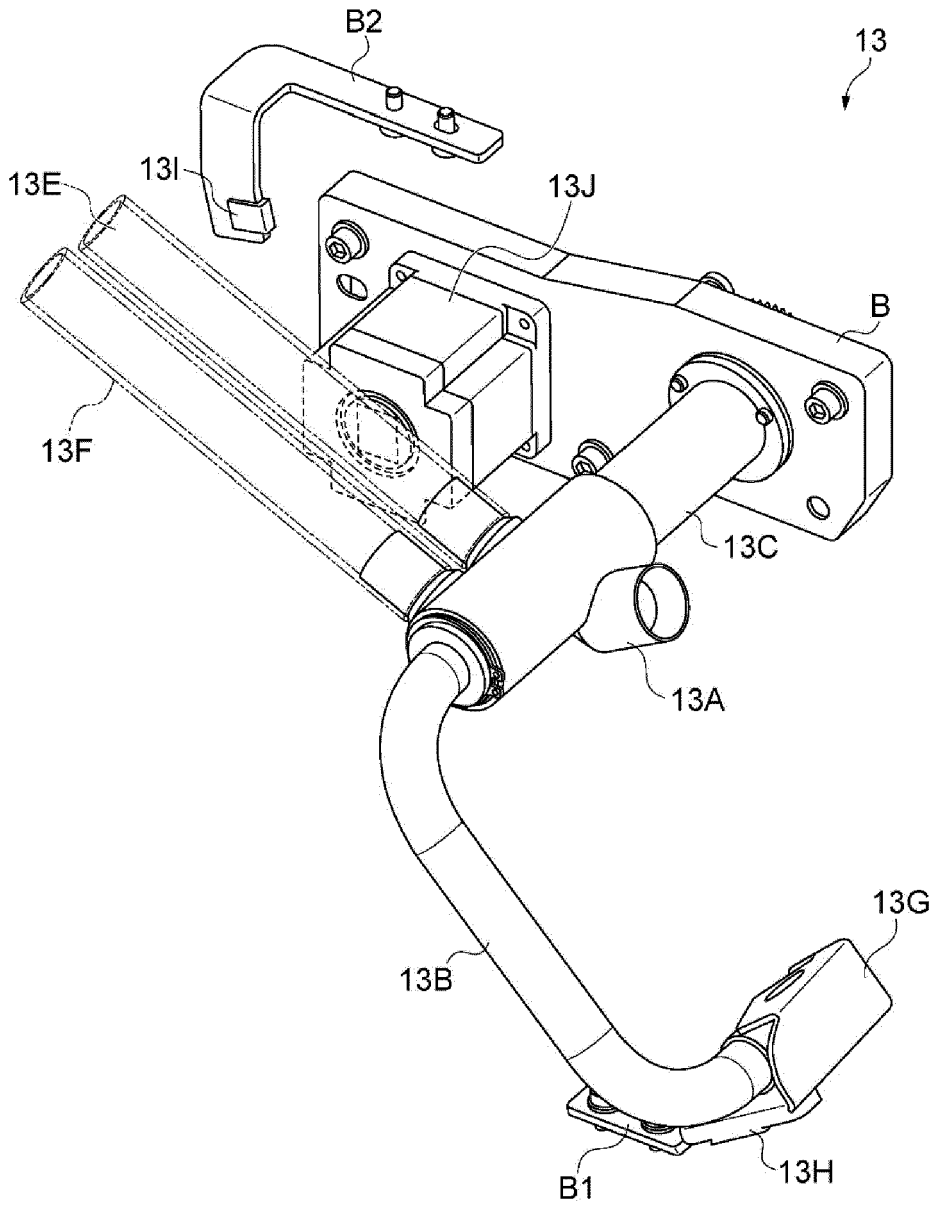


FIG. 4

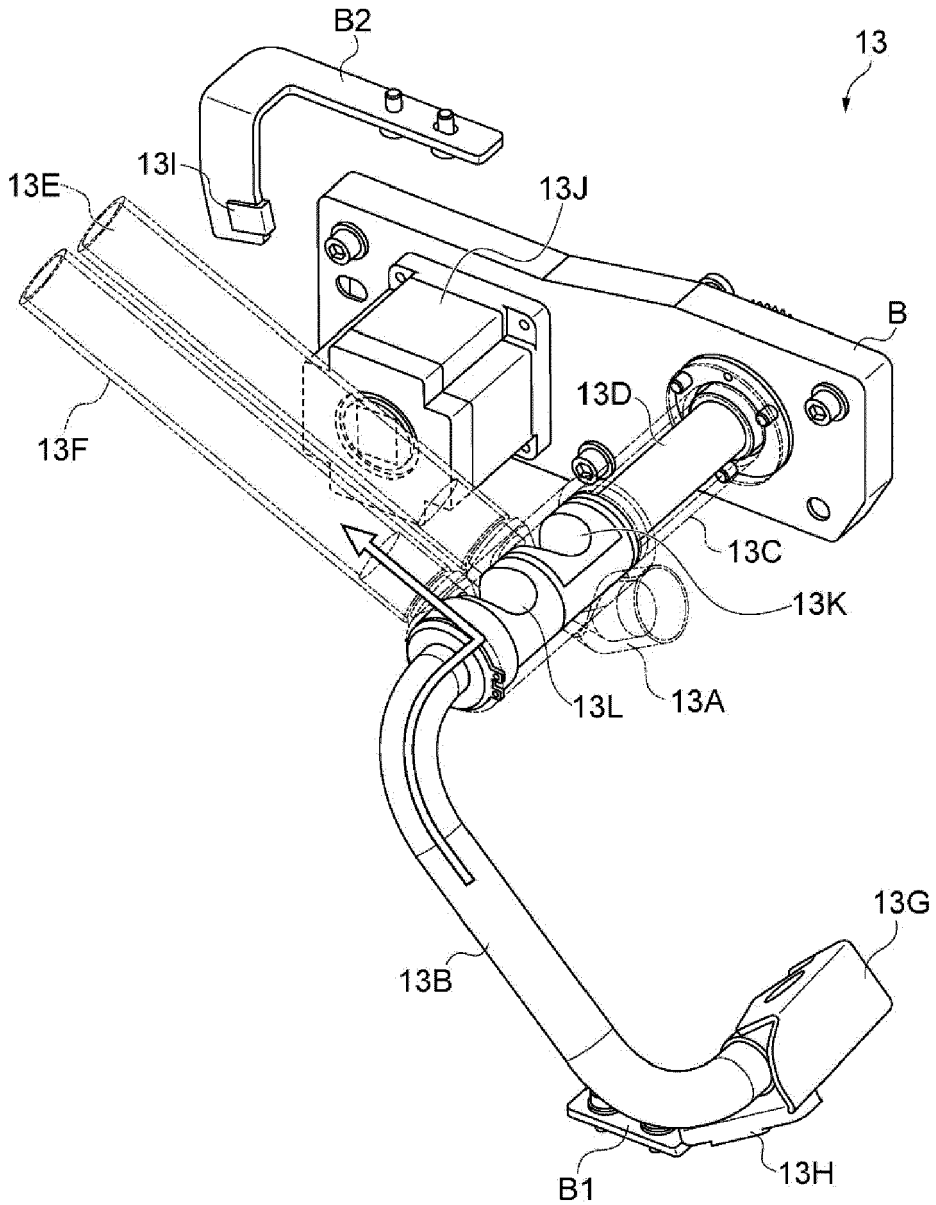
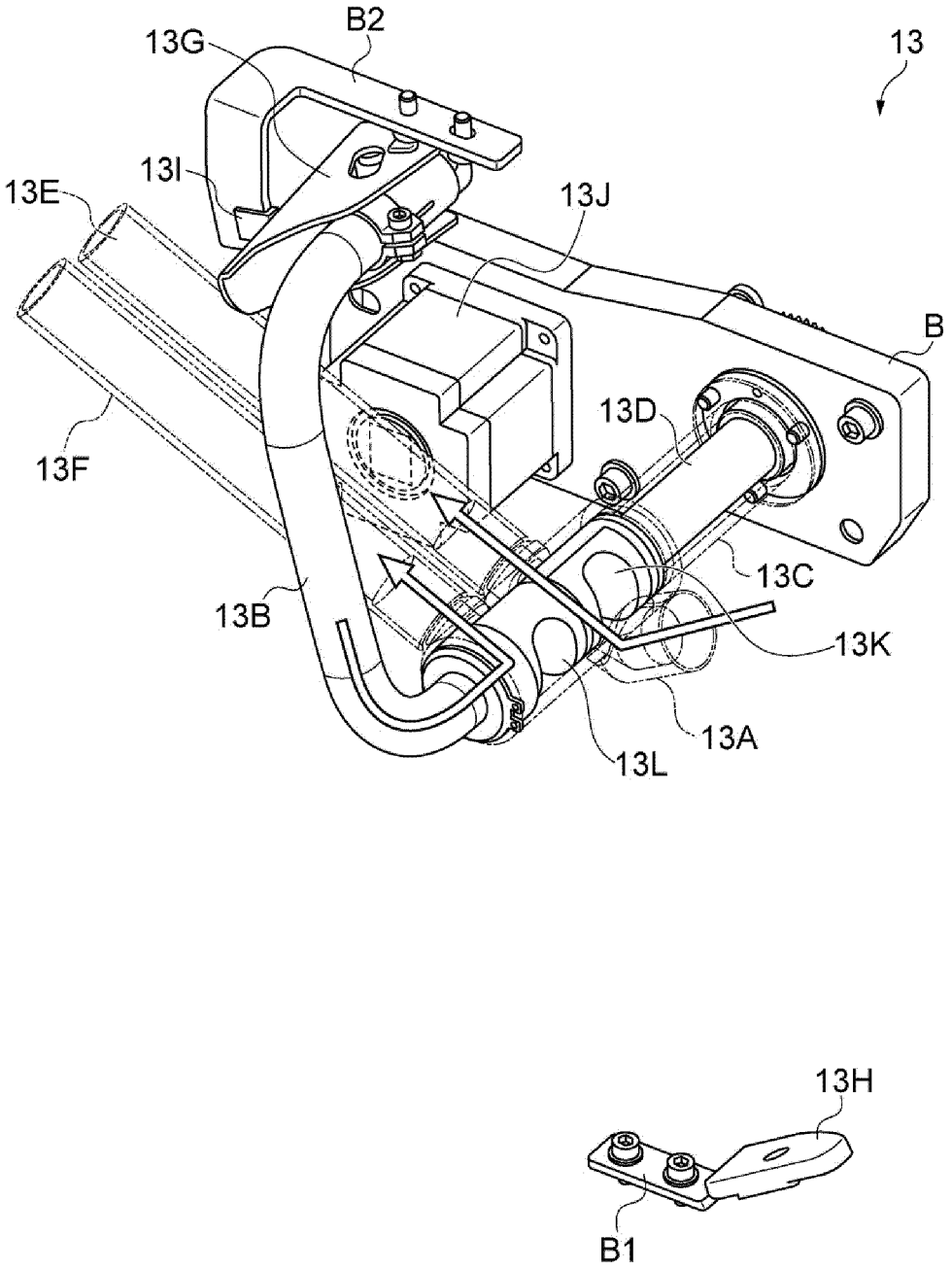


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 6900

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A	* paragraphs [0037], [0040], [0048]; figures *	2-5	B65H51/22 B65H67/08
A,D	JP 2017 057075 A (MURATA MACHINERY LTD) 23 March 2017 (2017-03-23) * paragraphs [0054] - [0056], [0066] - [0067]; figures *	1-5	

TECHNICAL FIELDS SEARCHED (IPC)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 November 2022	Lemmen, René

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