



EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.10.2018 Bulletin 2018/41

(51) Int Cl.:
B65H 67/08 (2006.01)

(21) Application number: **18165655.4**

(22) Date of filing: **04.04.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **07.04.2017 JP 2017076707**

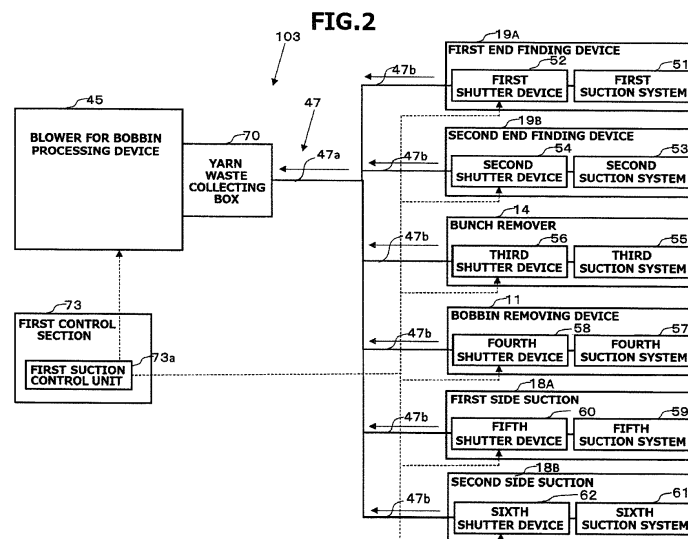
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(54) **BOBBIN PROCESSING DEVICE AND YARN PROCESSING SYSTEM**

(57) A bobbin processing device (103) is a device that supplies a yarn supplying bobbin to a yarn winding device (102). The bobbin processing device (103) includes suction systems (e.g., first suction system (51) and second suction system (53)), a blower for bobbin processing device (45), a suction duct for bobbin processing device (47), a first shutter device (52), and the like. The suction system processes a yarn of the yarn

supplying bobbin by sucking air. The blower for bobbin processing device (45) generates a suction airflow. The suction duct for bobbin processing device (47) is arranged between the blower for bobbin processing device (45) and the suction systems. The first shutter device (52) switches conduction of the air of the suction duct for bobbin processing device (47).



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a bobbin processing device that supplies a yarn supplying bobbin to a yarn winding device.

2. Description of the Related Art

[0002] Conventionally, a machine frame is constituted by an automatic winder, having a plurality of units, and a bobbin processing device. The bobbin processing device mounts a yarn-wound bobbin on a tray, performs various yarn processes, and finally supplies the yarn supplying bobbin to the automatic winder. The machine frame includes one blower. The blower operates a suction system of the units of the automatic winder and a plurality of yarn processing devices of the bobbin processing device. Even if the units of the automatic winder are in a state in which they can be operated at a low static pressure, a high static pressure is necessary to operate the yarn processing devices of the bobbin processing device. Therefore, the blower is operated according to the state of the bobbin processing device. That is, electric power is used unnecessarily. Conventionally, one suction source is arranged for one end finding device of the bobbin processing device, and energy saving is realized by switching between a low pressure and a high pressure (see, e.g., EP Patent No. 2322460).

[0003] The bobbin processing device includes, other than the end finding device, several yarn processing devices such as a residual yarn suction device and a yarn releasing device, for example. Therefore, in the configuration in which only one suction source is arranged for one end finding device, like that disclosed in the specification of EP Patent No. 2322460, the energy saving in the suction systems cannot be realized concretely.

SUMMARY OF THE INVENTION

[0004] One object of the present invention is to reduce the power consumption in a machine frame that includes an automatic winder and a bobbin processing device.

[0005] A plurality of embodiments is explained below as a means for solving the problem. These embodiments can be combined as desired.

[0006] A bobbin processing device according to one aspect of the present invention that supplies a yarn supplying bobbin to a yarn winding device includes a plurality of suction systems that processes a yarn on the yarn supplying bobbin by sucking air; a blower for bobbin processing device that functions as a suction source to generate a suction airflow; a plurality of air dispensing passages arranged between the suction systems and the blower for bobbin processing device; and an air con-

duction switching system that switches conduction of air in the air dispensing passages.

[0007] A yarn processing system according to another aspect of the present invention includes the yarn winding device including a blower for yarn winding device having a motor, a fan, and a yarn waste collecting box; and the bobbin processing device. The air dispensing passage includes a connection passage extending to the blower for yarn winding device from the suction systems. A connection shutter device is arranged in the middle of the connection passage. The blower for bobbin processing device includes a bobbin processing device filter, and the blower for bobbin processing device is arranged toward the suction system than the connection shutter device of the connection passage. In such a configuration, because it is not necessary to provide the yarn waste collecting box for the bobbin processing device, the number of yarn waste collecting boxes can be reduced.

[0008] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a schematic plan view of an automatic winder system according to a first embodiment.

FIG. 2 is a block diagram of a suction control system of a bobbin processing device.

FIG. 3 is a schematic diagram of a suction system of two end finding devices.

FIG. 4 is a block diagram of a suction control system of an automatic winder.

FIG. 5 is a schematic diagram of a suction system of two end finding devices according to a second embodiment.

FIG. 6 is another schematic diagram of the suction system of the two end finding devices according to the second embodiment.

FIG. 7 is a schematic diagram of a suction system of two end finding devices according to a third embodiment.

DETAILED DESCRIPTION

1. First Embodiment

(1) Automatic Winder System

[0010] An automatic winder system 101 including a bobbin processing device 103 according to a first embodiment of the present invention is explained by using FIG. 1. FIG. 1 is a schematic plan view of the automatic winder system 101 according to the first embodiment.

The automatic winder system 101 includes an automatic winder (yarn winding device) 102, the bobbin processing device 103, and a bobbin supplying device 104. The automatic winder 102 is arranged on the left side of the bobbin processing device 103 in the figure. The bobbin processing device 103 is arranged between the bobbin supplying device 104 and the automatic winder 102.

[0011] The automatic winder 102 includes several winding units 105. The winding unit 105 is a device that unwinds a spun yarn that has been wound on a yarn supply bobbin tube 5B (yarn supplying bobbin) and winds the spun yarn on a winding tube thereby forming a product package of the spun yarn. The bobbin processing device 103 is a device that removes from a tray 3 an empty bobbin tube 5A that has been discharged from the automatic winder 102, and mounts the yarn supply bobbin tube 5B on another tray 3 and supplies the yarn supply bobbin tube 5B to the automatic winder 102.

[0012] The bobbin supplying device 104 is a device that supplies the yarn supply bobbin tube 5B to the bobbin processing device 103. The empty bobbin tube 5A is just a tube on which no spun yarn has been wound. The yarn supply bobbin tube 5B is a bobbin tube formed by winding on a tube the spun yarn formed in a not shown spinning frame.

(2) Automatic Winder

[0013] As shown in FIG. 1, the automatic winder 102 includes a supply path 106 for transporting the yarn supply bobbin tubes 5B to the winding units 105. Moreover, the automatic winder 102 includes a collection path 107 for transporting the empty bobbin tubes 5A discharged from the winding units 105. The supply path 106 and the collection path 107 are constituted by a conveyor belt and the like, and the supply path 106 and the collection path 107 transport the yarn supply bobbin tubes 5B and the empty bobbin tubes 5A by using the trays 3.

(3) Bobbin Processing Device

[0014] The bobbin processing device 103 includes, as a transporting unit that transports the yarn supply bobbin tubes 5B and the empty bobbin tubes 5A, a tray transporting line 108 for transporting the yarn supply bobbin tubes 5B and the empty bobbin tubes 5A in a state in which the yarn supply bobbin tubes 5B and the empty bobbin tubes 5A are placed on the trays 3. The tray transporting line 108 is connected to the supply path 106 and the collection path 107 of the automatic winder 102. The tray 3 on which the yarn supply bobbin tube 5B has been mounted is supplied from the bobbin processing device 103 to the winding unit 105 by the tray transporting line 108 and the supply path 106. The tray 3 on which the empty bobbin tube 5A has been mounted is transported from the winding unit 105 to the collection path 107 and the tray transporting line 108.

[0015] The tray transporting line 108 includes a main

transporting line 121 and a second bunch processing line 122. The main transporting line 121 is a path that transports the empty bobbin tube 5A discharged from the automatic winder 102, replaces the empty bobbin tube 5A with the yarn supply bobbin tube 5B on the way, and transports the yarn supply bobbin tube 5B to the automatic winder 102. The main transporting line 121 is formed in a substantially U-shape. A starting end of the main transporting line 121 is connected to a terminal end of the collection path 107, and a terminal end of the main transporting line 121 is connected to a starting end of the supply path 106. A bobbin removing device 11 is a device that, when the empty bobbin tube 5A with a residual yarn remaining thereon is returned from the automatic winder 102, determines whether the yarn present on the bobbin can be unwound, and upon determining that the yarn cannot be unwound, removes this bobbin from the tray 3 and collects the bobbin. The bobbin removing device 11 includes a fourth suction system 57 (FIG. 2) for sucking the residual yarn that cannot be unwound from the empty bobbin tube 5A to remove the residual yarn.

[0016] A yarn supply bobbin tube supplying device 13 is a device that mounts the yarn supply bobbin tube 5B, which is formed in the spinning frame, in the tray 3 in a substantially upright posture. The yarn supply bobbin tube 5B is supplied to the yarn supply bobbin tube supplying device 13 from the bobbin supplying device 104. The yarn supply bobbin tube supplying device 13 includes, though not shown, a bobbin introducing device, a bobbin separating device, a bobbin dividing device, and a pair of bobbin chutes. The yarn supply bobbin tube supplying device 13 can supply the yarn supply bobbin tube 5B to the tray 3 simultaneously at two places by the bobbin dividing device and the bobbin chutes. The bobbin chute sets the yarn supply bobbin tube 5B by inserting the yarn supply bobbin tube 5B in a mounting member of the tray 3. For example, the bobbin chute is constituted by a one part of a cone shaped cylindrical member when the cone shaped cylindrical member is cut into two parts along an axial thereof. The yarn supply bobbin tube supplying device 13 includes, as shown in FIG. 2, a bunch remover 14 (bunch removing device). The bunch remover 14 includes a third suction system 55 (FIG. 2) that sucks a bottom bunch (winding end part when a bobbin is formed in the spinning frame) to remove the bottom bunch.

[0017] In the main transporting line 121 but downstream of the yarn supply bobbin tube supplying device 13 in a transport direction, a first bunch unwinding device 15A, a first yarn end processing device 17A, and a first end finding device 19A are arranged in this order. The first bunch unwinding device 15A is a device that realizes the function same as that of the bunch remover 14 of the yarn supply bobbin tube supplying device 13. The first bunch unwinding device 15A is a device for removing the bottom bunch that could not be removed by the bunch remover 14. The first bunch unwinding device 15A includes a not-shown suction system.

[0018] The first yarn end processing device 17A is a device that cuts a back-wind yarn wound on a surface of the yarn supply bobbin tube 5B to make it easy to pull the yarn end. The first yarn end processing device 17A includes a not-shown suction system. The first end finding device 19A is a device that separates the yarn end from the surface of the yarn supply bobbin tube 5B to find the yarn end, and winds the end-found yarn in an upper part of the tube and inserts the end of the yarn into a top hole of the tube. The first end finding device 19A includes a first suction system 51 (FIG. 2) that sucks the yarn end for finding the yarn end. Note that, a first side suction 18A can be optionally arranged between the first yarn end processing device 17A and the first end finding device 19A. The first side suction 18A is a device that assists a yarn end finding processing explained later by sucking the yarn end laterally. The first side suction 18A includes a not-shown side suction mouth as a fifth suction system 59 to suck the yarn end.

[0019] For example, the second bunch processing line 122 is a path to reprocess the yarn supply bobbin tube 5B for which a failure occurred in the yarn end finding processing in the first bunch unwinding device 15A. The second bunch processing line 122 is a bypass path for returning a bobbin from the terminal end to the starting end of the main transporting line 121. A second bunch unwinding device 15B, a second yarn end processing device 17B, and a second end finding device 19B are arranged in the second bunch processing line 122 in this order. Moreover, a second side suction 18B may be arranged optionally. These devices are similar to those explained above.

(4) Flow of Tray

[0020] A flow of the tray 3 is explained below. In the yarn supply bobbin tube supplying device 13, the bottom bunch formed in the yarn supply bobbin tube 5B is removed by the bunch remover 14. Then, when an empty tray 3 arrives at the position right below the not-shown bobbin chute of the yarn supply bobbin tube supplying device 13, the yarn supply bobbin tube 5B is mounted on the empty tray 3 in a substantially upright posture.

[0021] Subsequently, this tray 3 is transported to the main transporting line 121 and transported toward the first bunch unwinding device 15A arranged on the downstream side. In the first bunch unwinding device 15A, the removal of the bottom bunch formed in the yarn supply bobbin tube 5B is attempted again. This operation is performed to surely remove the bottom bunch that could not be removed in the bunch remover 14. Subsequently, the yarn supply bobbin tube 5B is transported on the main transporting line 121 toward the first yarn end processing device 17A. In the first yarn end processing device 17A, the back-wind yarn wound on the surface of the yarn supply bobbin tube 5B is cut and a tip winding part is formed in the yarn.

[0022] Subsequently, the yarn supply bobbin tube 5B

is transported on the main transporting line 121 toward the first end finding device 19A. In the first end finding device 19A, the tip winding part of the yarn is sucked from above and the tip winding part is inserted in the tube of the yarn supply bobbin tube 5B. Subsequently, the yarn supply bobbin tube 5B is transported further downstream on the main transporting line 121, and the yarn supply bobbin tube 5B is supplied to the supply path 106 of the automatic winder 102. The yarn supply bobbin tube 5B is transported on the supply path 106 and supplied to one of the winding units 105.

[0023] In the winding unit 105, the yarn is unwound from the yarn supply bobbin tube 5B, and the unwound yarn is wound into a package. The tray 3 on which is mounted the empty bobbin tube 5A from which all the yarns has been unwound is discharged from the winding unit 105. This tray 3 is returned to the main transporting line 121 of the bobbin processing device 103 via the collection path 107. In the main transporting line 121, the bobbin removing device 11 removes the empty bobbin tube 5A mounted on this tray 3.

(5) Suction Control System of Bobbin Processing Device

[0024] A suction control system of the bobbin processing device 103 is explained by using FIG. 2. FIG. 2 is a block diagram of the suction control system of the bobbin processing device 103. The bobbin processing device 103 includes a blower for bobbin processing device 45 (example of a suction source). The blower for bobbin processing device 45 is a device that supplies a suction force to a plurality of the suction systems of the bobbin processing device 103. The suction system is a mechanism for processing the yarn of the yarn supplying bobbin by sucking air. The bobbin processing device 103 includes a suction duct for bobbin processing device 47 (example of an air dispensing passage). The suction duct for bobbin processing device 47 includes a main duct 47a that extends from the blower for bobbin processing device 45, and a plurality of divergence ducts 47b that diverge from the main duct 47a and are connected to the suction systems.

[0025] The first end finding device 19A includes the first suction system 51 that positions the yarn end from the yarn supply bobbin tube 5B at a predetermined position. The first end finding device 19A includes a first shutter device 52 (example of an air conduction switching system). The first shutter device 52 is arranged in an air passage (example of a not-shown air dispensing passage) in the first end finding device 19A that is connected to the corresponding divergence duct 47b. The first shutter device 52 can open / close the air passage between the blower for bobbin processing device 45 and the first suction system 51. The first shutter device 52 includes, for example, a shutter and an air cylinder (same holds true for other shutter devices in the below explanation). The first shutter device 52 is, for example, a shutter cutter. The second end finding device 19B includes a second

suction system 53 that positions the yarn end from the bobbin at a predetermined position. The second end finding device 19B includes a second shutter device 54. The second shutter device 54 is arranged in an air passage (example of the not-shown air dispensing passage) in the second end finding device 19B that is connected to the corresponding divergence duct 47b. The second shutter device 54 can open / close the air passage between the blower for bobbin processing device 45 and the second suction system 53. The second shutter device 54 is, for example, a shutter cutter.

[0026] As shown in FIG. 3, the blower for bobbin processing device 45 includes a motor 68, a fan 69, and a yarn waste collecting box 70 all arranged in a blower box 66. FIG. 3 is a schematic diagram of a suction system of two end finding devices. The yarn waste collecting box 70 is a member for collecting yarn waste and fly-waste removed by suction. The yarn waste collecting box 70 includes an air filter (bobbin processing device filter) 71. With this structure, the yarn waste collecting box 70 can separate a suction airflow from the yarn waste and the fly-waste that have been flown by the suction airflow.

[0027] The bunch remover 14 includes the third suction system 55 to unwind the bottom bunch. The bunch remover 14 includes a third shutter device 56. The third shutter device 56 is arranged in an air passage (example of the not-shown air dispensing passage) in the bunch remover 14 that is connected to the corresponding divergence duct 47b. The third shutter device 56 can open / close the air passage between the blower for bobbin processing device 45 and the third suction system 55. The third shutter device 56 is, for example, a shutter cutter. The bobbin removing device 11 includes a residual yarn processing device as the fourth suction system 57 for sucking the residual yarn from the bobbin. The bobbin removing device 11 includes a fourth shutter device 58. The fourth shutter device 58 is arranged in an air passage (example of the not-shown air dispensing passage) in the bobbin removing device 11 that is connected to the corresponding divergence duct 47b. The fourth shutter device 58 can open / close the air passage between the blower for bobbin processing device 45 and the fourth suction system 57.

[0028] The first side suction 18A includes the fifth suction system 59 for sucking the yarn end laterally. The first side suction 18A includes a fifth shutter device 60. The fifth shutter device 60 is arranged in an air passage (example of the not-shown air dispensing passage) in the first side suction 18A that is connected to the corresponding divergence duct 47b. The fifth shutter device 60 can open / close an air passage between the blower for bobbin processing device 45 and the fifth suction system 59. The fifth shutter device 60 is, for example, a shutter cutter. The second side suction 18B includes a sixth suction system 61 for sucking the yarn end laterally. The second side suction 18B includes a sixth shutter device 62. The sixth shutter device 62 is arranged in an air passage (example of the not-shown air dispensing passage) in the

second side suction 18B that is connected to the corresponding divergence duct 47b. The sixth shutter device 62 can open / close the air passage between the blower for bobbin processing device 45 and the sixth suction system 61. The sixth shutter device 62 is, for example, a shutter cutter.

[0029] The bobbin processing device 103 includes a first control section 73. The first control section 73 is placed in a control box 81 shown in FIG. 3. The first control section 73 is a computer system including a processor (e.g., CPU), a storage device (e.g., ROM, RAM, HDD, SSD, and the like), and various interfaces (e.g., A/D converter, D/A converter, communication interface, and the like). The first control section 73 performs various control operations by executing a computer program stored in a memory (corresponds to a part or all of a memory area of the storage device). The first control section 73 can be constituted by one processor or can be constituted by a plurality of independent processors that respectively perform a corresponding control.

[0030] A part or all the functions of each of structural components of the first control section 73 can be realized by a computer program executable on a computer system that constitutes a control section. Specifically, control software to cause the CPU and the like to realize a function as a later-explained first suction control unit 73a is stored in the ROM included in the first control section 73. A part of the functions of each of the structural components of the control section can be constituted by a custom IC. Though not shown in the drawings, one or more sensors that detects a size, a shape, and a position of a target, one or more sensors and switches that detect a state of various devices, and an information input device are connected to the first control section 73. The first control section 73 includes, as mentioned above, the first suction control unit 73a that controls the operation of the suction systems and the blowers. The first suction control unit 73a changes a suction pressure in each of the suction systems by driving the blower for bobbin processing device 45, the first shutter device 52, the second shutter device 54, the third shutter device 56, the fourth shutter device 58, the fifth shutter device 60, and the sixth shutter device 62. Any one of the serial communication, such as the bus communication, and the parallel communication, that uses a plurality of wiring, can be adopted as the communication unit between the first suction control unit 73a and the suction systems. Alternatively, a transmitter and a receiver can be provided to realize radio communication.

(6) Suction Control System of Automatic Winder

[0031] The suction control system of the automatic winder 102 is explained by using FIG. 4. FIG. 4 is a block diagram of the suction control system of the automatic winder 102. The automatic winder 102 includes a blower for automatic winder (blower for yarn winding device) 65. The blower for yarn winding device 65 is a device that

supplies a suction force to the suction systems of the automatic winder 102. The automatic winder 102 includes a suction duct for automatic winder 67. The suction duct for automatic winder 67 includes a main duct 67a extending from the blower for yarn winding device 65, and several divergence ducts 67b that diverge from the main duct 67a.

[0032] Each of the winding units 105 includes a suction system 77 and a unit shutter device 79. The unit shutter device 79 is arranged, for example, in the corresponding divergence duct 67b. The unit shutter device 79 can open / close an air passage between the blower for yarn winding device 65 and the corresponding suction system 77. The automatic winder 102 includes second control sections 75. One second control section 75 is arranged in each of the winding units 105. The second control section 75 can communicate with the first control section 73 directly or indirectly. The second control section 75 includes a second suction control unit 75a that controls a suction operation of the suction system 77. The second suction control unit 75a changes a suction pressure in each of the suction systems 77 by driving the corresponding unit shutter device 79.

(7) Advantageous Effect of Embodiment

[0033] As explained above, the bobbin processing device 103 includes the blower for bobbin processing device 45, and the blower for bobbin processing device 45 operates the several suction systems by generating a suction airflow in the suction systems. Because of such a configuration, the suction operation of the blower for yarn winding device 65 of the automatic winder 102 can be stopped while the blower for bobbin processing device 45 is operating in the bobbin processing device 103. Moreover, the suction operation of the blower for bobbin processing device 45 can be stopped while suction is being performed in the automatic winder 102. Note that, the stopping of the suction operation means that a motor is stopped or that a suction port of a blower is closed with a not-shown shutter. As a result, the power consumption can be suppressed.

[0034] Specifically, if a winding condition when the yarn supply bobbin tube 5B is supplied from the spinning frame to the automatic winder 102 changes (a lot is changed), a long waiting time occurs before the yarn supply bobbin tube 5B of a new count is supplied to the automatic winder 102. During this waiting time, the suction operation of the blower for yarn winding device 65 of the automatic winder 102 is stopped while the suction system of the bobbin processing device 103 is operating. Moreover, when the removal of the bobbin from the spinning frame is completed and the automatic winder 102 is ready to perform the spinning, the suction operation of the blower for yarn winding device 65 of the automatic winder 102 is stopped while the suction system of the bobbin processing device 103 is operating. Furthermore, once all the yarn supply bobbin tubes 5B present in the bobbin processing device

103 are sent to the automatic winder 102, the suction operation of the blower for bobbin processing device 45 of the bobbin processing device 103 is stopped.

[0035] As one example of the operation, when the blower for bobbin processing device 45 is performing the suction operation, the first suction control unit 73a of the first control section 73 controls the suction force of the blower for bobbin processing device 45 so as to be constant. Furthermore, the first suction control unit 73a of the first control section 73 closes the conduction of the air to the suction system by using the shutter device corresponding to the suction system for which the suction is unnecessary or for which the priority of suction is low. Thus, because only the suction system for which the suction is necessary or for which the suction has a high priority is operated, energy saving is realized, and suction power of those suction systems can be maintained high. As a first example of the above, the suction operation of the second end finding device 19B is ordinarily stopped, and the suction operation of the second end finding device 19B can be performed only when the processing capacity in the first end finding device 19A is exceeded. As a second example of the above, when operating the first end finding device 19A and the second end finding device 19B for different types of yarns, the suction operation of the second end finding device 19B is stopped when the first end finding device 19A is performing the suction operation, and the suction operation of the first end finding device 19A is stopped when the second end finding device 19B is performing the suction operation.

2. Second Embodiment

[0036] An embodiment in which a bobbin processing device does not include a yarn waste collecting box is explained below by using FIGS. 5 and 6. FIGS. 5 and 6 are schematic diagrams of a suction system of two end finding devices according to a second embodiment.

[0037] The blower for yarn winding device 65 includes a motor 88, a fan 89, and a yarn waste collecting box 80 all arranged in a blower box 87. The yarn waste collecting box 80 is a device for collecting sucked and removed yarn waste and fly-waste. The yarn waste collecting box 80 includes an air filter 90. The suction duct for bobbin processing device 47 of the bobbin processing device 103 is connected to the suction duct for automatic winder 67 of the automatic winder 102. That is, the suction duct for bobbin processing device 47 has a passage (example of a connection passage) that communicates with the yarn waste collecting box 80 arranged in the automatic winder 102.

[0038] A connection shutter device 91 is arranged at a border between the suction duct for bobbin processing device 47 and the suction duct for automatic winder 67. The connection shutter device 91 includes a shutter 92 and a cylinder 93. The shutter 92 can open / close the border between the suction duct for bobbin processing device 47 and the suction duct for automatic winder 67.

A blower for bobbin processing device 45A of the bobbin processing device 103, in the suction duct for bobbin processing device 47, is arranged near the border between the suction duct for bobbin processing device 47 and the suction duct for automatic winder 67. The blower for bobbin processing device 45A of the bobbin processing device 103 includes a motor 68A, a fan 69A, and a filter (bobbin processing device filter) 71A. More specifically, the blower for bobbin processing device 45A is arranged toward the suction system with respect to the connection shutter device 91 of the suction duct for bobbin processing device 47.

[0039] Ordinarily, as shown in FIG. 5, the border between the suction duct for bobbin processing device 47 and the suction duct for automatic winder 67 is closed by the connection shutter device 91, and the suction operation is performed in the first end finding device 19A and the second end finding device 19B by the blower for bobbin processing device 45A. Therefore, the yarn waste accumulates near the shutter 92 or the filter 71A. During a cleaning operation, as shown in FIG. 6, the border between the suction duct for bobbin processing device 47 and the suction duct for automatic winder 67 is opened by operating the connection shutter device 91, and the suction force of the blower for bobbin processing device 45A is reduced. Therefore, the yarn waste is sucked by the blower for yarn winding device 65 of the automatic winder 102, and the yarn waste is accumulated in the yarn waste collecting box 80 of the automatic winder 102. In the above configuration, because it is not necessary to provide the yarn waste collecting box for the bobbin processing device, the number of yarn waste collecting boxes can be reduced.

3. Third Embodiment

[0040] One shutter device is arranged in each of the suction systems in the first embodiment; however, the bobbin processing device can include one shutter device that can switch a plurality of air dispensing passages. Such an embodiment is explained below by using FIG. 7. FIG. 7 is a schematic diagram of a suction system of two end finding devices according to a third embodiment.

[0041] As shown in FIG. 7, a not-shown first suction system of the first end finding device 19A and a not-shown second suction system of the second end finding device 19B are connected to one shutter device 95. The shutter device 95 is arranged in the suction duct for bobbin processing device 47 (example of the air dispensing passage). The shutter device 95 can open / close an air passage between the blower for bobbin processing device 45 and the first end finding device 19A and the second end finding device 19B. The shutter device 95 can realize a plurality of switching modes. The shutter device 95 can realize switching between at least two modes among, for example, a first mode in which only the first end finding device 19A performs the suction, a second mode in which only the second end finding device 19B

performs the suction, a third mode in which suction by both the first end finding device 19A and the second end finding device 19B is stopped, and a fourth mode in which both the first end finding device 19A and the second end finding device 19B perform the suction. This embodiment is also applicable to a combination of other suction systems other than the combination between the end finding devices.

4. Other Embodiments

[0042] Few embodiments of the present invention are explained above; however, the present invention is not limited to these embodiments, and various changes can be made therein without departing from subject matter of the invention. Particularly, the embodiments and variations explained in the present specification can be optionally combined as desired.

[0043] The number and the types of suction systems in the bobbin processing device are not limited to those in the embodiments. For example, only one end finding device can be arranged. The several suction systems in the bobbin processing device do not necessarily point to all the suction systems mentioned in the first embodiment. For example, one combination among a combination of the end finding devices, a combination of the end finding device and the bunch remover, a combination of the end finding device and the side suction mouth, a combination of the end finding device and the residual yarn handling device, a combination of the end finding device, the bunch remover, and the residual yarn handling device can be listed as the examples of the several suction systems. Moreover, the bobbin processing device 103 is arranged between the bobbin supplying device 104 and the automatic winder 102; however, the bobbin processing device 103 can be arranged between a ring spinning frame and the automatic winder 102.

[0044] The bobbin processing device may include a suction system that does not have a shutter device. The control section of the bobbin processing device may change between high / low pressure by using an inverter. One blower can include several blowers.

[0045] A bobbin processing device according to one aspect of the present invention that supplies a yarn supplying bobbin to a yarn winding device includes a plurality of suction systems that processes a yarn on the yarn supplying bobbin by sucking air; a blower for bobbin processing device that functions as a suction source to generate a suction airflow; a plurality of air dispensing passages arranged between the suction systems and the blower for bobbin processing device; and an air conduction switching system that switches conduction of air in the air dispensing passages.

[0046] The above bobbin processing device includes the suction source, and the suction source operates the suction system by generating the suction airflow in the suction system. Suction performed in each of the suction systems is controlled by the air conduction switching sys-

tem switching the conduction in the air dispensing passages. The air conduction switching system is, for example, a shutter device.

[0047] Because of such a configuration, a suction operation of a suction system of the yarn winding device can be stopped while the suction system is operating in the bobbin processing device. Moreover, the operation of the suction system of the bobbin processing device can be stopped while suction is being performed in the yarn winding device. As a result, the power consumption can be suppressed. As one example, if a winding condition when the yarn supplying bobbin is supplied from a spinning frame to the yarn winding device changes (a lot is changed), a long waiting time occurs before the yarn supplying bobbin of a new count is supplied to the yarn winding device. As another example, if the yarn winding device is ready to perform the spinning of the yarn from the yarn supplying bobbin supplied from the spinning frame, while stopping the operation of the suction system of the bobbin processing device according to the present invention, only the suction operation of the suction system of the yarn winding device can be continued.

[0048] In the above bobbin processing device, the suction systems can be arranged in end finding devices that position a yarn end of the yarn on the yarn supplying bobbin at a predetermined position.

[0049] In the above bobbin processing device, the suction systems can be arranged in end finding devices that position a yarn end of the yarn on the yarn supplying bobbin at a predetermined position, and side suction mouths that suck the yarn end of the yarn on the yarn supplying bobbin from a side.

[0050] In the above bobbin processing device, the suction systems can be arranged in end finding devices that position a yarn end of the yarn on the yarn supplying bobbin at a predetermined position, and a bunch removing device of a bobbin supplying device that supplies the yarn supplying bobbin to a tray.

[0051] In the above bobbin processing device, the suction systems can be arranged in end finding devices that position a yarn end of the yarn on the yarn supplying bobbin at a predetermined position, and a residual yarn processing device that removes a residual yarn from the yarn supplying bobbin by suction.

[0052] In the above bobbin processing device, the suction systems can be arranged in end finding devices that position a yarn end of the yarn on the yarn supplying bobbin at a predetermined position, a bunch remover of a bobbin supplying device that supplies the yarn supplying bobbin to a tray, and a bobbin removing device that removes a residual yarn from the yarn supplying bobbin by suction.

[0053] The above bobbin processing device can further include a first control section that controls operations of the air conduction switching system and the suction source. When one of the suction systems is performing a suction operation, the first control section can control so that a suction force is maintained constant.

[0054] In the above bobbin processing device, the air conduction switching system can include a plurality of shutter devices corresponding to the suction systems.

[0055] In the above bobbin processing device, a control section can control the shutter devices. When operating the shutter devices, the control section can stop the suction operation of the suction system having low priority. Therefore, because only the suction system for which the suction is necessary or for which the suction has a high priority is operated, energy saving can be realized, and suction power of those suction systems can be maintained high.

[0056] In the above bobbin processing device, one shutter device can be arranged in each of the suction systems. One shutter device can be arranged in each of the air dispensing passages. The suction systems can be opened / closed individually.

[0057] A yarn processing system according to another aspect of the present invention includes the yarn winding device including a blower for yarn winding device having a motor, a fan, and a yarn waste collecting box; and the bobbin processing device. The air dispensing passage includes a connection passage extending to the blower for yarn winding device from the suction systems. A connection shutter device is arranged in the middle of the connection passage. The blower for bobbin processing device includes a bobbin processing device filter, and the blower for bobbin processing device is arranged toward the suction system than the connection shutter device of the connection passage. In such a configuration, because it is not necessary to provide the yarn waste collecting box for the bobbin processing device, the number of yarn waste collecting boxes can be reduced.

[0058] In the above yarn processing system, the first control section is capable of executing accumulating yarn waste near any one of the connection shutter device and the bobbin processing device filter in a state that the connection passage is closed by the connection shutter device by the blower for bobbin processing device causing the suction systems to perform the suction operation, and accumulating the yarn waste in the yarn waste collecting box by reducing a suction force of the blower for bobbin processing device and by performing suction in the suction systems by the blower for yarn winding device in a state that the connection passage is opened by the connection shutter device. In such a configuration, the yarn waste accumulated on the bobbin processing device side can be temporarily accumulated inside a duct and finally can be collected in the yarn waste collecting box arranged on the yarn winding device side. As a result, because it is not necessary to provide the yarn waste collecting box for the bobbin processing device, the number of yarn waste collecting boxes can be reduced.

[0059] In the above bobbin processing device, the air conduction switching system can include one shutter device capable of switching the air dispensing passages between the suction systems.

[0060] According to the above bobbin processing de-

vice, the power consumption can be reduced.

[0061] The present invention can be widely applied to a bobbin processing device for supplying a yarn supplying bobbin to a yarn winding device.

[0062] In the above explanation, the meaning of "a plurality of" also includes "a predetermined number of".

[0063] Although the invention has been explained with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the scope of the claims.

Claims

1. A bobbin processing device (103) that supplies a yarn supplying bobbin (5B) to a yarn winding device (102), comprising:

a plurality of suction systems (51, 53, 55, 57, 59, 61) that processes a yarn on the yarn supplying bobbin (5B) by sucking air;

a blower for bobbin processing device (45) that functions as a suction source to generate a suction airflow;

a plurality of air dispensing passages (47) arranged between the suction systems (51, 53, 55, 57, 59, 61) and the blower for bobbin processing device (45); and

an air conduction switching system (52) that switches conduction of air in the air dispensing passages (47).

2. The bobbin processing device (103) as claimed in Claim 1, wherein the suction systems (51, 53) are arranged in end finding devices (19A, 19B) that position a yarn end of the yarn on the yarn supplying bobbin (5B) at a predetermined position.

3. The bobbin processing device (103) as claimed in Claim 1, wherein the suction systems (51, 53, 59, 61) are arranged in end finding devices (19A, 19B) that position a yarn end of the yarn on the yarn supplying bobbin (5B) at a predetermined position, and side suction (18A, 18B) that suck the yarn end of the yarn on the yarn supplying bobbin (5B) from a side.

4. The bobbin processing device (103) as claimed in Claim 1, wherein the suction systems (51, 53, 55) are arranged in end finding devices (19A, 19B) that position a yarn end of the yarn on the yarn supplying bobbin (5B) at a predetermined position, and a bunch remover (14) of a bobbin supplying device

(104) that supplies the yarn supplying bobbin (5B) to a tray.

5. The bobbin processing device (103) as claimed in Claim 1, wherein the suction systems (51, 53, 57) are arranged in end finding devices (19A, 19B) that position a yarn end of the yarn on the yarn supplying bobbin (5B) at a predetermined position, and a bobbin removing device (11) that removes a residual yarn from the yarn supplying bobbin (5B) by suction.

6. The bobbin processing device (103) as claimed in Claim 1, wherein the suction systems (51, 53, 55, 57) are arranged in end finding devices (19A, 19B) that position a yarn end of the yarn on the yarn supplying bobbin (5B) at a predetermined position, a bunch remover (14) arranged in a bobbin supplying device (104) that supplies the yarn supplying bobbin (5B) to a tray, and a bobbin removing device (11) that removes a residual yarn from the yarn supplying bobbin (5B) by suction.

7. The bobbin processing device (103) as claimed in any one of Claims 1 to 6, further comprising a first control section (73) that controls operations of the air conduction switching system (52) and the suction source, wherein when one of the suction systems (51, 53, 55, 57, 59, 61) is performing a suction operation, the first control section (73) controls so that a suction force of the suction source is maintained constant.

8. The bobbin processing device (103) as claimed in any one of Claims 1 to 7, wherein the air conduction switching system (52) includes a plurality of shutter devices (52, 54, 56, 58, 60, 62) corresponding to the suction systems (51, 53, 55, 57, 59, 61).

9. The bobbin processing device (103) as claimed in Claim 8, wherein one shutter device (52, 54, 56, 58, 60, 62) is arranged in each of the suction systems (51, 53, 55, 57, 59, 61).

10. The bobbin processing device (103) as claimed in Claim 8, wherein one shutter device (52, 54, 56, 58, 60, 62) is arranged in each of the air dispensing passages (47).

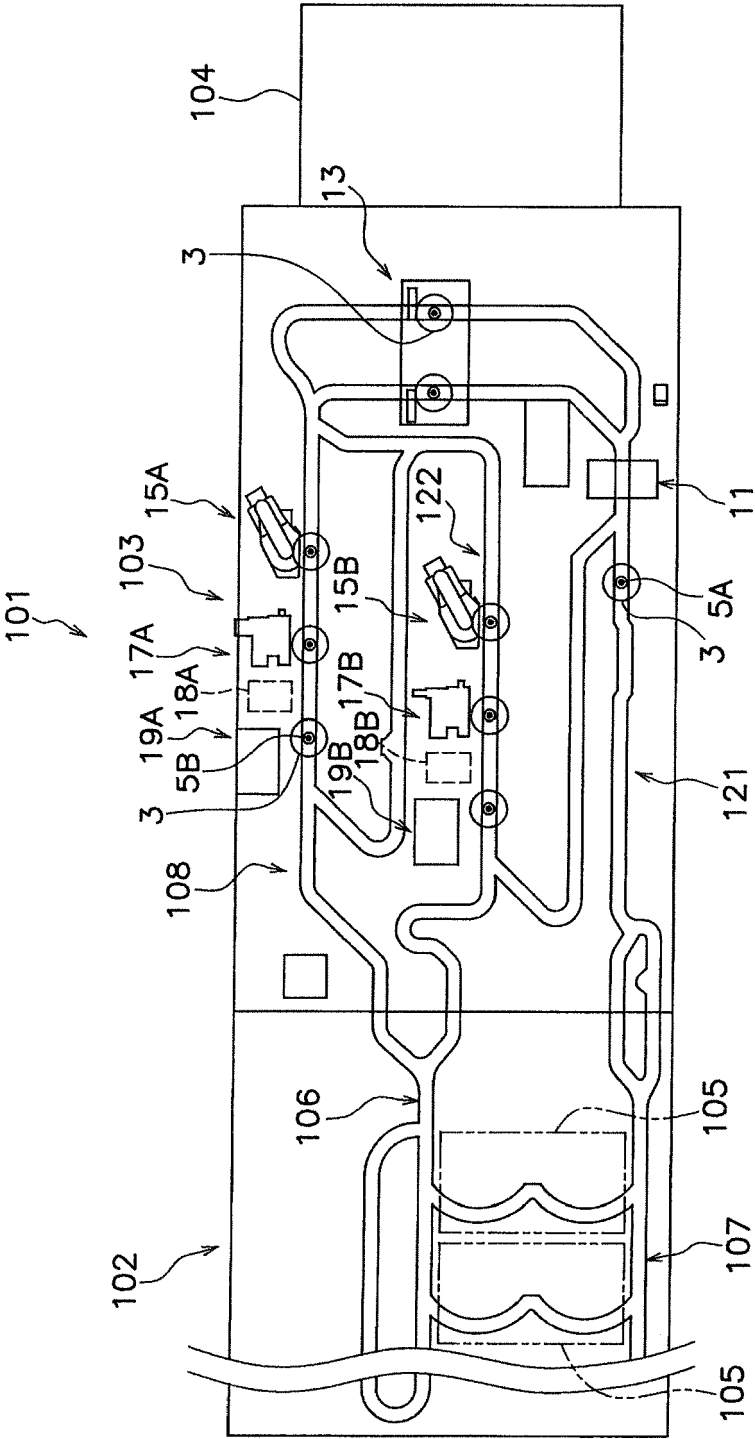
11. The bobbin processing device (103) as claimed in any one of Claims 1 to 6, wherein the air conduction switching system (52) includes one shutter device (95) capable of switching the air dispensing passages (47) between the suction systems (51, 53).

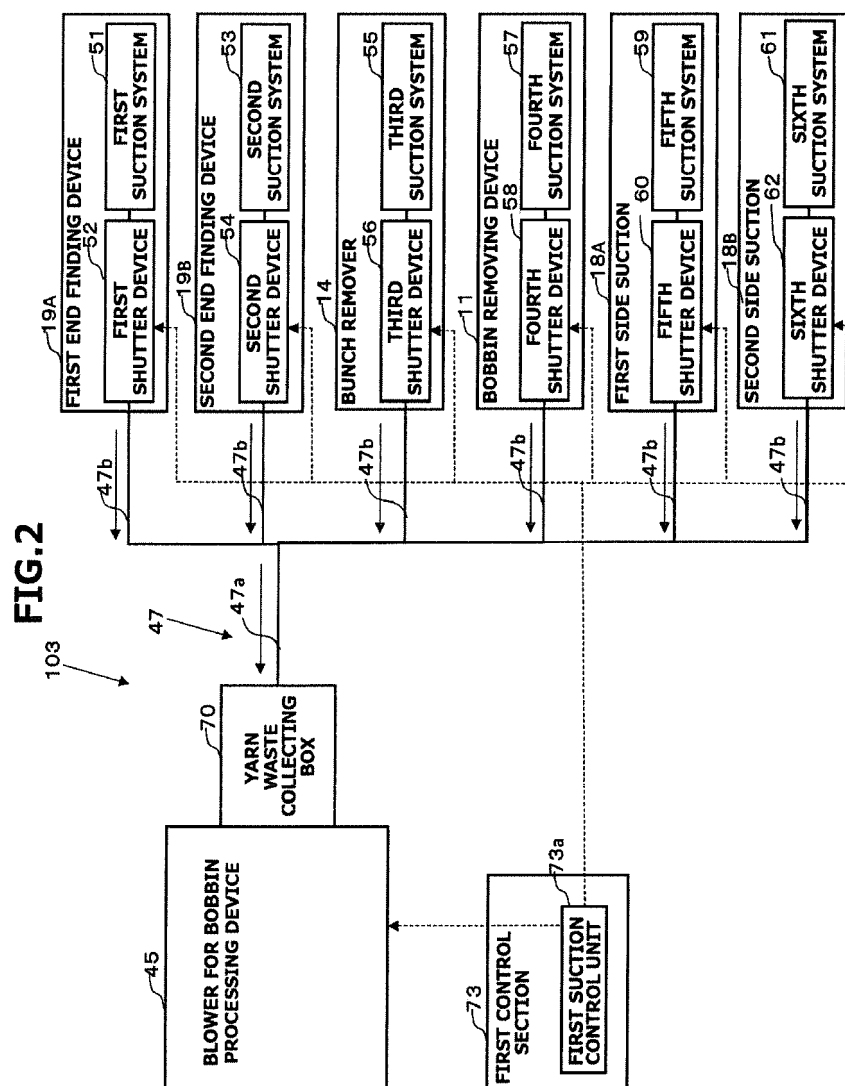
12. The bobbin processing device (103) as claimed in any one of Claims 8 to 10, wherein the first control section (73) can control the shutter devices (52, 54, 56, 58, 60, 62), and when operating the suction systems (51, 53, 55, 57, 59, 61), the first control section (73) stops the suction operation of the suction system (51, 53, 55, 57, 59, 61) having low priority. 5
13. A yarn processing system, comprising: 10
- a yarn winding device (102) including a blower for yarn winding device (65) having a motor, a fan, and a yarn waste collecting box (80); and the bobbin processing device (103) as claimed in any one of Claims 7 to 12, wherein the air dispensing passage (47) includes a connection passage (47) extending to the blower for yarn winding device (65) from the suction systems (51, 53, 55, 57, 59, 61), 15 20
- a connection shutter device (91) is arranged in the middle of the connection passage (47), the blower for bobbin processing device (45) includes a bobbin processing device filter (71A), 25
- and the blower for bobbin processing device (45) is arranged toward the suction system than the connection shutter device (91) of the connection passage (47). 30
14. The yarn processing system as claimed in Claim 13, wherein the first control section (73) is capable of executing
- accumulating yarn waste near any one of the connection shutter device (91) and the bobbin processing device filter (71A) in a state that the connection passage (47) is closed by the connection shutter device (91) by the blower for bobbin processing device (45) causing the suction systems (51, 53, 55, 57, 59, 61) to perform the suction operation, and 35 40
- accumulating the yarn waste in the yarn waste collecting box (80) by reducing a suction force of the blower for bobbin processing device (45) and by performing suction in the suction systems (51, 53, 55, 57, 59, 61) by the blower for yarn winding device (65) 45
- in a state that the connection passage (47) is opened by the connection shutter device (91). 50

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FIG.1





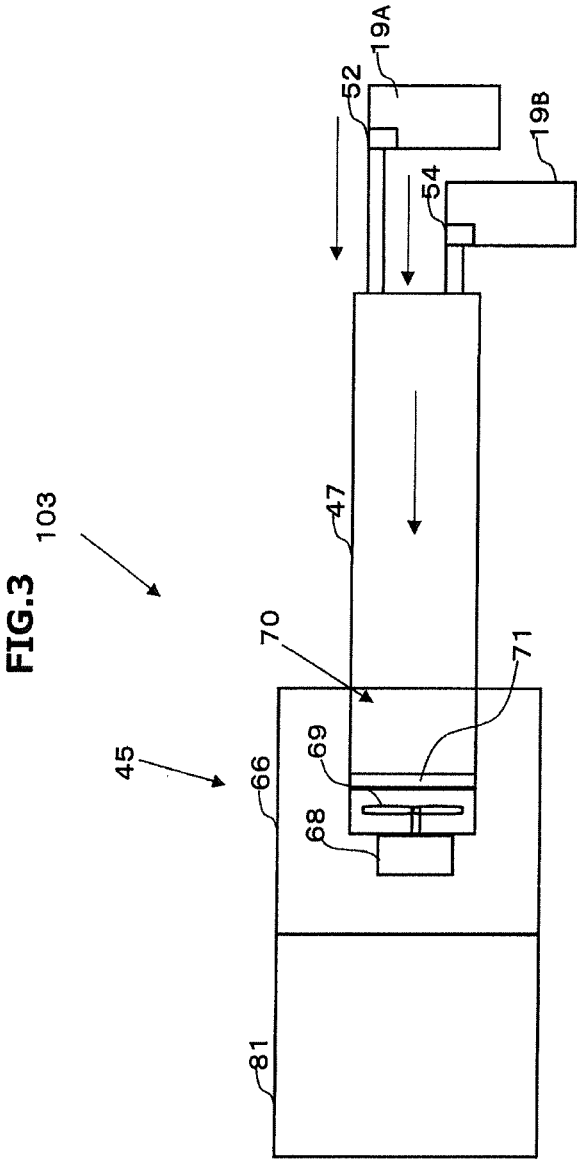


FIG.4

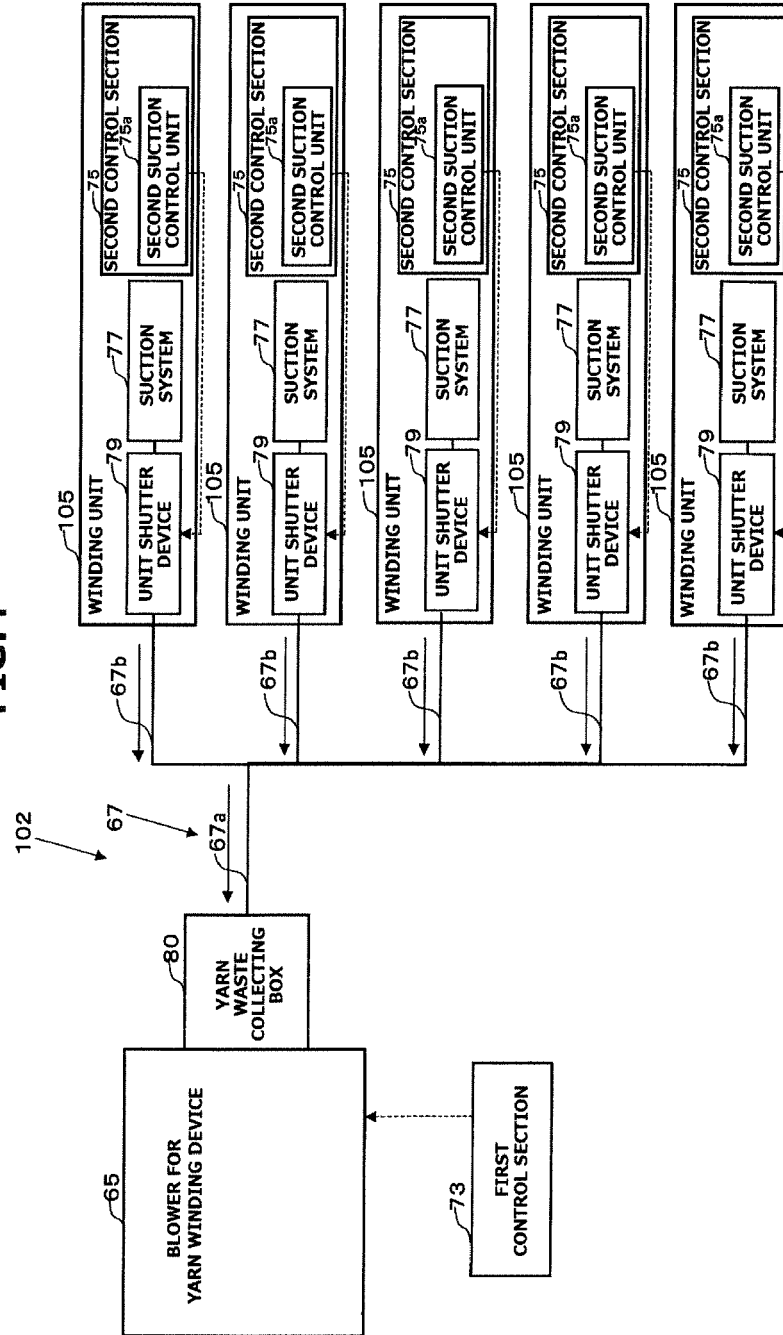
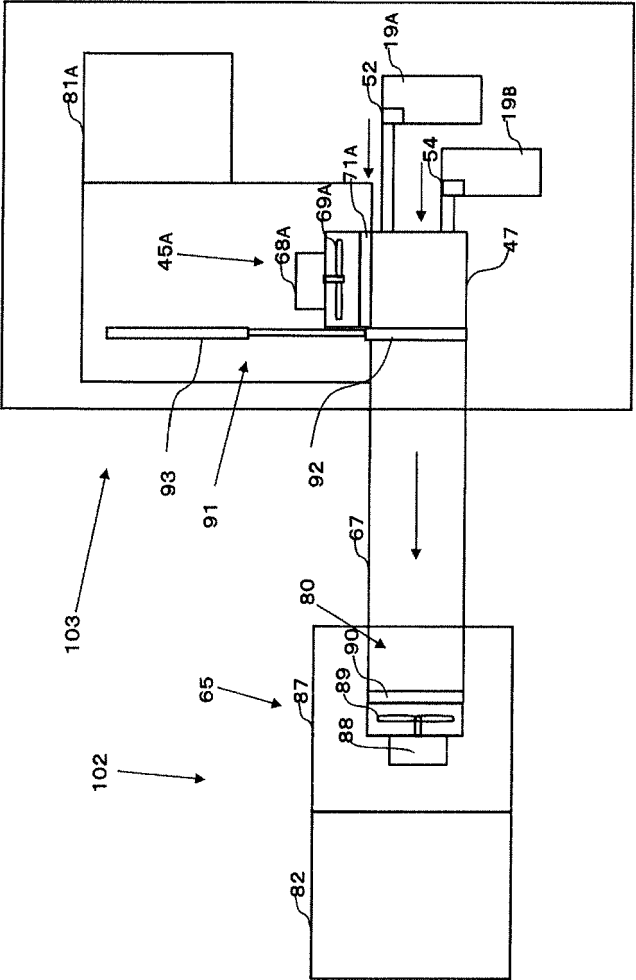
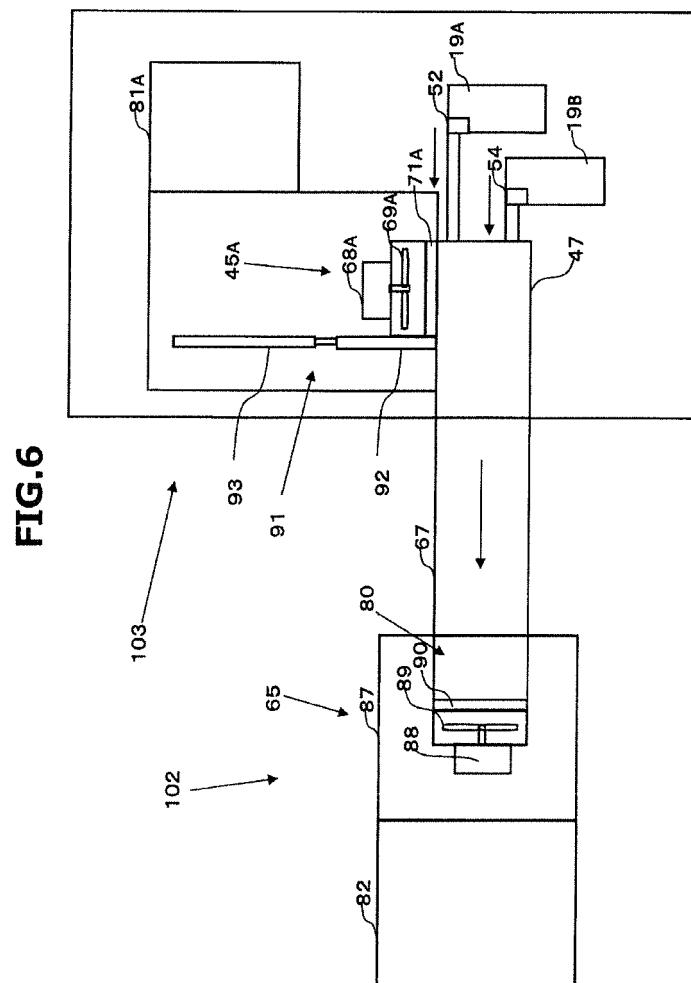
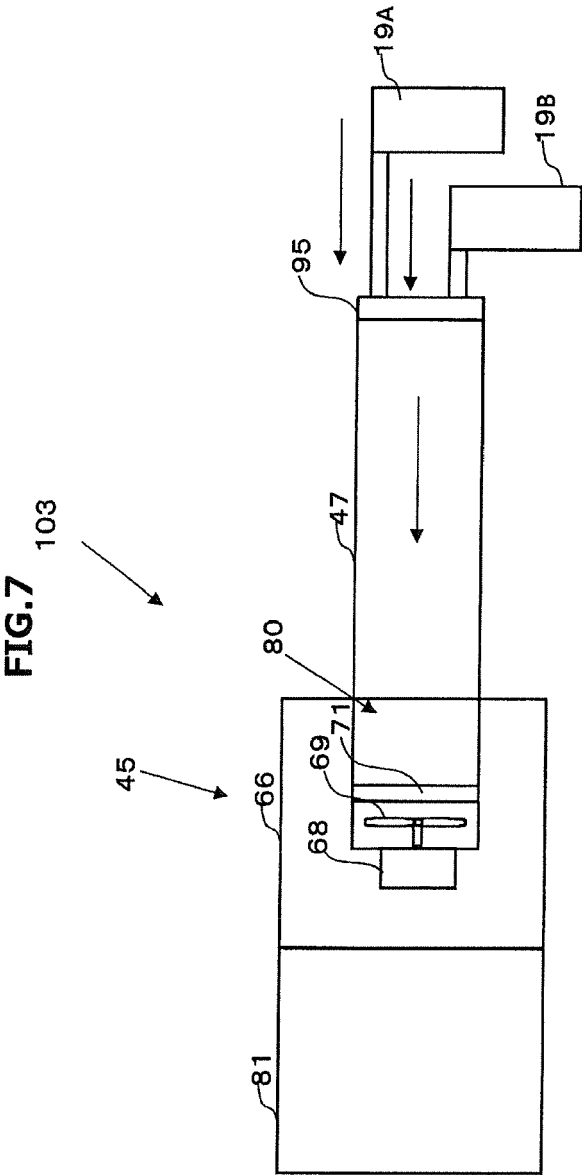


FIG.5









EUROPEAN SEARCH REPORT

Application Number
EP 18 16 5655

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Place of search The Hague		Date of completion of the search 29 August 2018	Examiner Guisan, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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