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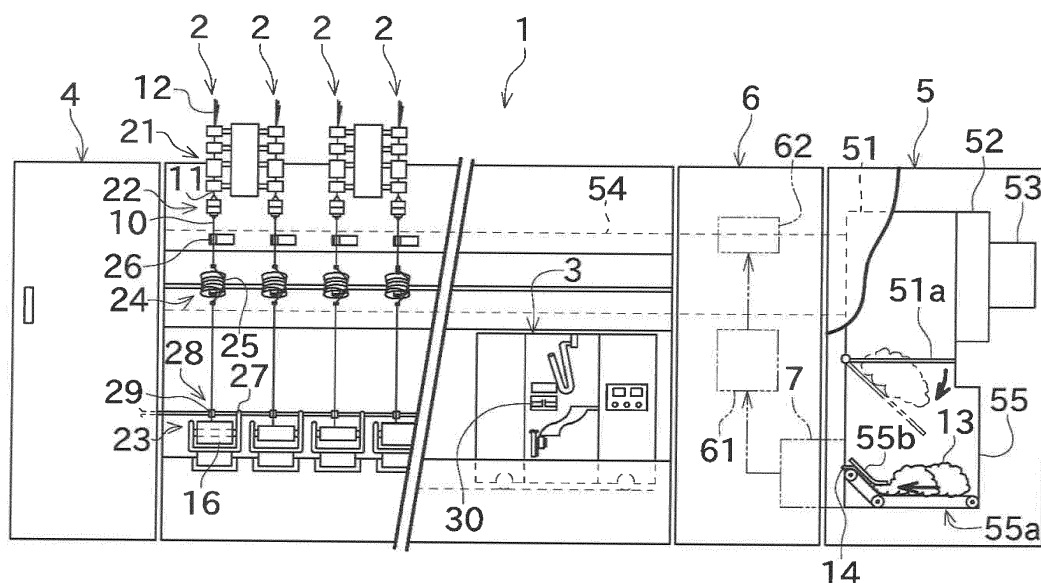
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(54) **YARN WINDING MACHINE**

(57) A spinning machine (1) includes a spinning unit (2), a blower box (5), and an open-end spinning unit (6). The spinning unit (2) winds a first yarn into a first package (16). The blower box (5) collects excess fibers (13) generated in the spinning unit (2). The open-end spinning unit (6) forms a second yarn using the excess fibers (13) collected by the blower box (5), and winds the second yarn into a second package.

erated in the spinning unit (2). The open-end spinning unit (6) forms a second yarn using the excess fibers (13) collected by the blower box (5), and winds the second yarn into a second package.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn winding machine capable of reusing excess fibers generated in each winding unit.

2. Description of the Related Art

[0002] Conventionally, there is known a yarn winding machine including a plurality of winding units, each adapted to wind a yarn, and having a configuration of collecting excess fibers such as fly waste, yarn waste, and the like generated by a winding operation in each winding unit. JP H04-110766 U discloses a spinning device, which is a yarn winding machine of a type described above. The spinning device (winding unit) of JP H04-110766 U includes a draft device, a pneumatic yarn spinning device, and a fiber separating device that returns reusable fibers discharged from the pneumatic yarn spinning device towards an entrance side of the draft device. In JP H04-110766 U, the reusable fibers contained in discharged air from the pneumatic yarn spinning device can be collected and reused according to the above-described configuration.

BRIEF SUMMARY OF THE INVENTION

[0003] It was recognized, that, in the configuration of JP H04-110766 U, the fibers discharged from one winding unit can be reused in the relevant winding unit, but excess fibers discharged from another winding unit cannot be reused.

[0004] Moreover, it was recognized that the air-jet pneumatic yarn spinning device disclosed in JP H04-110766 U can spin only fibers having a predetermined length or more because the fibers are spun by a jet airflow. Therefore, some of the excess fibers generated in the pneumatic yarn spinning device cannot be reused.

[0005] It is an object of the present invention to provide a yarn winding machine capable of reusing excess fibers generated in a winding unit.

[0006] According to an aspect of the present invention, a yarn winding machine includes a winding unit, a collecting section, and an open-end spinning unit. The winding unit is adapted to wind a first yarn into a first package. The collecting section is adapted to collect excess fibers generated in the winding unit. The open-end spinning unit is adapted to form a second yarn using the excess fibers collected by the collecting section and to wind the second yarn into a second package.

[0007] Thus, the excess fibers generated in the winding unit can be reused by the open-end spinning unit in one yarn winding machine. Furthermore, since spinning

is carried out after the fibers are opened and short fiber groups are formed, the open-end spinning unit can form a second yarn from the excess fibers of various modes such as fly waste and yarn waste.

[0008] In the above-described yarn winding machine, the winding unit is an air-jet spinning unit including a draft device and an air-jet spinning device, and the air-jet spinning unit is adapted to form the first yarn by applying twists to fibers by air-jet and to wind the first yarn into the first package.

[0009] In this case, the excess fibers generated in the air-jet spinning unit can be efficiently reused in the open-end spinning unit.

[0010] In the above-described yarn winding machine, the winding unit is an automatic winder unit adapted to unwind the first yarn from a yarn supplying bobbin and to wind the first yarn into the first package.

[0011] In this case, the excess fibers generated in the automatic winder unit can be efficiently reused in the open-end spinning unit.

[0012] In the above-described yarn winding machine, the winding unit is configured to separate fibers, to form the first yarn by converging and twisting the separated fibers, and to wind the first yarn into the first package.

[0013] In this case, the excess fibers generated in a main open-end spinning unit can be efficiently reused in another open-end spinning unit.

[0014] In the above-described yarn winding machine, the open-end spinning unit preferably includes a rotor spinning device adapted to form the second yarn by spinning fibers.

[0015] Thus, even short excess fibers can be efficiently reused.

[0016] The above-described yarn winding machine preferably further includes a fiber bundle forming device adapted to receive the excess fibers from the collecting section and to form an excess fiber bundle from the excess fibers. The fiber bundle forming device includes a converging section, a receiving section, and a drawing section. The converging section is adapted to converge the excess fibers. The receiving section is adapted to receive converged fibers converged by the converging section. The drawing section is adapted to draw the converged fibers from the receiving section to form the excess fiber bundle.

[0017] Thus, the fiber bundle of the excess fibers can be prepared by the fiber bundle forming device such that the excess fibers can be smoothly spun by the open-end spinning unit.

[0018] In the above-described yarn winding machine, the fiber bundle forming device is preferably arranged to automatically supply the excess fiber bundle to the open-end spinning unit.

[0019] Thus, the open-end spinning unit can more efficiently spin the excess fibers to form the second yarn.

[0020] In the above-described yarn winding machine, the winding unit is preferably arranged in a plurality, the open-end spinning unit is arranged adjacent to the col-

lecting section, and one of the open-end spinning unit and the collecting section is arranged adjacent to an end-position winding unit, the end-position winding unit being one of the plurality of the winding units and located at a most end position where the winding units are arranged side by side.

[0021] Thus, the open-end spinning unit can be arranged at a rational position in relation with the winding unit and the collecting section, and the excess fibers can be more efficiently reused.

[0022] In the above-described yarn winding machine, the winding unit is preferably configured to support the first package at an upper part thereof, and the open-end spinning unit is preferably configured to support the second package at an upper part thereof.

[0023] Thus, heights of the packages to be supported can be made to substantially coincide between the winding unit and the open-end spinning unit, and the yarn winding machine can be more rationally configured.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a schematic front view illustrating an overall configuration of a spinning machine according to a first embodiment of the present invention;

FIG. 2 is a plan view illustrating a configuration of a fiber bundle forming device;

FIG. 3 is a side view illustrating a configuration of the fiber bundle forming device;

FIG. 4 is a cross-sectional view illustrating a configuration of an open-end spinning unit;

FIG. 5 is a schematic view illustrating a configuration of a winding unit in which a first package is wound at an upper part thereof in a height direction; and

FIG. 6 is a schematic front view illustrating an overall configuration of an automatic winder according to a second embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] Next, a spinning machine (yarn winding machine) 1 according to a first embodiment of the present invention will be hereinafter described with reference to the drawings. "Upstream" and "downstream" in the present specification refer to upstream and downstream in a direction in which a fiber bundle, a yarn, or excess fibers move when the yarn is wound or the like.

[0026] The spinning machine 1 illustrated in FIG. 1 includes a plurality of spinning units (winding units) 2 arranged side by side, a yarn joining cart 3, a motor box 4, a blower box (collecting section) 5, and an open-end spinning unit 6.

[0027] The spinning unit 2 is configured as an air-jet spinning unit adapted to produce a spun yarn (first yarn) 10 by applying twists to a fiber bundle (fibers) 11 by air-

jet. The spinning unit 2 includes a draft device 21, a spinning device (air-jet spinning device) 22, a yarn storage device 24, and a winding device 23 arranged in this order from upstream to downstream. Each of the spinning units 2 spins the fiber bundle 11 fed from the draft device 21 by the spinning device 22 to produce the spun yarn 10, and winds the produced spun yarn 10 by the winding device 23 to form a first package 16.

[0028] A sliver 12, which is a raw material of the fiber bundle 11, is supplied to the draft device 21 from a sliver case (not illustrated) arranged at an appropriate position via a sliver guide. The draft device 21 is configured to stretch (draft) the sliver 12 to a predetermined width to obtain the fiber bundle 11 by conveying the sliver 12 between rotating draft rollers and opposing rollers facing the draft rollers. Each of a plurality of draft rollers arranged in the draft device 21 is driven by at least one of a drive device provided in each spinning unit 2 and a drive device provided commonly among the plurality of spinning units 2.

[0029] The spinning device 22 is arranged downstream of the draft device 21, and produces the spun yarn 10 by applying twists to the fiber bundle 11 supplied from the draft device 21. In the present embodiment, a device adapted to apply twists to the fiber bundle 11 by a whirling airflow that uses air-jet is adopted for the spinning device 22.

[0030] The winding device 23 is arranged downstream of the spinning device 22. The winding device 23 includes a cradle arm 27 supported to be swingable about a supporting shaft. The cradle arm 27 can rotatably support a bobbin for winding the spun yarn 10.

[0031] The winding device 23 includes a winding drum (not illustrated) and a traverse device 28. The winding drum is driven while making contact with an outer peripheral surface of the bobbin or an outer peripheral surface of the first package 16 formed by winding the spun yarn 10 around the bobbin. The first package 16 is supported at a lower part of the spinning unit 2. The traverse device 28 includes a traverse guide 29 that can guide the spun yarn 10. According to such a configuration, the winding drum is driven by an electric motor (not illustrated) while reciprocating the traverse guide 29 by a drive means (not illustrated), so that the first package 16 making contact with the winding drum can be rotated and the spun yarn 10 can be wound while the spun yarn 10 is being traversed at a predetermined width. The traverse guide 29 and the winding drum are driven by at least one of a drive device provided in each spinning unit 2 and a drive device provided commonly among the plurality of spinning units 2.

[0032] The yarn storage device 24 is arranged between the spinning device 22 and the winding device 23. The yarn storage device 24 includes a yarn storage roller 25 capable of winding and storing the spun yarn 10. The yarn storage device 24 functions as a type of buffer between the spinning device 22 and the winding device 23, and temporarily stores the spun yarn 10 on an outer pe-

riphery of the yarn storage roller 25.

[0033] A yarn defect detection device 26 is arranged between the spinning device 22 and the yarn storage device 24. The yarn defect detection device 26 is configured to detect a defect of the spun yarn 10 (specifically, abnormality in thickness and/or mixture of foreign substance, and the like of the spun yarn 10) by an optical sensor or a capacitance sensor (not illustrated). When the yarn defect is detected by the yarn defect detection device 26, the spun yarn 10 is immediately cut by a cutting device (not illustrated). However, instead of being cut by the cutting device, the spun yarn 10 may be cut by stopping a spinning operation by the spinning device 22.

[0034] The yarn joining cart 3 is configured to include a yarn joining device 30 on a cart that can travel in a direction in which the spinning units 2 are arranged. When yarn breakage or yarn cut occurs in a certain spinning unit 2, the yarn joining cart 3 travels to the relevant spinning unit 2 and stops, catches a yarn end fed from the spinning device 22 and a yarn end of the first package 16, and guides the yarn ends to the yarn joining device 30 to perform a yarn joining operation by the yarn joining device 30.

[0035] The motor box 4 is arranged at one end in the direction in which the spinning units 2 are arranged in the spinning machine 1. A drive source common to the plurality of spinning units 2 is arranged inside the motor box 4.

[0036] The blower box 5 is arranged on one end side in the direction in which the spinning units 2 are arranged in the spinning machine 1, the side being a side opposite to the motor box 4. An air supply source (e.g., a blower 52 to be described later) for generating a suction airflow, a whirling airflow, and the like necessary for a winding operation of each spinning unit 2, and the like is installed inside the blower box 5.

[0037] The open-end spinning unit 6 is arranged between the spinning unit 2 and the blower box 5. The blower box 5 and the open-end spinning unit 6 are arranged to be adjacent (next) to each other. The open-end spinning unit 6 is arranged adjacent to the spinning unit 2 (end-position winding unit) located at an end of a region where the plurality of spinning units 2 are arranged side by side.

[0038] The open-end spinning unit 6 reuses excess fibers 13 such as the fly waste collected from each spinning unit 2 and/or yarn waste collected from the yarn joining device 30 by the blower box 5 to produce a yarn (second yarn) 17, and winds the produced yarn 17 to form a second package 18.

[0039] As described above, the spinning machine 1 of the present embodiment can perform spinning and form a plurality of first packages 16 by the plurality of spinning units 2. The spinning machine 1 can also perform spinning using the excess fibers 13 generated in each spinning unit 2 and the like and collected by the blower box 5 and form the second package 18 by the open-end spinning unit 6. Thus, the excess fibers 13 generated in a

course of spinning in the spinning units 2 can be reused.

[0040] Next, a description will be made in detail on the collection and the reuse of the excess fibers 13 in the spinning machine 1 of the present embodiment.

[0041] As illustrated in FIG. 1, the blower box 5 includes a blower 52, a storage box 51, and an automatic discharging device 55.

[0042] The blower 52 is a negative pressure supplying device connected to the spinning units 2, the yarn joining cart 3, and the like. The blower 52 can generate a suction airflow by driving a blower motor 53 configured by an electric motor.

[0043] As illustrated in FIG. 1, the spinning machine 1 includes a suction duct 54 configured as a duct having an elongate shape in the direction in which the spinning units 2 are arranged. One end of the suction duct 54 is connected to the blower 52 in the blower box 5, and the suction airflow can thus be generated in the suction duct 54. A negative pressure generated by the blower 52 is supplied to each spinning unit 2 through the suction duct 54, and is also supplied to the yarn joining cart 3 through a piping (not illustrated).

[0044] The storage box 51 is arranged inside the blower box 5, and can accommodate fibers of a certain amount. The storage box 51 is arranged between the suction duct 54 and the blower 52. According to such a configuration, the excess fibers 13 generated in each of the spinning units 2 are conveyed to the storage box 51 by the suction airflow in the suction duct 54. The conveyed excess fibers 13 are temporarily stored in the storage box 51.

[0045] A bottom of the storage box 51 is configured by a swingably-supported plate member 51a. A cylinder (not illustrated) is coupled to the plate member 51a. When a sensor (not illustrated) detects that an amount of excess fibers 13 stored in the storage box 51 is greater than or equal to a predetermined amount, the cylinder is driven and the plate member 51a is swung downward. Thus, the excess fibers 13 can be discharged downward from the storage box 51.

[0046] The automatic discharging device 55 includes a belt conveyor 55a and a pressing plate member 55b, and is provided below the storage box 51.

[0047] The belt conveyor 55a conveys the excess fibers 13 discharged from the storage box 51 to outside of the blower box 5 (specifically, open-end spinning unit 6 arranged adjacent to the blower box 5).

[0048] The pressing plate member 55b is a plate-like member arranged to face a conveying surface of the belt conveyor 55a with an appropriate gap therebetween. The pressing plate member 55b is arranged in proximity to a discharging port of the excess fibers 13 in the blower box 5.

[0049] According to such a configuration, in a course of being conveyed by the belt conveyor 55a, the excess fibers 13 are pressed by the pressing plate member 55b, and are shaped into a sheet-like excess fiber group 14. The sheet-like excess fiber group 14 after the shaping is

supplied to a fiber bundle forming device 7.

[0050] The fiber bundle forming device 7 is arranged between the blower box 5 and the open-end spinning unit 6. The fiber bundle forming device 7 converges the sheet-like excess fiber group 14 to a sliver-form to shape the excess fiber group 14 into an excess fiber bundle 15. The detailed configuration of the fiber bundle forming device 7 will be described below with reference to FIGS. 2 and 3.

[0051] As illustrated in FIG. 2, the fiber bundle forming device 7 includes a guiding member 70, a converging section 71, a receiving roller (receiving section) 72, and a drawing roller (drawing section) 73.

[0052] The guiding member 70 is provided with two opened portions having different sizes. A relatively large first opened portion 70a is a guide-in port of the sheet-like excess fiber group 14, and a relatively small second opened portion 70b is a guide-out port through which the sheet-like excess fiber group 14 inside the guiding member 70 is guided out. A cross-sectional area of an internal space of the guiding member 70 gradually becomes smaller from the first opened portion 70a towards the second opened portion 70b. Thus, the sheet-like excess fiber group 14 guided in from the first opened portion 70a is converged such that a width becomes narrower as the sheet-like excess fiber group 14 passes through the internal space of the guiding member 70, and is guided out from the second opened portion 70b.

[0053] The converging section 71 includes a rotor 71a and a regulating member 71b, and is arranged downstream of the guiding member 70. The rotor 71a is rotatably driven by a drive source (not illustrated), and conveys the sheet-like excess fiber group 14 so as to pull the sheet-like excess fiber group 14 from the second opened portion 70b of the guiding member 70. The regulating member 71b is arranged with respect to the rotor 71a with a predetermined gap therebetween. When the rotor 71a is rotated, the sheet-like excess fiber group 14 is conveyed towards the downstream while being compressed between the rotor 71a and the regulating member 71b. Therefore, the sheet-like excess fiber group 14 converged by the guiding member 70 is further converged by the rotor 71a and the regulating member 71b to form a converged fiber group (converged fibers) 14a.

[0054] As illustrated in FIG. 3, the receiving roller 72 is configured by two rollers facing each other, the rollers being arranged downstream of the converging section 71. When the receiving roller 72 is rotated with the converged fiber group 14a sandwiched by the two rollers, the receiving roller 72 can convey the converged fiber group 14a towards the downstream.

[0055] The drawing roller 73 is configured by two rollers facing each other, the rollers being arranged downstream of the receiving roller 72. The drawing roller 73 is rotated at a higher speed than the receiving roller 72 with the converged fiber group 14a sandwiched by the two rollers. Thus, the converged fiber group 14a is appropriately drawn between the receiving roller 72 and the drawing

roller 73. The drawing roller 73 can convey the converged fiber group 14a towards the downstream while shaping the converged fiber group 14a into the excess fiber bundle 15.

[0056] According to the fiber bundle forming device 7 having the above configuration, the sheet-like excess fiber group 14 is converged into the excess fiber bundle 15 having an appropriate thickness, and is supplied to the open-end spinning unit 6.

[0057] Next, a description will be made on the open-end spinning unit 6 with reference to FIGS. 1 and 4. FIG. 4 is a cross-sectional view illustrating a configuration of the open-end spinning unit 6.

[0058] As illustrated in FIG. 1, the open-end spinning unit 6 includes a rotor spinning device 61 and a winding device 62.

[0059] As illustrated in FIG. 4, the rotor spinning device 61 includes a feed roller 61a, a combing roller 61b, a spinning chamber 61c, a rotor 61d, and a yarn guide-out port 61e.

[0060] The open-end spinning unit 6 can produce the yarn 17 by spinning the excess fiber bundle (fibers) 15 by the rotor spinning device 61, and can wind the yarn 17 by the winding device 62 to form the second package 18.

[0061] The feed roller 61a is configured to be rotatably driven by the electric motor (not illustrated). The feed roller 61a rotates to guide the excess fiber bundle 15 supplied from the fiber bundle forming device 7 into a fiber opening chamber 61f for opening the fibers.

[0062] The combing roller 61b is supported so as to be rotatably driven inside the fiber opening chamber 61f, and an outer periphery of the combing roller 61b is formed in a saw-shape to open the excess fiber bundle 15 into small pieces. The combing roller 61b rotates to open the excess fiber bundle 15 guided into the fiber opening chamber 61f by the feed roller 61a.

[0063] Opened fibers are conveyed from the fiber opening chamber 61f to the spinning chamber 61c on an airflow. A whirling airflow is generated in the spinning chamber 61c when the rotor 61d is rotated at high speed. The fibers guided into the spinning chamber 61c are converged on a wall surface of the spinning chamber 61c, twists are continuously applied to the fibers by the whirling airflow, and the yarn 17 is formed. The yarn 17 is guided out from the spinning chamber 61c through the yarn guide-out port 61e.

[0064] The yarn 17 produced by the rotor spinning device 61 is wound by the winding device 62, and the second package 18 is formed in the above manner. In FIG. 1, a position of the second package 18 is not illustrated, but the second package 18 is supported at an upper part of the open-end spinning unit 6. In FIG. 1, the second package 18 is supported near a position on an upper side of a block illustrating the winding device 62 indicated with a chain double dashed line.

[0065] As described above, a material of the yarn 17 is the excess fibers 13 generated in the respective spin-

ning unit 2 and the like, and thus the excess fibers 13 can be reused in one spinning machine 1. As opposed to the air-jet spinning unit 2 in which a fiber length of a certain extent is required for the fiber bundle 11, the yarn 17 can be produced without any problem in the open-end spinning unit 6 even if the excess fibers 13 contain fibers of short fiber length. Therefore, efficiency of reuse of the excess fibers 13 can be enhanced.

[0066] As illustrated in FIG. 1, the spinning machine 1 of the present embodiment has a configuration in which the first package 16 is arranged at a lower part of the spinning unit 2 and the second package 18 is arranged at an upper part of the open-end spinning unit 6.

[0067] However, the present invention is not limited to this configuration, and for example, as in a spinning unit 2z illustrated in FIG. 5, the spinning unit may have a configuration in which the first package 16 is supported at an upper part of the spinning unit 2z. In this case, the heights at which the packages are supported can be made to substantially coincide between the spinning unit 2z and the open-end spinning unit 6. Furthermore, all of yarn paths of the spinning unit 2z and the open-end spinning unit 6 may be directed from bottom to top, and heights from which the sliver 12 and the excess fiber bundle 15 are supplied can be substantially unified. As a result, a more rational configuration of the spinning machine 1 can be realized. For example, by arranging, at an upper part of the spinning machine 1, a doffing cart and a guiding rail adapted to guide the doffing cart so as to be able to travel, service can be provided to both the spinning unit 2z and the open-end spinning unit 6 with one doffing cart. The doffing cart is a cart including a discharging device for discharging the fully wound package and/or a bobbin supplying device for supplying a new bobbin.

[0068] As opposed to this, the second package 18 may be arranged at the lower part in the open-end spinning unit 6, so that directions of the yarn paths can be made to coincide between the spinning unit 2 and the open-end spinning unit 6. In this case as well, by arranging, at the lower part of the spinning machine 1, the doffing cart and the guiding rail adapted to guide the doffing cart so as to be able to travel, the service can be provided to both the spinning unit 2 and the open-end spinning unit 6 with one doffing cart.

[0069] The spinning unit 2 is not limited to the air-jet spinning unit as described above, and may be configured as the open-end spinning unit (main open-end spinning unit) having the same configuration as the open-end spinning unit 6. In this case as well, the excess fibers 13 can be reused.

[0070] As described above, the spinning machine 1 of the present embodiment includes the spinning unit 2, the blower box 5, and the open-end spinning unit 6. The spinning unit 2 winds the spun yarn 10 into the first package 16. The blower box 5 collects the excess fibers generated in the spinning unit 2. The open-end spinning unit 6 forms the yarn 17 using the excess fibers 13 collected by the

blower box 5, and winds the yarn 17 into the second package 18.

[0071] Thus, the excess fibers 13 generated in the spinning unit 2 can be reused by the open-end spinning unit 6. Furthermore, since the spinning is carried out after the fibers are opened and the short fiber groups are formed, the open-end spinning unit 6 can form the yarn 17 from the excess fibers 13 of various modes such as fly waste and yarn waste.

[0072] In the spinning machine 1 of the present embodiment, the spinning unit 2 is configured as an air-jet spinning unit including the draft device 21 and the air-jet spinning device 22, and is adapted to form the spun yarn 10 by applying twists to fiber bundle 11 by air-jet and to wind the spun yarn 10 into the first package 16.

[0073] Thus, the excess fibers 13 generated in the air-jet spinning unit can be efficiently reused in the open-end spinning unit 6.

[0074] In place of the spinning unit 2, which is the air-jet spinning unit, the winding unit may be configured to separate the fibers, converge and twist the separated fibers to form the spun yarn 10, and wind the spun yarn 10 into the first package 16.

[0075] In this case, the excess fibers 13 generated in the main open-end spinning unit can be efficiently reused in the other open-end spinning unit 6.

[0076] In the spinning machine 1 of the present embodiment, the open-end spinning unit 6 includes the rotor spinning device 61 adapted to spin the fibers to form the yarn 17.

[0077] Thus, even the short excess fibers 13 can be efficiently reused.

[0078] The spinning machine 1 of the present embodiment further includes the fiber bundle forming device 7 adapted to receive the excess fibers 13 from the blower box 5, and to form the excess fiber bundle 15 from the excess fibers 13. The fiber bundle forming device 7 includes the converging section 71, the receiving roller 72, and the drawing roller 73. The converging section 71 is adapted to converge the excess fibers 13. The receiving roller 72 is adapted to receive the converged fibers converged by the converging section 71. The drawing roller 73 is adapted to draw the converged fibers from the receiving roller 72 to form the excess fiber bundle 15.

[0079] Thus, the excess fiber bundle 15 can be prepared by the fiber bundle forming device 7 such that the excess fibers 13 can be smoothly spun by the open-end spinning unit 6.

[0080] In the spinning machine 1 of the present embodiment, a plurality of the spinning units 2 are arranged side by side. The open-end spinning unit 6 and the blower box 5 are arranged adjacent to each other. The open-end spinning unit 6 is arranged adjacent to the spinning unit 2 (end-position winding unit) located at the end of the region where the plurality of spinning units 2 are arranged side by side.

[0081] Thus, the open-end spinning unit 6 can be arranged at a rational position in relation with the spinning

unit 2 and the blower box 5, and the excess fibers 13 can be more efficiently reused.

[0082] In the spinning machine 1 of the present embodiment, the fiber bundle forming device 7 is arranged to automatically supply the excess fiber bundle 15 to the open-end spinning unit 6.

[0083] Thus, the open-end spinning unit 6 can more efficiently spin the excess fibers 13 to form the yarn 17.

[0084] When the spinning unit 2z having the configuration illustrated in FIG. 5 is adopted, the first package 16 is supported at the upper part of the spinning unit 2z. The second package 18 is supported at the upper part of the open-end spinning unit 6.

[0085] Thus, the heights of the packages to be supported can be made to substantially coincide between the spinning unit 2z and the open-end spinning unit 6, and the spinning machine 1 can be more rationally configured.

[0086] Next, a description will be made on an automatic winder 1x according to a second embodiment with reference to FIG. 6. In the description of the present embodiment, same reference numerals are denoted in the drawing for the members same as or similar to those in the above-described embodiment, and the description thereof will be omitted.

[0087] The automatic winder (the yarn winding machine) 1x illustrated in FIG. 6 includes winder units (automatic winder units) 2x arranged side by side. Each of the winder units 2x can unwind and wind the spun yarn 10 from a supplied yarn supplying bobbin 19 to form a first package 16x.

[0088] In the automatic winder 1x, the fiber waste and the like generated in the winder unit 2x are collected by the blower box 5 (the storage box 51) from the suction duct 54. The excess fibers 13 collected by the blower box 5 are converged by the fiber bundle forming device 7, and then spun by the open-end spinning unit 6. The produced yarn 17 is wound into the second package 18.

[0089] In the automatic winder 1x of the present embodiment, the open-end spinning unit 6 and the blower box 5 are arranged adjacent to each other. The blower box 5 is arranged adjacent to the winder unit 2x (end-position winding unit) located at the end of the region where the plurality of winder units 2x are arranged side by side. Thus, a positional relationship between the blower box 5 and the open-end spinning unit 6 is opposite from that in the first embodiment. However, the positional relationship between the blower box 5 and the open-end spinning unit 6 may be the same as that in the first embodiment. Also, the first embodiment may adopt the positional relationship between the blower box 5 and the open-end spinning unit 6 similar to that in the second embodiment.

[0090] As described above, the automatic winder 1x of the present embodiment includes the winder unit 2x adapted to unwind the spun yarn 10 from the yarn supplying bobbin 19 and wind the spun yarn 10 into the first package 16x.

[0091] Thus, the excess fibers 13 generated in the winder unit 2x can be efficiently reused in the open-end spinning unit 6.

[0092] Preferred embodiments and alternative embodiments of the present invention have been described above, but the above-described configurations may be modified as below.

[0093] In the above-described embodiments, only one open-end spinning unit 6 is arranged. However, for example, if the number of spinning units 2 or winder units 2x is large, two or more open-end spinning units 6 may be provided. In this case, the open-end spinning units 6 may be arranged on both sides of the blower box 5.

[0094] In the above-described embodiments, the excess fiber bundle 15 converged by the fiber bundle forming device 7 is directly supplied to the open-end spinning unit 6. However, the present invention is not limited thereto, and the excess fiber bundle 15 converged by the fiber bundle forming device 7 may be once collected in an appropriate container (e.g., can) by an operator, and the collected excess fiber bundle 15 may be supplied to the open-end spinning unit 6. In this case, the open-end spinning unit 6 may carry out the spinning with only the excess fiber bundle 15 collected in the can. If an amount of the excess fiber bundle 15 is small, the spinning may be carried out by supplying a sliver from a drawing frame to the open-end spinning unit 6, or the spinning may be carried out by supplying the excess fiber bundle 15 to the open-end spinning unit 6 at a time point at which the amount of excess fiber bundle 15 reaches a certain extent.

[0095] The configuration of the fiber bundle forming device 7 is not limited to that described in the above-described embodiment. For example, the number of drawing rollers 73 is not limited to one pair, and may be two or more pairs.

[0096] In the automatic winder 1x, the yarn supplying bobbin 19 may be supplied to each of the winder units 2x by the magazine type supplying device or may be supplied by the bobbin supplying mechanism using a conveying tray.

[0097] The configuration of traversing the spun yarn 10 when forming the first package 16 is not limited to using the traverse guide 29 of FIG. 1. For example, the arm type traverse device or the belt type traverse device may be individually provided in each of the spinning units 2. Furthermore, a traverse groove may be formed on a surface of the winding drum which causes the first package 16 to rotate accompanying rotation of the winding drum, and the spun yarn 10 may be traversed with such a traverse groove.

[0098] The fiber bundle forming device 7 used in the spinning machine 1 and/or the automatic winder 1x includes the guiding member 70 having the first opened portion 70a, through which the excess fibers 13 are guided in, and the second opened portion 70b smaller than the first opened portion 70a; the converging section 71 adapted to converge the excess fibers 13 guided out from the second opened portion 70b; the receiving roller 72

adapted to receive the excess fibers 13 converged by the converging section 71; the drawing roller 73 adapted to draw the excess fibers 13 from the receiving roller 72 to form the excess fiber bundle 15, and to convey the excess fiber bundle 15 to downstream; and a supporting section (not illustrated). The supporting section is adapted to support the guiding member 70, the converging section 71, the receiving roller 72, and the drawing roller 73 as a module. For example, the supporting section is a frame member, and the guiding member 70, the converging section 71, the receiving roller 72, and the drawing roller 73 are attached to the frame member. Thus, the fiber bundle forming device 7 can be easily attached/detached as a module with respect to the spinning machine 1 and/or the automatic winder 1x.

[0099] In the above-described embodiments, one collecting section is provided with respect to the spinning machine 1 and the automatic winder 1x. However, a plurality of collecting sections may be arranged in accordance with the number of spinning units 2 in the spinning machine 1 and/or the number of winder units 2x in the automatic winder 1x. Specifically, for example, one collecting section may be provided for every predetermined number of spinning units 2, and at least one open-end spinning unit 6 may be provided with respect to one collecting section.

Claims

1. A yarn winding machine (1; 1x) comprising:

a winding unit (2; 2z; 2x) adapted to wind a first yarn (10) into a first package (16; 16x);
a collecting section (5) adapted to collect excess fibers (13) generated in the winding unit (2; 2z; 2x); and
an open-end spinning unit (6) adapted to form a second yarn (17) using the excess fibers (13) collected by the collecting section (5) and to wind the second yarn (17) into a second package (18).

2. The yarn winding machine (1) according to claim 1, wherein the winding unit (2; 2z) is an air-jet spinning unit (2; 2z) including a draft device (21) and an air-jet spinning device (22), and the air-jet spinning unit (2; 2z) is adapted to form the first yarn (10) by applying twists to fibers (11) by air-jet and to wind the first yarn (10) into the first package (16).

3. The yarn winding machine (1x) according to claim 1, wherein the winding unit (2x) is an automatic winder unit (2x) adapted to unwind the first yarn (10) from a yarn supplying bobbin (19) and to wind the first yarn (10) into the first package (16x).

4. The yarn winding machine (1) according to claim 1,

wherein the winding unit (2) is configured to separate fibers, to form the first yarn (10) by converging and twisting the separated fibers, and to wind the first yarn (10) into the first package (16).

5. The yarn winding machine (1; 1x) according to any one of claim 1 through claim 4, wherein the open-end spinning unit (6) includes a rotor spinning device (61) adapted to form the second yarn (17) by spinning fibers (15).

6. The yarn winding machine (1; 1x) according to any one of claim 1 through claim 5, further comprising a fiber bundle forming device (7) adapted to receive the excess fibers (13) from the collecting section (5) and to form an excess fiber bundle (15) from the excess fibers (13), wherein the fiber bundle forming device (7) includes a converging section (71) adapted to converge the excess fibers (13), a receiving section (72) adapted to receive converged fibers (14a) converged by the converging section (71); and a drawing section (73) adapted to draw the converged fibers (14a) from the receiving section (72) to form the excess fiber bundle (15).

7. The yarn winding machine (1; 1x) according to claim 6, wherein the fiber bundle forming device (7) is arranged to automatically supply the excess fiber bundle (15) to the open-end spinning unit (6).

8. The yarn winding machine (1; 1x) according to any one of claim 1 through claim 7, wherein the winding unit (2; 2z; 2x) is arranged in a plurality, the open-end spinning unit (6) is arranged adjacent to the collecting section (5), and one of the open-end spinning unit (6) and the collecting section (5) is arranged adjacent to an end-position winding unit (2; 2z; 2x), the end-position winding unit (2; 2z; 2x) being one of the plurality of the winding units (2; 2z; 2x) and located at a most end position where the winding units (2; 2z; 2x) are arranged side by side.

9. The yarn winding machine (1; 1x) according to any one of claim 1 through claim 8, wherein the winding unit (2z; 2x) is configured to support the first package (16) at an upper part thereof, and the open-end spinning unit (6) is configured to support the second package (18) at an upper part thereof.

10. A fiber bundle forming device (7) for use in a yarn winding machine (1; 1x), the fiber bundle forming device (7) comprising:

a guiding member (70) including a first opened portion (70a) through which excess fibers (13) are guided in, and a second opened portion

(70b) smaller than the first opened portion (70a);
a converging section (71) adapted to converge
the excess fibers (13) guided out from the second
opened portion (70b);
a receiving section (72) adapted to receive con- 5
verged fibers (14a) converged by the converging
section (71);
a drawing section (73) adapted to draw the con-
verged fibers (14a) from the receiving section
(72) to form the excess fiber bundle (15), and to 10
convey the excess fiber bundle (15) to down-
stream; and
a supporting section adapted to support the
guiding member (70), the converging section
(71), the receiving section (72) and the drawing 15
section (73) as a module.

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FIG. 1

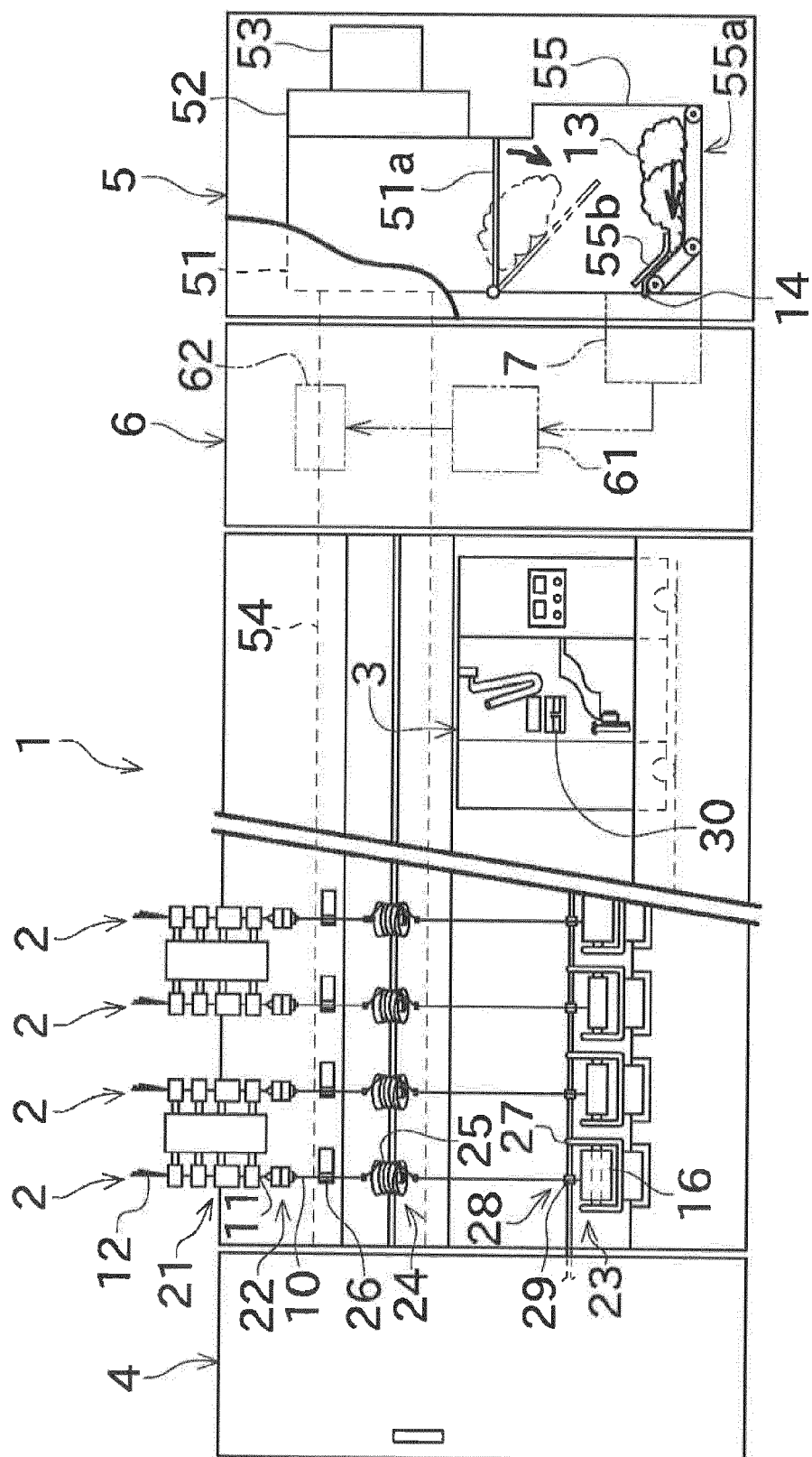


FIG. 2

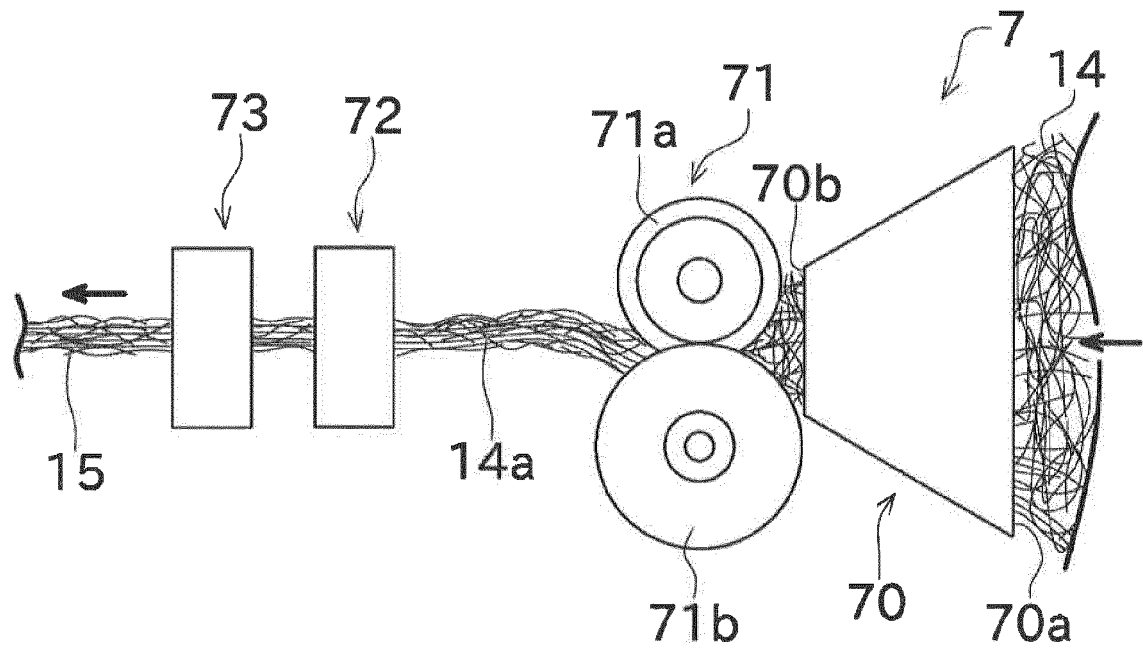


FIG. 3

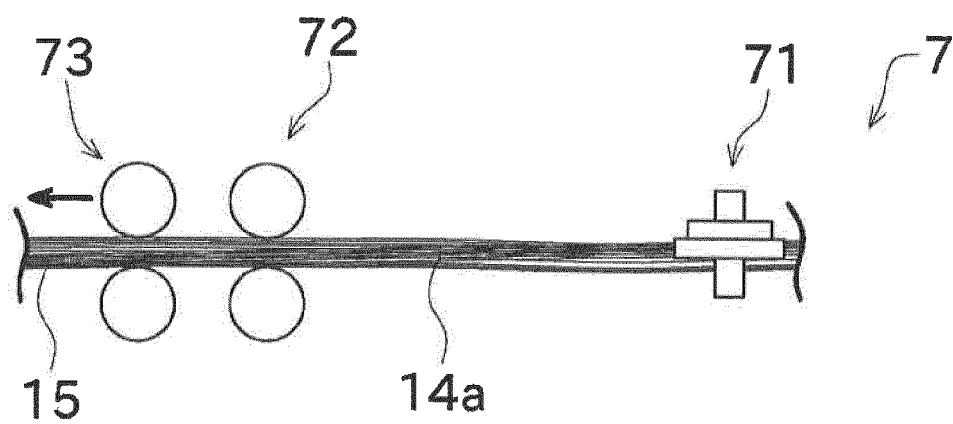


FIG. 4

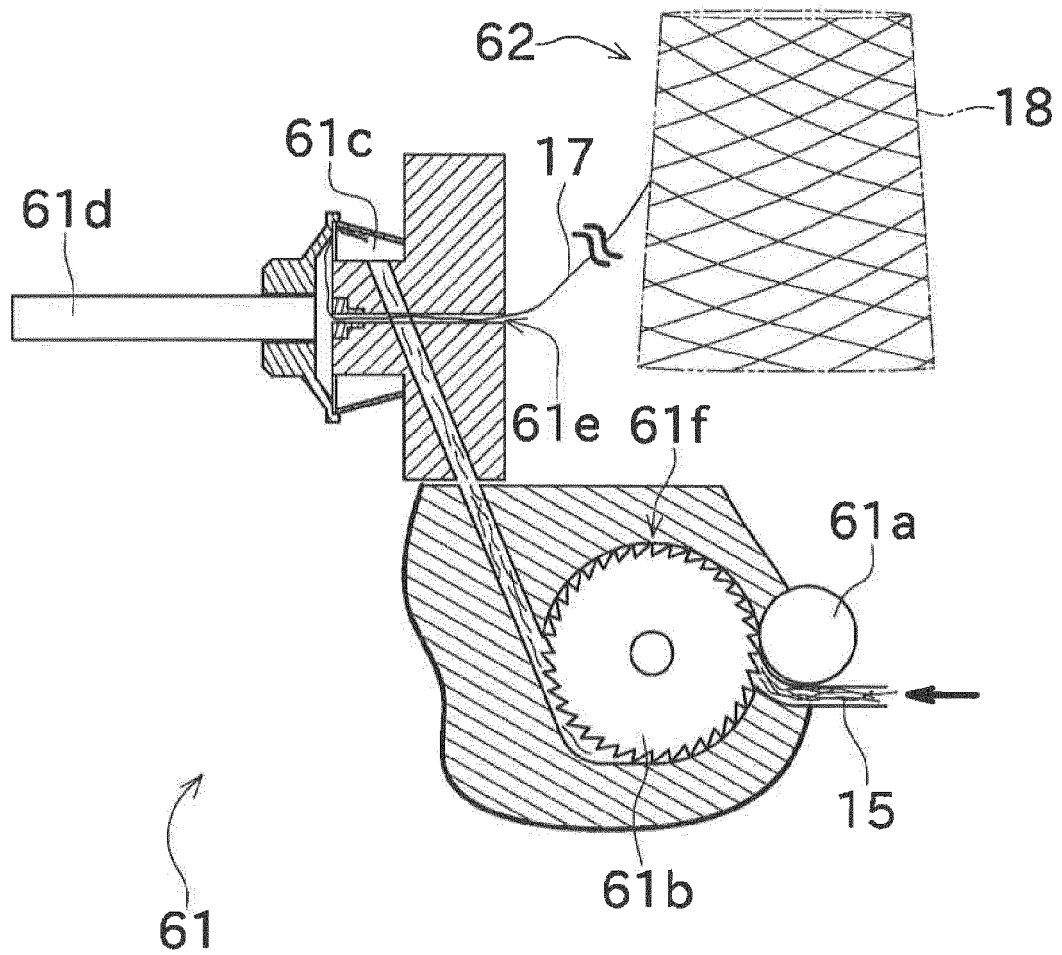


FIG. 5

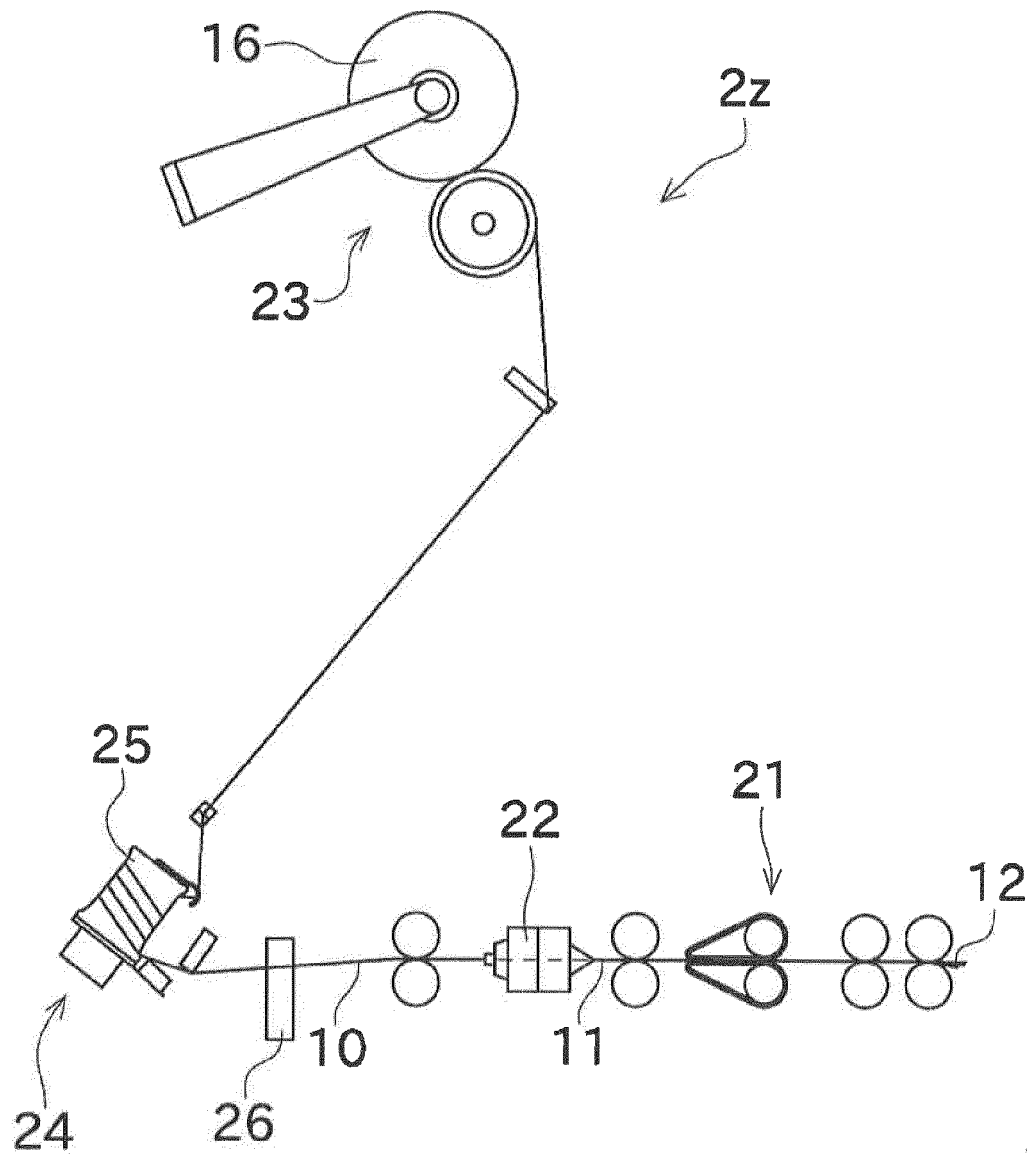
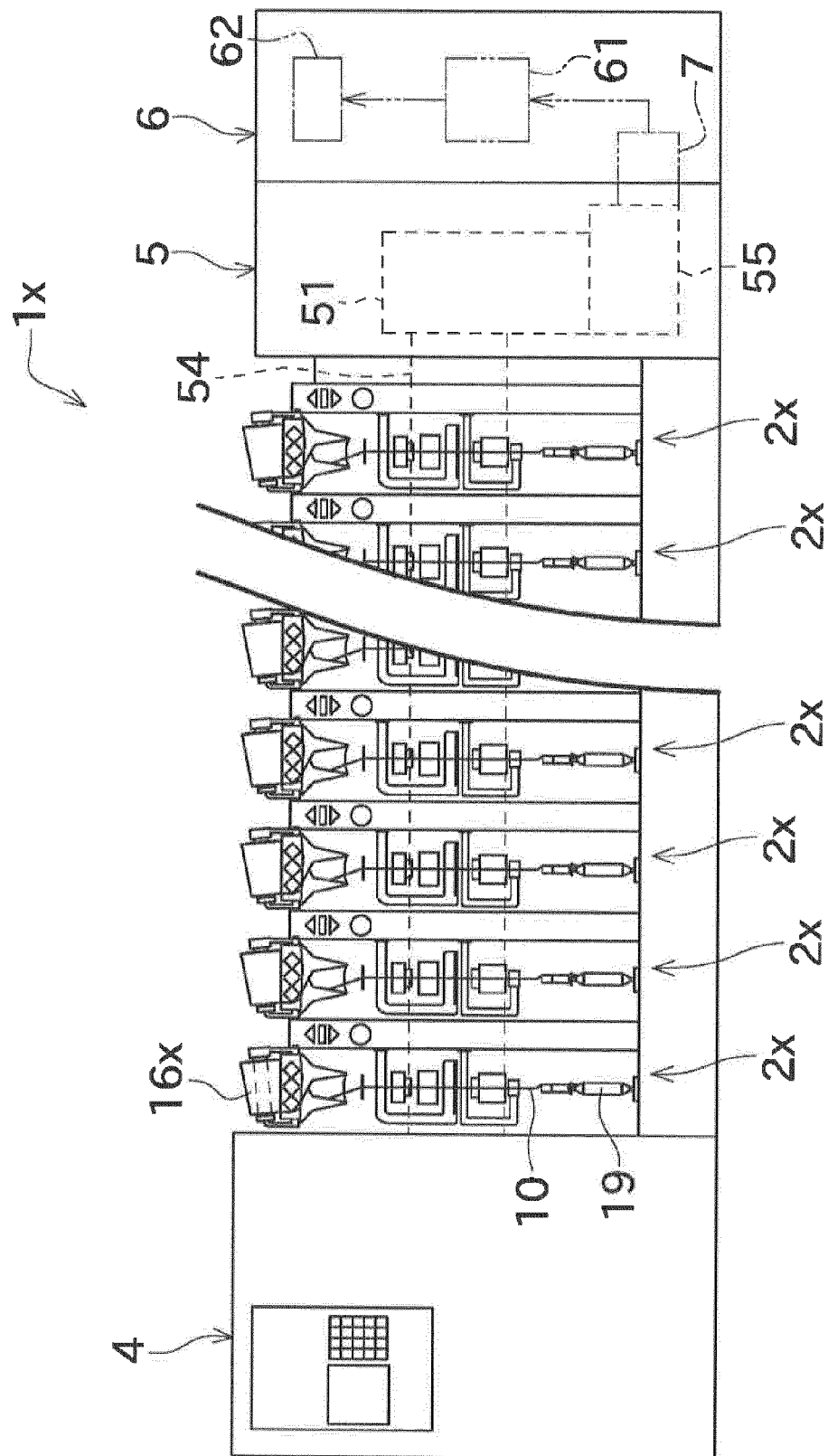


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H04110766 U [0002] [0003] [0004]