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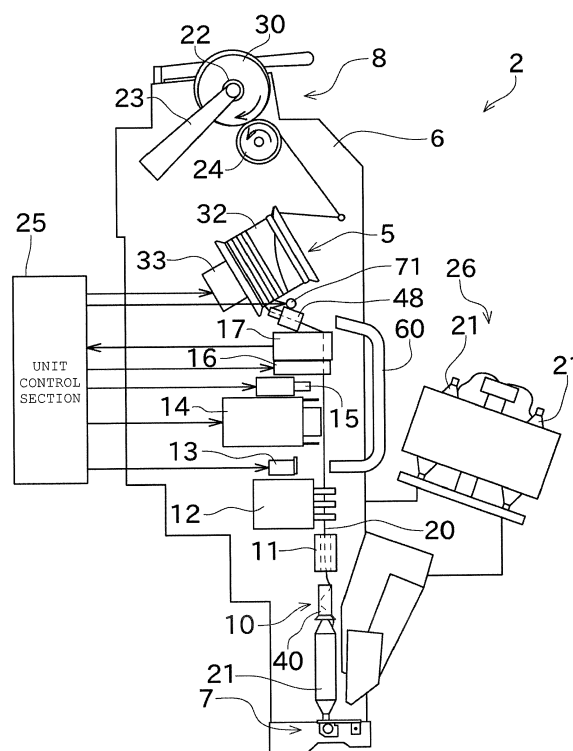
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(54) **TEXTILE MACHINE**

(57) A textile machine (automatic winder) includes a plurality of winding units (2). Each of the winding units (2) includes a unit frame (6), and an LED lamp (71) is attached to the unit frame (6). For example, when a defect occurs in a yarn storage device (5) or the like, that is, when work of an operator is required, the LED lamp (71) illuminates the yarn storage device (5) to improve workability of the work for the operator.

FIG. 2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a textile machine. Specifically, the present invention relates to a configuration for improving workability for an operator in a textile machine.

2. Description of the Related Art

[0002] In a textile machine such as an automatic winder, a spinning machine, and the like, there has been conventionally proposed various types of configurations for notifying, upon occurrence of a defect, the operator of the occurrence of the defect and the area where the defect occurred. Japanese Unexamined Patent Publication No. 2-243475 discloses an automatic winder including this type of configuration.

[0003] The automatic winder of Japanese Unexamined Patent Publication No. 2-243475 includes a plurality of winding units arranged side by side, and a yarn length counter adapted to store a length and the like of a yarn wound by the plurality of winding units. A green lamp is attached to a front side of each winding unit. A warning lamp is attached to an upper part of the yarn length counter. When a defect occurs in any of the winding units, the automatic winder lights the warning lamp and also lights the green lamp of the relevant winding unit. The operator can thus immediately understand the occurrence of defect and the area where the defect occurred.

[0004] The textile machine such as the automatic winder is provided with a plurality of yarn processing devices adapted to perform processes associated with a yarn. Therefore, a portion being shaded by the yarn processing device and the like and thus has poor visibility exists in proximity to a yarn path. Furthermore, when a defect such as entangling of the yarn occurs, the operator needs to manually remove the defect. Thus, when a defect occurs at a portion shaded by other yarn processing devices and the like, the work of specifying the defect and the work of removing the defect become difficult.

[0005] In Japanese Unexamined Patent Publication No. 2-243475, the warning lamp is for indicating the presence and absence of occurrence of a defect, and does not illuminate the area that requires the work of the operator. Furthermore, the green lamp is arranged on the front side of the winding unit so that the operator can easily check the occurrence of the defect, and does not illuminate the area that requires the work of the operator.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention has been made in view of the above circumstances, and a main object thereof is to provide a textile machine in which visibility of an area

that requires work of an operator is improved.

[0007] The problem to be solved by the present invention is as described above, and the means for solving the problem and the effect thereof will be described next.

[0008] According to one aspect of the present invention, there is provided a textile machine including a plurality of units, wherein the textile machine includes an illuminating section adapted to illuminate an area that requires work of an operator from an outer side to brighten the area, and the illuminating section is provided for each of the units.

[0009] Thus, the area that requires the work of the operator can be illuminated with the illuminating section to improve the visibility, whereby the workability of the work for checking the defect, the work for removing the defect, or the like, for example, can be improved. Furthermore, the illuminating section is not required to be moved from one unit to another unit. Moreover, the relevant area can be illuminated simultaneously with the plurality of units.

[0010] The above-described textile machine preferably has the following configuration. Specifically, each of the units includes a unit frame arranged on a boundary between the adjacent units and adapted to support a plurality of yarn processing devices which carry out processes associated with a yarn. The illuminating section illuminates a space between the adjacent unit frames.

[0011] Thus, a space surrounded by two adjacent unit frames is shaded by the unit frames and the yarn processing devices and thus becomes dark, and hence such a portion can be illuminated to improve the workability for the operator.

[0012] In the above-described textile machine, the illuminating section preferably illuminates a lower side of the winding section.

[0013] Since the package is generally large, the space on the lower side of the package is likely to be shaded easily, and thus such a portion can be illuminated to improve the workability for the operator.

[0014] In the above-described textile machine, the illuminating section is preferably provided such that illumination light is directed toward the area that requires the work of the operator or such that the illumination light is guided to the area.

[0015] Thus, the area that requires the work of the operator can be accurately illuminated, and hence the workability of the work by the operator can be further improved.

[0016] In the above-described textile machine, the illuminating section is preferably arranged such that the illumination light is radiated toward the area that requires the work from a side on which the operator stops to carry out the work.

[0017] Thus, the portion seen from the operator of the area that requires the work of the operator becomes particularly bright, and hence the workability for the operator can be further improved.

[0018] In the above-described textile machine, the illuminating section preferably illuminates the area that

requires the work of the operator due to occurrence of a defect, to brighten the area.

[0019] Thus, the workability of the work for checking the defect, the work for removing the defect, or the like can be improved by illuminating the area where the defect occurred.

[0020] The above-described textile machine preferably has the following configuration. Specifically, the textile machine includes a defect detecting section adapted to detect occurrence of a defect. The illuminating section starts to be lighted when the defect detecting section detects the defect.

[0021] Thus, the occurrence of the defect can be notified to the operator. Since the lighting time can be reduced compared to the configuration in which the illuminating section is always lighted, the lifespan of the illuminating section can be extended.

[0022] In the above-described textile machine, a lighting color of the illuminating section is changeable, the lighting color preferably being changed according to detection content of the defect detecting section.

[0023] Thus, not only the presence and absence of occurrence of defect, but also the state of the defect, and the like can be notified to the operator.

[0024] The above-described textile machine preferably has the following configuration. Specifically, the textile machine includes a winding section and a yarn storage device. The winding section is adapted to wind the yarn to form a package. The yarn storage device is adapted to temporarily store the yarn to be wound by the winding section. The illuminating section is adapted to illuminate the portion where the yarn is stored in the yarn storage device.

[0025] The yarn is likely to get entangled easily since the yarn is stored on the yarn storage device, and such a portion can be illuminated, for example, to greatly improve the workability of the operator.

[0026] The above-described textile machine preferably has the following configuration. Specifically, the yarn storage device includes the yarn storage roller adapted to wind the yarn around an outer peripheral surface thereof by rotating to store the yarn. The illuminating section illuminates a surface of the yarn storage roller.

[0027] Thus, the surface of the yarn storage roller is illuminated to improve the visibility, whereby the operator can carry out the work without damaging the surface of the yarn storage roller. Therefore, the occurrence of storage failure of the yarn which occurs when the surface of the yarn storage roller is damaged can be prevented.

[0028] In the above-described textile machine, the rotation axis of the yarn storage roller is preferably inclined with respect to a vertical direction, and the illuminating section preferably illuminates the surface on the lower side of the yarn storage roller.

[0029] Thus, the lower side of the yarn storage roller is shaded by the yarn storage roller itself, and such a portion can be illuminated to improve the workability of the work of detaching the yarn attached to the yarn stor-

age roller, and the like.

[0030] The above-described textile machine preferably has the following configuration. Specifically, the textile machine includes a yarn supplying section and a pull-out section. The yarn supplying section is adapted to supply a yarn. The pull-out section is arranged in proximity to the portion for winding the yarn from the yarn supplying section in the yarn storage roller, and is adapted to suck and pull out the yarn wound around the yarn storage roller. The illuminating section illuminates a vicinity of the pull-out section.

[0031] When the pull-out section cannot catch the upstream yarn of the yarn storage roller, the operator needs to manually process the yarn end located in proximity to the pull-out section (proximity to the upstream end of the yarn storage roller). Thus, the work carried out by the operator can be smoothly carried out by illuminating the relevant portion.

[0032] In the above-described textile machine, the lighting color of the illuminating section is preferably white.

[0033] Thus, the area that requires the work of the operator can be illuminated brightly.

[0034] In the above-described textile machine, the illuminating section is preferably an LED.

[0035] Since the LED has small heat generation amount and small power consumption, the running cost can be reduced. Furthermore, the lifespan of the illuminating section can be extended.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

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

FIG. 2 is a schematic side view of a winding unit during winding of a yarn;

FIG. 3 is a schematic side view of the winding unit illustrating a state where a yarn blown up by a lower yarn blow-up section is caught by a yarn trap and a yarn blown away by an upper yarn pull-out section is caught by an upper yarn catching section;

FIG. 4 is a schematic side view of the winding unit illustrating a state where a lower yarn and an upper yarn are guided to a yarn joining device;

FIG. 5 is a flowchart illustrating a process carried out when carrying out a yarn joining operation; and

FIG. 6 is a schematic side view of a spinning unit arranged in a spinning machine according to a second embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0037] A first embodiment of the present invention will be hereinafter described with reference to the drawings. FIG. 1 is a schematic front view of an automatic winder

1 according to the first embodiment.

[0038] The automatic winder (textile machine) 1 illustrated in FIG. 1 includes a plurality of winding units (units) 2 arranged side by side, a machine control device 3, a doffing device 4, and a blower box (not illustrated) as main components.

[0039] The winding unit 2 includes a yarn supplying section 7, a yarn storage device 5, and a winding section 8 as main components. The winding unit 2 is configured to unwind a yarn 20 of a yarn supplying bobbin 21 supplied to the yarn supplying section 7, and temporarily store the unwound yarn 20 in the yarn storage device 5, and thereafter, wind the unwound yarn 20 around a winding bobbin 22 in the winding section 8 to form a package 30. The winding unit 2 also includes a unit frame 6 provided on one side (right side) in a left and right direction in front view. The unit frame 6 is arranged at a boundary between adjacent winding units 2 (i.e., arranged to divide the adjacent winding sections 8 and the like). The unit frame 6 supports a plurality of yarn processing devices (devices adapted to perform processes associated with the yarn 20) arranged in the winding unit 2, and includes therein a unit control section 25.

[0040] The machine control device 3 is configured as a microcomputer, and includes a display 65 and an input keyboard 66. The machine control device 3 is configured to communicate with each winding unit 2. The operator of the automatic winder 1 operates the input keyboard 66 to intensively manage the plurality of winding units 2.

[0041] When the package 30 is fully wound in the winding unit 2 (state where a prescribed amount of the yarn 20 is wound), the doffing device 4 travels to the position of the relevant winding unit 2, detaches the fully wound package 30, and sets an empty winding bobbin 22. The operation of the doffing device 4 is controlled by the machine control device 3.

[0042] Next, a description will be made on a configuration of the winding unit 2 with reference to FIG. 2. FIG. 2 is a schematic side view of the winding unit 2.

[0043] As described above, the winding unit 2 includes the yarn supplying section 7, the yarn storage device 5, and the winding section 8. "Upstream" and "downstream" respectively refer to upstream and downstream when seen in a travelling direction of the yarn 20 during the normal winding.

[0044] The yarn supplying section 7 can hold the yarn supplying bobbin 21 adapted to supply the yarn 20 in a substantially upright state, and unwind the yarn 20 from the yarn supplying bobbin 21 and supply the yarn 20. Furthermore, when all the yarn 20 is unwound from the set yarn supplying bobbin 21, the yarn supplying section 7 discharges the empty yarn supplying bobbin 21, and receives the supply of a new yarn supplying bobbin 21 from a magazine device 26 arranged on the front side of the winding unit 2. In FIG. 1, the illustration of the magazine device 26 is omitted to facilitate understanding of a yarn path from the yarn supplying section 7 to the winding section 8.

[0045] The yarn storage device 5 is arranged between the yarn supplying section 7 and the winding section 8 as illustrated in FIG. 2, and is configured to temporarily store the yarn 20 supplied from the yarn supplying section 7 and then supply the yarn 20 to the winding section 8. The yarn storage device 5 includes a yarn storage roller 32 and a roller drive motor 33. The yarn storage roller 32 is adapted to wind the yarn 20 therearound to store the yarn 20. The yarn storage roller 32 is arranged such that a (rotation) axis direction is inclined with respect to the vertical direction. The roller drive motor 33 is adapted to rotationally drive the yarn storage roller 32.

[0046] The roller drive motor 33 can rotate the yarn storage roller 32 in a direction of winding the yarn 20 from the yarn supplying section 7, and can also rotate the yarn storage roller 32 in the opposite direction. In the following description, with respect to the rotation of the yarn storage roller 32, the rotation in the direction of winding the yarn 20 from the yarn supplying section 7 is referred to as forward rotation and the rotation in the opposite direction is referred to as reverse rotation.

[0047] Furthermore, an LED lamp (illuminating section) 71 is arranged in proximity to the yarn storage roller 32. As illustrated in FIGS. 1 and 2, the LED lamp 71 is attached to the unit frame 6. The LED lamp 71 is arranged to illuminate the yarn storage device 5 (particularly, the yarn storage roller 32) from the outer side (so that a lens surface faces the yarn storage device 5). Moreover, as illustrated in FIG. 2, the LED lamp 71 is arranged on the lower side of the yarn storage roller 32 in side view (FIG. 2), and is configured to illuminate the upstream end of the yarn storage roller 32, that is, the lower side of the yarn storage roller 32 in the vertical direction. The arrangement of the LED lamp 71 is arbitrary, and may be arranged to overlap the yarn storage roller 32 in side view.

[0048] In the present embodiment, a structure of illuminating the yarn storage roller 32 from the left and right direction is adopted, but a structure of illuminating from the front and back direction may also be adopted. For example, the LED lamp 71 may be attached to a member or the like arranged in front of the yarn storage roller 32, and adapted to radiate illumination light toward the back side (toward the yarn storage roller 32). Since the front side of the yarn storage roller 32 is the side on which the operator stops to perform the work, the yarn storage roller 32 is illuminated from such a direction so that the portion seen from the operator becomes particularly bright, whereby the workability for the operator can be improved.

[0049] The LED lamp 71 is configured to include a plurality of light emitting elements, and can be lighted in at least white, blue, and red. The lighting on/off and the lighting color of the LED lamp 71 are controlled by the unit control section 25. The LED lamp 71 may be lighted only in a single color (e.g., only in white). The LED lamp 71 may illuminate a wide range with a diffusing lens.

[0050] The winding section 8 includes a cradle 23 configured to detachably attach the winding bobbin 22, and a traverse drum 24 adapted to traverse the yarn 20 and

to drive the winding bobbin 22.

[0051] The traverse drum 24 is arranged facing the winding bobbin 22, and when the traverse drum 24 is rotationally driven with an electric motor (not illustrated), the winding bobbin 22 is rotated accompanying the rotation of the traverse drum 24. The yarn 20 stored on the yarn storage device 5 can thus be unwound and pulled out, and wound around the winding bobbin 22. A traverse groove (not illustrated) is formed on an outer peripheral surface of the traverse drum 24, and the yarn 20 is traversed by the traverse groove at a predetermined width. According to such a configuration, the yarn 20 can be wound around the winding bobbin 22 while being traversed, and the package 30 having a predetermined shape can be formed to a predetermined length.

[0052] The winding unit 2 includes a plurality of yarn processing devices on a yarn path from the yarn supplying section 7, through the yarn storage device 5, to the winding section 8. Specifically, an unwinding assisting device 10, a lower yarn blow-up section 11, a tension applying section 12, an upper yarn catching section 13, a yarn joining device 14, a yarn trap 15, a cutter 16, a yarn monitoring device (defect detecting section) 17, and an upper yarn pull-out section (pull-out section) 48 are arranged on the yarn path in this order from the yarn supplying section 7 towards the yarn storage device 5. At least one of the yarn processing devices is supported by the unit frame 6 via a coupling member (not illustrated).

[0053] The unwinding assisting device 10 causes a movable member 40 to make contact with a balloon formed at an upper part of the yarn supplying bobbin 21 when the yarn 20 unwound from the yarn supplying bobbin 21 is swung around, and appropriately controls the size of the balloon to assist the unwinding of the yarn 20.

[0054] The lower yarn blow-up section 11 is an air sucker device arranged immediately downstream of the unwinding assisting device 10, and is configured to blow up the lower yarn from the yarn supplying bobbin 21 toward the yarn joining device 14 with compressed air. According to such a configuration, when the yarn 20 is disconnected between the yarn supplying bobbin 21 and the yarn storage device 5, the yarn 20 from the yarn supplying bobbin 21 is blown up by the lower yarn blow-up section 11 to guide the yarn 20 to the yarn trap 15.

[0055] The tension applying section 12 applies a predetermined tension on the travelling yarn 20. The tension applying section 12 of the present embodiment is a gate type tension applying device in which movable comb teeth are arranged with respect to fixed comb teeth, and is adapted to apply a predetermined resistance by causing the yarn 20 to travel (causing the yarn 20 to travel between the comb teeth) with the comb teeth brought into contact with the yarn 20. The comb teeth on the movable side are configured to be movable by a solenoid, for example, so that the meshed state of the comb teeth can be adjusted, whereby the tension to be applied to the yarn 20 can be adjusted. As a matter of course, the configuration of the tension applying section 12 is not limited

thereto, and for example, a disc-type tension applying device can be adopted.

[0056] The upper yarn catching section 13 is arranged immediately upstream of the yarn joining device 14. The upper yarn catching section 13 is connected to a negative pressure source (not illustrated), and generates a suction airflow at the time of the yarn joining operation to suck and catch the yarn 20 (upper yarn) from the yarn storage device 5 (the package 30).

[0057] The yarn joining device 14 joins the yarn 20 from the yarn supplying bobbin 21 and the yarn 20 from the yarn storage device 5 when the yarn 20 between the yarn supplying bobbin 21 and the yarn storage device 5 is disconnected, that is, when a yarn defect is detected by the yarn monitoring device 17 and the yarn 20 is cut with the cutter 16, when the yarn 20 being unwound from the yarn supplying bobbin 21 breaks, or when the yarn supplying bobbin 21 is under replacement. The yarn joining device 14 may be a type that uses fluid such as compressed air or a mechanical-type.

[0058] The yarn trap 15 is arranged upstream of the cutter 16 and immediately downstream of the yarn joining device 14. The yarn trap 15 is formed as a tubular member connected to the negative pressure source (not illustrated), and is arranged close to the yarn path. According to such a configuration, when the yarn 20 is disconnected between the yarn supplying bobbin 21 and the yarn storage device 5, the yarn 20 from the yarn supplying bobbin 21 blown up by the lower yarn blow-up section 11 can be sucked and caught by the yarn trap 15.

[0059] The yarn monitoring device 17 is configured to detect a yarn defect such as slub and mixture of foreign substance by monitoring the thickness of the yarn 20 and the like. When detecting the defect of the yarn, the yarn monitoring device 17 transmits a yarn defect detection signal to the control section 25, to be described later, adapted to control the winding unit 2. The cutter 16 for immediately cutting the yarn 20 in response to the yarn defect detection signal is arranged in proximity to the yarn monitoring device 17. The tension applying section 12 is not limited to being arranged as above, and may be arranged between the yarn trap 15 and the cutter 16.

[0060] The upper yarn pull-out section 48 is an air sucker device arranged immediately upstream of the yarn storage device 5, and is configured to blow down the upper yarn from the yarn storage device 5 toward the yarn joining device 14 with the compressed air. Specifically, a blowing port of the yarn 20 is formed in the upper yarn pull-out section 48, and a yarn guiding member 60, which is a curved tubular member, is provided in proximity to the blowing port. Openings are formed at both ends in a longitudinal direction of the yarn guiding member 60. The yarn guiding member 60 is arranged such that the opening on one end side faces the blowing port of the upper yarn pull-out section 48 and the opening on the other end side faces the upper yarn catching section 13. A guiding path that connects the openings on both ends so as to circumvent the yarn joining device 14 and the

like is formed inside the yarn guiding member 60.

[0061] Now, with reference to FIGS. 3 to 5, a description will be made on the control carried out by the unit control section 25 when carrying out the yarn joining operation.

[0062] When the yarn 20 is disconnected between the yarn supplying bobbin 21 and the yarn storage device 5 and the yarn joining operation is to be carried out, the unit control section 25 first blows up the yarn 20 from the yarn supplying bobbin 21 with the lower yarn blow-up section 11 (S101 of FIG. 5). The blown up yarn 20 is sucked and caught by the yarn trap 15 (see FIG. 3). The yarn 20 from the yarn supplying bobbin 21 thus can be guided to the yarn joining device 14.

[0063] The yarn end of the yarn 20 from the yarn storage device 5 formed by yarn breakage, yarn cut, and the like is wound by the yarn storage roller 32. Thus, the unit control section 25 reversely rotates the yarn storage roller 32 while generating a suction flow in the upper yarn pull-out section 48 (S102). The yarn end of the yarn 20 located on the surface of the yarn storage roller 32 is thereby sucked and caught by the upper yarn pull-out section 48.

[0064] The upper yarn pull-out section 48 blows away the sucked and caught yarn 20 toward the yarn guiding member 60 (S103). The yarn 20 is fed along the yarn guiding member 60, and sucked and caught by the upper yarn catching section 13 (see FIG. 3). A slit (not illustrated) is formed along the longitudinal direction in the yarn guiding member 60, and the upper yarn catching section 13 can continue to suck the yarn 20 to take out the yarn 20 from the slit. The yarn 20 from the yarn storage device 5 thus can be guided to the yarn joining device 14 (see FIG. 4).

[0065] In this case, the yarn 20 is located in a detection region of the yarn monitoring device 17. The unit control section 25 determines whether or not the yarn monitoring device 17 detected the presence of the yarn 20 (S104). When the yarn joining device 14 detected the presence of the yarn 20, the unit control section 25 determines that the pull-out of the yarn 20 (upper yarn) is successful. In this case, the unit control section 25 operates the yarn joining device 14, and carries out the yarn joining operation on the yarn 20 (lower yarn) from the yarn supplying bobbin 21 and the yarn 20 (upper yarn) from the yarn storage device 5 (S105). When the yarn joining operation is completed, the unit control section 25 forwardly rotates the yarn storage device 5 to resume the winding of the yarn 20 to the yarn storage device 5 (S106).

[0066] When the yarn monitoring device 17 does not detect the presence of the yarn 20, the unit control section 25 determines that the pull-out of the yarn 20 (upper yarn) has failed. For example, when the yarn end portion of the yarn 20 is entangled in the yarn layer stored on the yarn storage roller 32, the pull-out of the yarn 20 may fail. In this case, the operator needs to manually detach the yarn 20 from the yarn storage roller 32 or remove the entangling of the yarn 20 (work by the operator is required).

[0067] However, light of a ceiling illumination provided in a factory and the like where the automatic winder 1 is installed hardly reaches the lower part (work area) on the upstream of the yarn storage roller 32. Specifically, the work area is located on the lower side of the winding section 8, and since the package 30 is relatively large, in particular, the work area is likely to be shaded. Since the axial direction of the yarn storage roller 32 is inclined with respect to the vertical direction, the lower side is likely to be easily shaded compared to the upper side. Furthermore, the unit frame 6 is arranged on the left and the right of the work area, and various yarn processing devices as well as attachment members for attaching the yarn processing devices to the unit frame 6 are arranged on the unit frame 6. Therefore, the work area is likely to be easily shaded also in this respect. Therefore, visibility of the work area is poor, and hence it is difficult to carry out the work by the operator of manually searching for the yarn end portion of the yarn 20 from the yarn storage roller 32 and carrying out the process on the yarn so that the yarn can be easily pulled out.

[0068] In view of the above, when the yarn monitoring device 17 does not detect the presence of the yarn 20, the unit control section 25 lights the LED lamp 71 (S107).

Thus, the work area becomes brighter, and the workability of the work by the operator can be improved. Alternatively, the operator does not need to hold the illumination by hand, which also improves the workability. In the present embodiment, the LED lamp 71 is lighted in white, placing significance on brightness.

[0069] In the description made above, the LED lamp 71 is lighted when the yarn monitoring device 17 does not detect the presence of the yarn 20. In place of such a configuration, even when the yarn monitoring device 17 does not detect the presence of the yarn 20, the pull out of the upper yarn may be further carried out once or a plurality of times, and the LED lamp 71 may be lighted if the upper yarn still cannot be pulled out.

[0070] As described above, the automatic winder 1 of the present embodiment includes the LED lamp 71 adapted to illuminate the area, which requires the work of the operator due to the occurrence of a defect, from the outer side to brighten the area. Furthermore, in the automatic winder 1 of the present embodiment, the LED lamp 71 is provided such that the illumination light is directed toward the area that requires the work of the operator.

[0071] Thus, the area that requires the work of the operator can be illuminated with the LED lamp 71 thus improving the visibility, whereby the workability of the work for checking the defect, the work for removing the defect, or the like can be improved.

[0072] The automatic winder 1 of the present embodiment further includes the yarn monitoring device 17 adapted to detect the occurrence of the defect. The LED lamp 71 starts to be lighted when the yarn monitoring device 17 detects the defect.

[0073] Thus, the occurrence of the defect can be noti-

fied to the operator. The lighting time can be reduced compared to the configuration where the LED lamp 71 is always lighted, so that the lifespan of the LED lamp 71 can be extended.

[0074] The automatic winder 1 of the present embodiment includes the plurality of winding units 2. The winding unit 2 includes the winding section 8 and the unit frame 6. The winding section 8 is adapted to wind the yarn 20 to form the package 30. The unit frame 6 is arranged at the boundary between the adjacent winding units 2, and is adapted to support a plurality of yarn processing devices that carry out processes associated with the yarn 20. The LED lamp 71 illuminates the lower side of the winding section 8, i.e., a space between the adjacent unit frames 6.

[0075] Thus, a space surrounded by the unit frame 6 and located on the lower side of the winding section 8 (package 30) becomes very dark, and such a portion can be illuminated to greatly improve the workability for the operator.

[0076] The automatic winder 1 of the present embodiment includes the yarn storage device 5. The yarn storage device 5 is adapted to temporarily store the yarn 20 to be wound by the winding section 8. The LED lamp 71 is adapted to illuminate the portion where the yarn 20 is stored in the yarn storage device 5.

[0077] Thus, the yarn 20 is likely to get entangled easily since the yarn 20 is stored on the yarn storage device 5, and such a portion can be illuminated, for example, to greatly improve the workability for the operator.

[0078] In the automatic winder 1 of the present embodiment, the yarn storage device 5 includes the yarn storage roller 32 adapted to wind the yarn 20 around the outer peripheral surface thereof by rotating to store the yarn 20. The LED lamp 71 illuminates the surface of the yarn storage roller 32.

[0079] Thus, the surface of the yarn storage roller 32 is illuminated to improve the visibility, whereby the operator can carry out the work of detaching the yarn 20 attached to the yarn storage roller 32, and the like without damaging the surface of the yarn storage roller 32. Therefore, the storage failure of the yarn 20 that occurs when the surface of the yarn storage roller 32 is damaged can be prevented.

[0080] In the automatic winder 1 of the present embodiment, the rotation axis of the yarn storage roller 32 is inclined with respect to the vertical direction, and the LED lamp 71 illuminates the surface on the lower side of the yarn storage roller 32.

[0081] Thus, the lower side of the yarn storage roller 32 is shaded by the yarn storage roller 32 itself, and such a portion can be illuminated to improve the workability of the work of detaching the yarn 20 attached to the yarn storage roller 32, and the like.

[0082] The automatic winder 1 of the present embodiment includes the yarn supplying section 7 adapted to supply the yarn 20, and the upper yarn pull-out section 48. The upper yarn pull-out section 48 is arranged in prox-

imity to the portion for winding the yarn 20 from the yarn supplying section 7 in the yarn storage roller 32, and is adapted to suck and pull out the yarn 20 wound around the yarn storage roller 32. The LED lamp 71 is adapted to illuminate the vicinity of the upper yarn pull-out section 48.

[0083] When the upper yarn pull-out section 48 cannot catch the yarn 20 on the upstream of the yarn storage roller 32, the operator needs to manually detach the yarn 20 in proximity to the upper yarn pull-out section 48 (in proximity to the upstream end of the yarn storage roller 32) from the yarn storage roller 32. Thus, the work by the operator can be smoothly carried out by illuminating the relevant portion.

[0084] Next, a description will be made on a second embodiment with reference to FIG. 6. FIG. 6 is a schematic side view of a spinning unit (unit) 81 arranged in a spinning machine (textile machine) 80 according to the second embodiment.

[0085] The spinning machine 80 is configured by arranging the plurality of spinning units 81 illustrated in FIG. 6 side by side. Each of the spinning units 81 includes a plurality of devices (yarn processing devices) adapted to carry out processes related to a spun yarn 85. Specifically, the spinning unit 81 includes a draft device 83, a pneumatic spinning device 84, a yarn storage device 86, and a winding device 89 arranged in this order from upstream to downstream.

[0086] The draft device 83 is provided in proximity to the upper end of a housing 87 of the spinning machine 80. The draft device 83 drafts a sliver 82 supplied from a sliver case (not illustrated) to a predetermined thickness. The sliver 82 drafted by the draft device 83 is supplied to the pneumatic spinning device 84. The pneumatic spinning device 84 applies twists to the sliver 82 using the whirling airflow to produce the spun yarn 85.

[0087] The yarn storage device 86 is adapted to wind the spun yarn 85 around the outer peripheral surface thereof to store the spun yarn 85. The yarn storage device 86 is supported by the housing 87, and an LED lamp 88 is attached to the housing 87. The LED lamp 88 is configured so as to be lighted when a defect occurs in the yarn storage device 86.

[0088] The winding device 89 includes a cradle 91, a winding drum 92, and a traverse device 93. The cradle 91 holds a package 90. The winding drum 92 is rotated while making contact with the package 90, thus rotating the package 90 and winding the spun yarn 85. The traverse device 93 traverses the spun yarn 85 to be wound into the package 90.

[0089] The spinning machine 80 includes a yarn joining cart 94 adapted to carry out the yarn joining operation. When the spun yarn 85 is disconnected, the yarn joining cart 94 travels to the relevant spinning unit 81. The yarn joining cart 94 includes an upper yarn catching device 95, a lower yarn catching device 96, and a yarn joining device 97.

[0090] The upper yarn catching device 95 catches the

spun yarn 85 (upper yarn) from the pneumatic spinning device 84, and guides the spun yarn 85 to the yarn joining device 97. The lower yarn catching device 96 catches the spun yarn 85 (lower yarn) from the package 90, and guides the spun yarn 85 to the yarn joining device 97. The yarn joining device 97 is adapted to join the guided upper yarn and lower yarn.

[0091] The preferred embodiment of the present invention has been described above, but the configuration described above may be modified as below.

[0092] The timing to light the illuminating section is arbitrary, and can be appropriately changed. For example, the illuminating section may be constantly lighted, may be lighted on/off by the operator through a switch and the like, or may be lighted at a timing at which a predetermined situation is detected. The predetermined situation includes, for example, a case where the operator approaching the unit, the illuminating section, or the like is detected, and a case where the start of work by the operator is detected.

[0093] The method for detecting the defect is arbitrary, and can be appropriately changed. In the first embodiment, a configuration has been adopted in which the yarn monitoring device 17 adapted to monitor the quality of the yarn 20 also detects the defect, but a dedicated defect detecting section adapted to detect the defect may be provided. For example, a sensor provided inside the yarn guiding member 60 and adapted to be able to detect the yarn 20 can be adopted as the defect detecting section. Various types of defects can be assumed, for example, no yarn supplying bobbins 21 are available in the magazine device 26, the tension applied by the tension applying section 12 is higher than the prescribed value thus frequently causing yarn breakage, the communication of the unit control section 25 and the yarn processing device is disabled, and the like.

[0094] The lighting color of the illuminating section is arbitrary, and is not limited to white. The lighting color may be switchable. In this case, the lighting color may be switched according to the state of the defect, the area where the defect occurred, or the like. For example, red may be used for the lighting color when the urgency of the defect is high, and blue may be used for the lighting color when the urgency of the defect is low. Furthermore, the lighting color may be changed according to elapse of time from the occurrence of the defect. Moreover, a plurality of illuminating sections may be used and lighted in different lighting colors.

[0095] The type of illuminating section is arbitrary, and is not limited to the LED. For example, in place of the LED, an organic EL, an incandescent light bulb, a fluorescent light, or the like can be used.

[0096] The illuminating section may be provided at a place other than the unit frame 6. For example, the illuminating section may be provided on the device to be illuminated (the yarn storage device 5 in the first embodiment). Illumination light may be guided to the relevant area by reflecting the illumination light with a mirror, and

the like. Furthermore, the illuminating section may be provided on a movable member (the yarn joining cart 94 and the like in the second embodiment), and for example, the illuminating section may be moved to the area where the defect occurred to illuminate the area. The illuminating section may be provided on a member in which the illuminating direction can be changed, and for example, the direction of the illuminating section may be changed to illuminate the area where the defect occurred. Furthermore, the illuminating section may be provided at a plurality of areas, and for example, the illuminating section corresponding to the area where the defect occurred may be lit.

[0097] The textile machine, provided with the illuminating section, is arbitrary, and is not limited to the magazine type automatic winder and the pneumatic spinning machine. For example, a tray type automatic winder, a ring spinning machine, an open end spinning machine, a yarn twisting machine, or the like may be adopted. The present invention can also be applied to a bobbin supplying device, a bobbin preparing device, or the like provided in the tray type automatic winder. Furthermore, the present invention can also be applied to an automatic winder that does not include the yarn storage device 5 or an automatic winder that includes an arm type traverse device.

[0098] As long as the area that requires the work of the operator is illuminated, the target to be illuminated by the illuminating section is arbitrary and is not limited to the vicinity of the yarn storage device 5. For example, in the automatic winder 1, the inside of a pipe (the yarn guiding member 60 and the like) adapted to suck the yarn 20, the inside of a duct adapted to remove fly waste and the like, the unwinding assisting device 10, the inside of a housing accommodating the unit control section 25, the yarn joining device 14, the traverse drum 24, and the like, may be illuminated. In the spinning machine 80, the draft device 83, the pneumatic spinning device 84, the operation cart (the yarn joining cart 94, doffing cart (not illustrated), and the like), the winding drum 92, and the like, may be illuminated. Furthermore, in the tray type textile machine, a conveyor on which the tray is conveyed may be illuminated.

Claims

1. A textile machine (1, 80) comprising a plurality of units (2), **characterized in that** the textile machine (1, 80) includes an illuminating section (71, 88) adapted to illuminate an area that requires work of an operator from an outer side to brighten the area, and the illuminating section (71, 88) is provided for each of the units (2).
2. The textile machine (1, 80) according to claim 1, **characterized in that** each of the units (2) includes a unit frame (6) ar-

ranged on a boundary between the adjacent units (2) and adapted to support a plurality of yarn processing devices which carry out processes associated with a yarn (20); and the illuminating section (71, 88) illuminates a space between the adjacent unit frames (6).

3. The textile machine (1) according to claim 2, **characterized by** further comprising a winding section (8) adapted to wind the yarn (20) to form a package (30), wherein the illuminating section (71) illuminates a lower side of the winding section (8). 10
4. The textile machine (1, 80) according to any one of claims 1 to 3, **characterized in that** the illuminating section (71, 88) is provided such that illumination light is directed toward the area that requires the work of the operator or such that the illumination light is guided to the area. 20
5. The textile machine (1, 80) according to claim 4, **characterized in that** the illuminating section (71, 88) is arranged such that the illumination light is radiated toward the area that requires the work from a side on which the operator stops to carry out the work. 25
6. The textile machine (1, 80) according to any one of claims 1 to 5, **characterized in that** the illuminating section (71, 88) illuminates the area that requires the work of the operator due to occurrence of a defect, to brighten the area. 30
7. The textile machine (1, 80) according to any one of claims 1 to 6, **characterized by** further comprising a defect detecting section (17) adapted to detect occurrence of a defect, wherein the illuminating section (71, 88) is lighted when the defect detecting section (17) detects the defect. 35 40
8. The textile machine (1, 80) according to claim 7, **characterized in that** a lighting color of the illuminating section (71, 88) is changeable, the lighting color being changed according to detection content of the defect detecting section (17). 45
9. The textile machine (1, 80) according to claim 1 or 2, **characterized by** further comprising:
a winding section (8; 89) adapted to wind the yarn (20) to form a package (30; 90); and
a yarn storage device (5, 86) adapted to temporarily store the yarn (20) to be wound by the winding section (8; 89),
wherein the illuminating section (71, 88) illumi- 55

ates a portion where the yarn (20) is stored in the yarn storage device (5, 86).

10. The textile machine (1, 80) according to any one of claims 3 to 8, **characterized by** further comprising:
a yarn storage device (5, 86) adapted to temporarily store the yarn (20) to be wound by the winding section (8),
wherein the illuminating section illuminates a portion where the yarn (20) is stored in the yarn storage device (5, 86).
11. The textile machine (1, 80) according to claim 9 or 10, **characterized in that** the yarn storage device (5, 86) includes a yarn storage roller (32) adapted to wind the yarn (20) around an outer peripheral surface thereof by rotating to store the yarn (20), and the illuminating section (71, 88) illuminates a surface of the yarn storage roller (32).
12. The textile machine (1, 80) according to claim 11, **characterized in that** a rotation axis of the yarn storage roller (32) is inclined with respect to a vertical direction, and the illuminating section (71, 88) illuminates the surface on a lower side of the yarn storage roller (32).
13. The textile machine (1, 80) according to claim 11 or 12, **characterized by** further comprising:
a yarn supplying section (7) adapted to supply a yarn (20) ; and
a pull-out section (48) arranged in proximity to a portion of winding the yarn (20) from the yarn supplying section (7) in the yarn storage roller (32), and adapted to suck and pull out the yarn (20) wound around the yarn storage roller (32), wherein the illuminating section (71, 88) illuminates a vicinity of the pull-out section (48).
14. The textile machine (1, 80) according to any one of claims 1 to 13, **characterized in that** the lighting color of the illuminating section (71, 88) is white.
15. The textile machine (1, 80) according to any one of claims 1 to 14, **characterized in that** the illuminating section (71, 88) is an LED.

FIG. 1

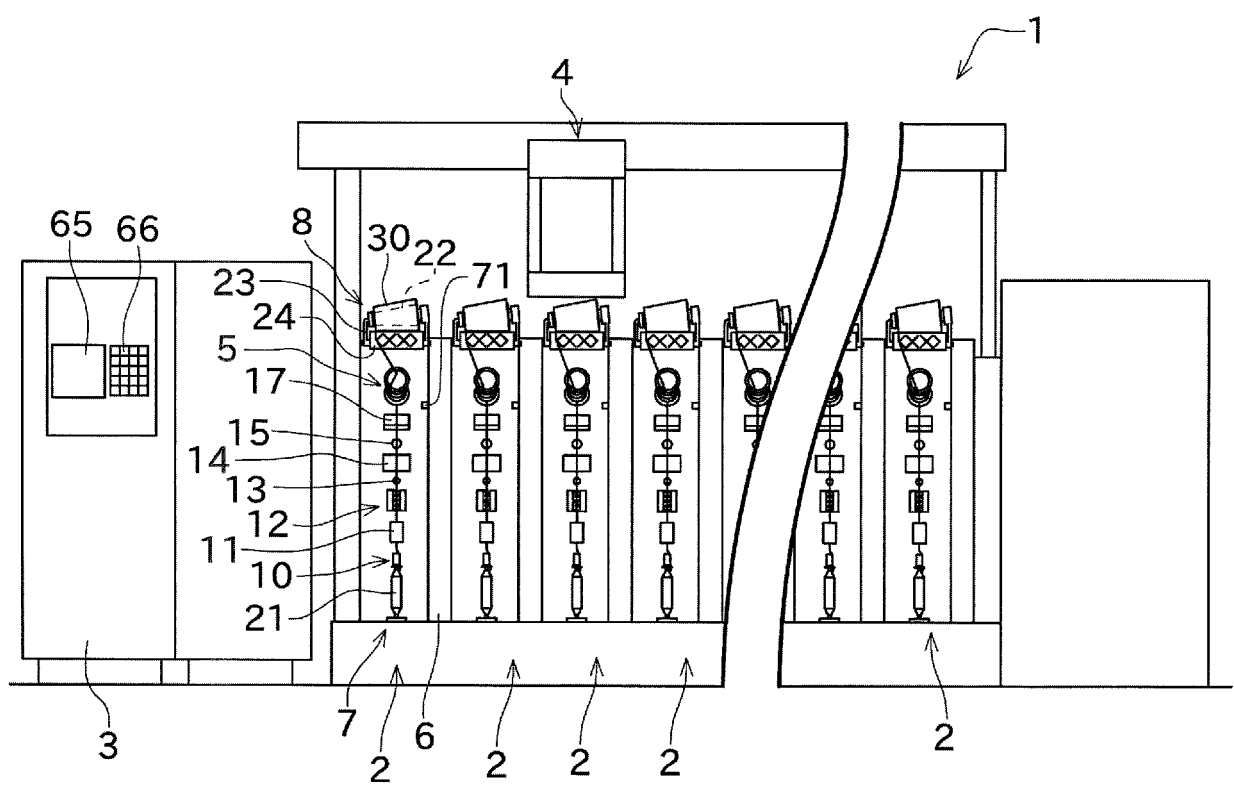


FIG. 2

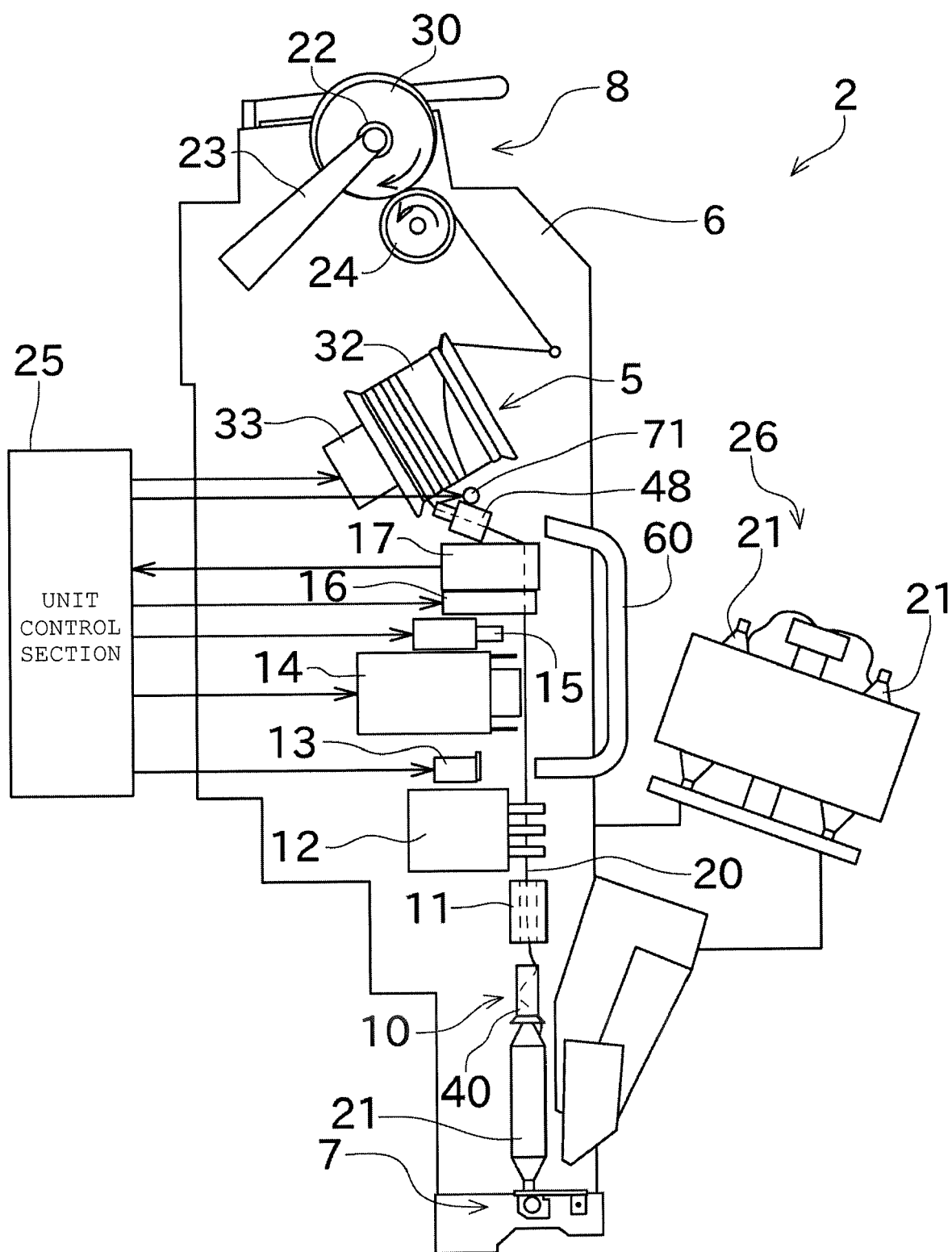


FIG. 3

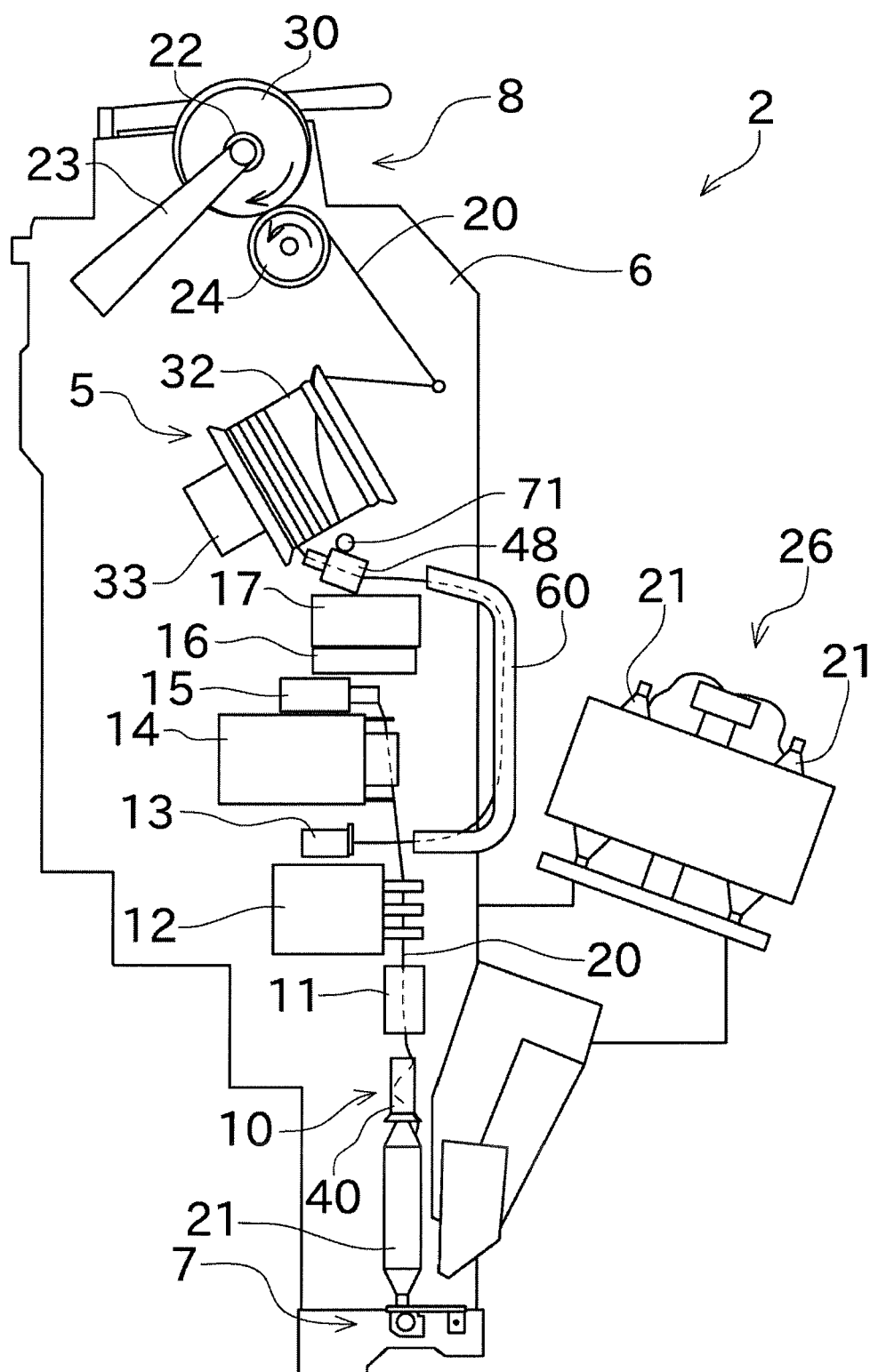


FIG. 4

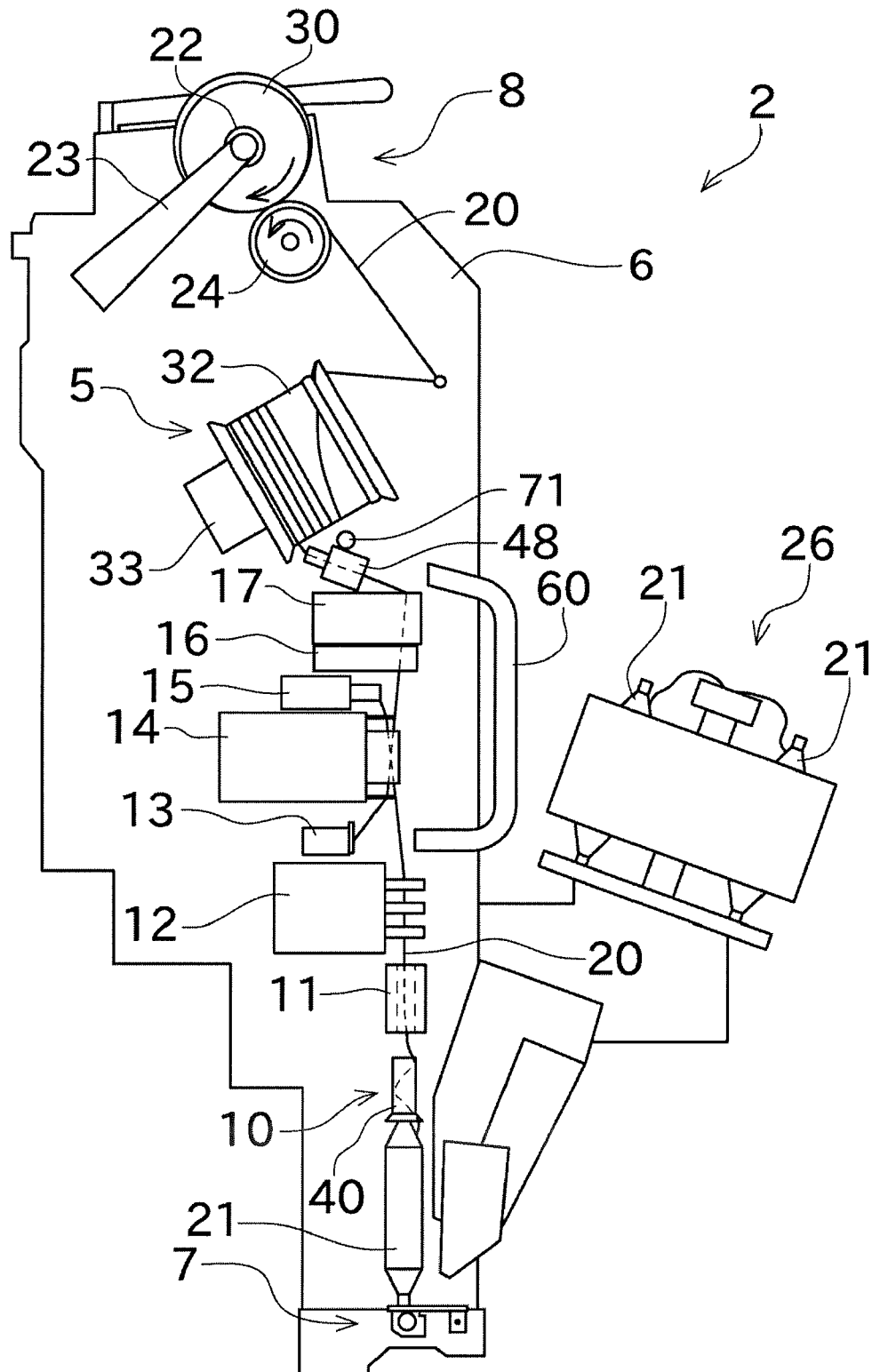


FIG. 5

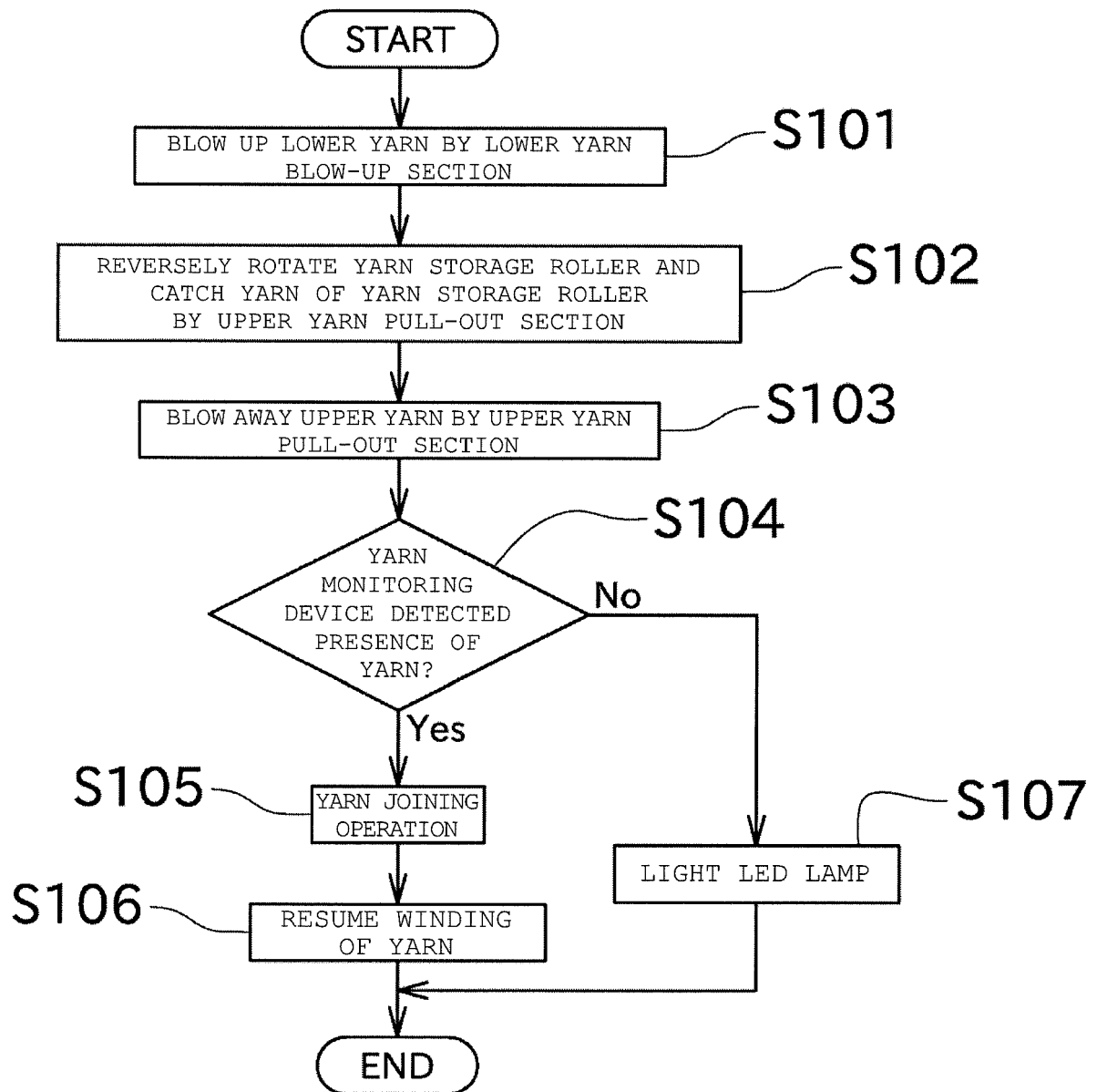
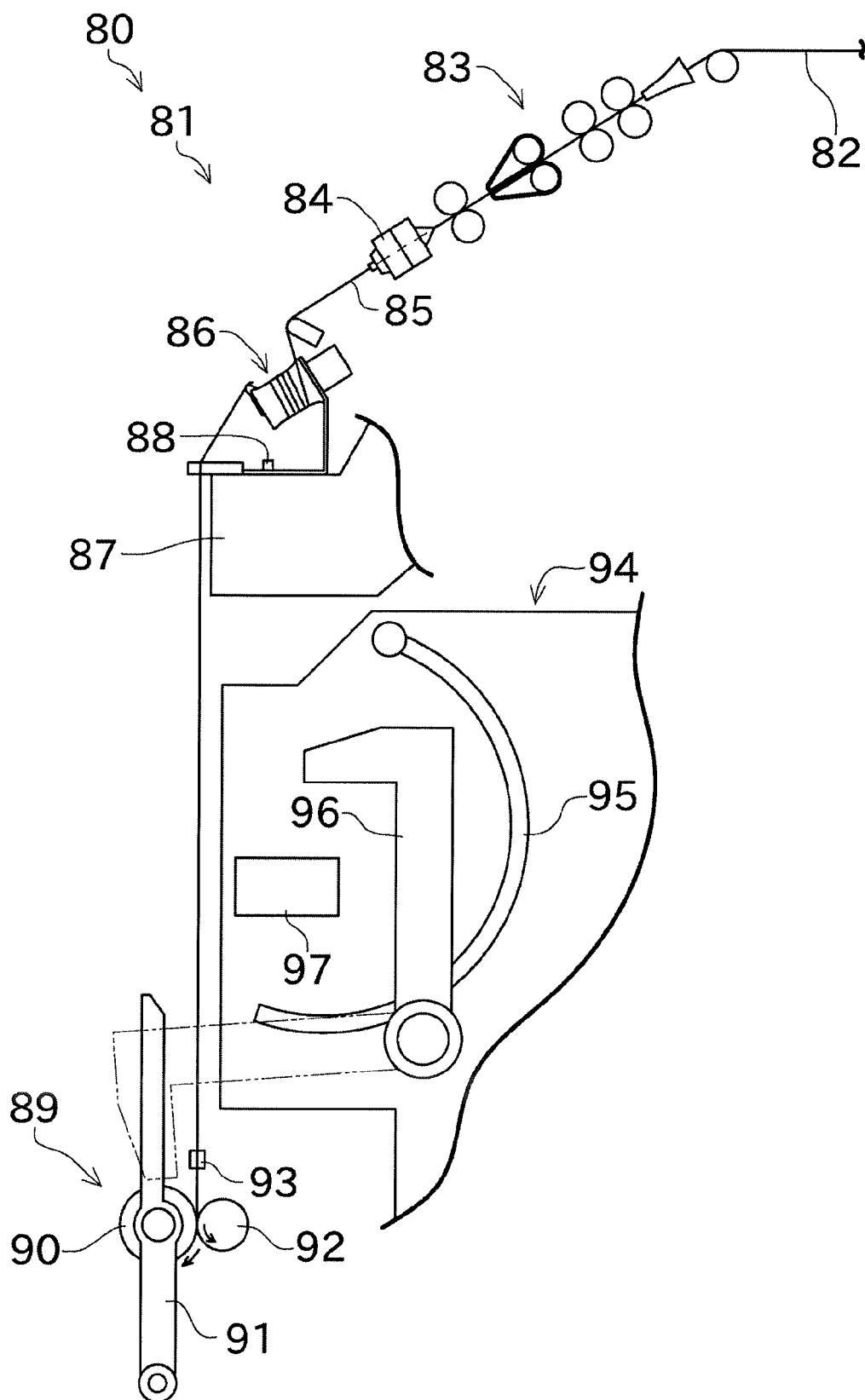


FIG. 6





EUROPEAN SEARCH REPORT

 Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 September 2016	Examiner Pussemier, Bart
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