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(72) Inventors:
• **IKKAI Tomoyuki**
Kyoto-shi
Kyoto 612-8686 (JP)
• **KAWAMOTO Kenji**
Kyoto-shi
Kyoto 612-8686 (JP)

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(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

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

(54) **YARN WINDING MACHINE**

(57) An automatic winder includes a yarn winding unit including a yarn feeder configured to supply yarn and a winding apparatus configured to wind the yarn supplied

from the yarn feeder and to form a package, and a receiving unit configured to receive a setting of target quality of the yarn to be wound by the winding apparatus.

Fig.3

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	LOT 1	LOT 2	LOT 3	LOT 4
COUNT TYPE	* * *	* * *	* * *	* * *
COUNT	* * *	* * *	* * *	* * *
YARN TYPE	* * *	* * *	* * *	* * *
⋮	⋮	⋮	⋮	⋮
OPERATION MODE	QUALITY EMPHASIS	BALANCE	PRODUCTIVITY EMPHASIS	MANUAL
WINDING SPEED	—	—	—	1500 (m/min)

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Description

Technical Field

[0001] An aspect of the present invention relates to a yarn winding machine.

Background Art

[0002] A yarn winding machine provided with a yarn winding unit including a yarn feeder configured to supply yarn, a winding apparatus configured to wind the yarn supplied from the yarn feeder and to form a package, and a yarn monitoring device configured to detect a state of the yarn to be wound by the winding apparatus, and provided with a control device configured to control the operation of the yarn winding unit has been known (for example, see Patent Literature 1).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Examined Patent Publication No. H6-76177

Summary of Invention

Technical Problem

[0004] In the yarn winding machine described above, it is desired to obtain a package of yarn quality that satisfies desired target quality.

[0005] Thus, an object of an aspect of the present invention is to provide a yarn winding machine capable of obtaining a package of yarn quality that satisfies desired target quality.

Solution to Problem

[0006] A yarn winding machine according to an aspect of the present invention includes a yarn winding unit including a yarn feeder configured to supply yarn and a winding apparatus configured to wind the yarn supplied from the yarn feeder and to form a package, and a receiving unit configured to receive a setting of target quality of the yarn to be wound by the winding apparatus.

[0007] In this yarn winding machine, the receiving unit that receives the setting of the target quality of the yarn to be wound by the winding apparatus is provided, and thus, as the user sets desired target quality via the receiving unit, it is possible to obtain a package of yarn quality that satisfies the desired target quality.

[0008] In the yarn winding machine according to an aspect of the present invention, a control device configured to control operation of the yarn winding unit may further be provided, and the control device may control the operation of the yarn winding unit so that the yarn

quality of the yarn to be wound by the winding apparatus results in the target quality received by the receiving unit. This makes it possible to surely obtain a package of yarn quality that satisfies the desired target quality.

[0009] In the yarn winding machine according to an aspect of the present invention, the yarn winding unit may further include a yarn monitoring device configured to detect a state of the yarn to be wound by the winding apparatus, and the control device may acquire information concerning the state of the yarn detected by the yarn monitoring device from the yarn monitoring device, and may control the operation of the yarn winding unit so that the yarn quality based on the information concerning the state of the yarn detected by the yarn monitoring device results in the target quality. This makes it possible, by utilizing the information that the yarn monitoring device has, to obtain a package of yarn quality that satisfies the desired target quality.

[0010] In the yarn winding machine according to an aspect of the present invention, the yarn monitoring device may detect a yarn defect of the yarn to be wound by the winding apparatus, and the control device may change a threshold value on determination of yarn defect detection by the yarn monitoring device so that the yarn quality satisfies the target quality. This makes it possible to further surely obtain a package of yarn quality that satisfies the desired target quality.

[0011] In the yarn winding machine according to an aspect of the present invention, the control device may control at least one of a winding speed at which the winding apparatus winds the yarn and a tension of the yarn to be wound by the winding apparatus so that the yarn quality satisfies the target quality. This makes it possible, by changing the operation of the yarn winding unit that has a great influence on the yarn quality, to surely obtain a package of yarn quality that satisfies the desired target quality.

[0012] In the yarn winding machine according to an aspect of the present invention, the yarn quality may be at least any of a yarn defect of the yarn, hairiness of the yarn, and unevenness in thickness of the yarn. In this case, when at least any of the number of the yarn defects, the amount of the hairiness, and the degree of the unevenness in thickness are set as the target quality, the control device may control the operation of the yarn winding unit to satisfy the set target quality. This makes it possible to obtain a package having the desired number of yarn defects, the amount of hairiness, or the degree of unevenness in thickness.

[0013] In the yarn winding machine according to an aspect of the present invention, the yarn winding unit may have a plurality of kinds of operation modes, and the target quality may be set in each of the operation modes. This makes it possible, by setting the operation mode of the yarn winding unit, to easily obtain a package of yarn quality that satisfies the desired target quality. In this case, the operation modes may include at least a quality emphasis mode that emphasizes yarn quality and a pro-

ductivity emphasis mode that emphasizes productivity, and the target quality that is set in the quality emphasis mode may be higher than the target quality that is set in the productivity emphasis mode. In each of the quality emphasis mode and the productivity emphasis mode, a winding speed at which the winding apparatus winds the yarn may be set, and the winding speed that is set in the productivity emphasis mode may be faster than the winding speed that is set in the quality emphasis mode.

[0014] In the yarn winding machine according to an aspect of the present invention, the receiving unit may receive, as a setting of the target quality, an input of a numerical value, a character, or a symbol. This makes it possible to obtain a package of yarn quality that satisfies the target quality on which a user's request is accurately reflected.

Advantageous Effects of Invention

[0015] According to an aspect of the present invention, it is possible to obtain a package of yarn quality that satisfies the desired target quality.

Brief Description of Drawings

[0016]

FIG. 1 is a front view of an automatic winder according to one embodiment.

FIG. 2 is a side view of a yarn winding unit.

FIG. 3 is a diagram illustrating an example of a display screen of operating conditions.

FIG. 4 is a diagram illustrating an example of an operation mode selection screen.

Description of Embodiment

[0017] With reference to the accompanying drawings, the following describes an exemplary embodiment of the present invention in detail. In the description of the drawings, identical or equivalent constituent elements are denoted by identical reference signs, and redundant explanations are omitted.

[0018] As illustrated in FIG. 1, an automatic winder (a yarn winding machine) 1 includes a plurality of yarn winding units 3 arranged side by side, a machine control device (a control device) 5, and a doffer 7.

[0019] The machine control device 5 is capable of communicating with each of the yarn winding units 3. An operator of the automatic winder 1 can collectively manage the yarn winding units 3 by operating the machine control device 5 as appropriate. On the machine control device 5, a display operating unit (receiving unit) 5a is provided. The display operating unit 5a receives input of various conditions and displays various types of information. The display operating unit 5a is a liquid crystal display and displays an operation screen as a touch panel, for example. As will be described later, the operator inputs oper-

ating conditions of the yarn winding units 3 via the display operating unit 5a.

[0020] The yarn winding unit 3 unwinds yarn Y from a supply yarn bobbin SB and winds it around a winding bobbin WB while traversing. Thus, the yarn winding unit 3 forms a package P. The doffer 7 travels, when the package P is fully wound (in a state in which a predetermined amount of yarn is wound) in one yarn winding unit 3, to the position of said yarn winding unit 3, and removes the fully wound package P and sets an empty winding bobbin WB.

[0021] As illustrated in FIG. 2, the yarn winding unit 3 includes a unit controller (a control device) 10, a yarn feeder 12, and a winding apparatus 14. The unit controller 10 includes a central processing unit (CPU) and a read only memory (ROM), for example. In the ROM, a program for controlling each constituent of the yarn winding unit 3 is stored. The CPU executes the program stored in the ROM. The unit controller 10 is communicably connected to various units of the yarn winding unit 3 and controls the operation of each unit.

[0022] The yarn feeder 12 is a support mechanism that supports the supply yarn bobbin SB placed on a transportation tray (not depicted) at a predetermined position. The yarn Y is unwound from the supply yarn bobbin SB supported by the yarn feeder 12 and is drawn out. As a result, the yarn feeder 12 supplies the yarn Y. The yarn feeder 12 is not limited to the transportation tray type, and may be a magazine type, for example.

[0023] The winding apparatus 14 includes a cradle 16 and a winding drum 18. The cradle 16 has a pair of rotary support portions (not depicted). The cradle 16 rotatively supports the winding bobbin WB (or the package P), by sandwiching the winding bobbin WB with the rotary support portions. The cradle 16 can be switched between a state in which the supporting package P is brought into contact with the winding drum 18 and a state in which the package P is separated from the winding drum 18.

[0024] The winding drum 18 traverses the yarn Y on the surface of the package P and rotates the package P. The winding drum 18 is rotationally driven by a drum drive motor (not depicted). The winding drum 18 is rotationally driven in a state in which the outer circumference of the package P is in contact. Thus, the winding drum 18 causes the package P to passively rotate. On the outer circumferential surface of the winding drum 18, a helical traverse groove is formed. The yarn Y unwound from the supply yarn bobbin SB is wound around the surface of the package P while being traversed in a certain width by the traverse groove. This makes it possible to form the package P having a certain winding width. The configuration of the winding apparatus 14 is not limited thereto. For example, the traverse groove may be not formed on the winding drum 18, and the winding apparatus 14 may be configured so that the yarn Y is traversed by a traverse member (for example, an arm, a belt, or a vane) provided separately from the winding drum 18. Alternatively, the winding apparatus 14 may be configured so

that the package P is not passively rotated but directly rotationally driven.

[0025] Each yarn winding unit 3 includes, in order from the yarn feeder 12 side in a yarn path between the yarn feeder 12 and the winding apparatus 14, an unwinding assisting device 20, a tension applying device 22, a tension detection device 24, a yarn joining device 26, and a yarn monitoring device 28. In the vicinity of the yarn joining device 26, a first catching device 30 and a second catching device 32 are arranged.

[0026] The unwinding assisting device 20 is provided with a regulating member 21 that assists unwinding of the yarn from the supply yarn bobbin SB. The unwinding assisting device 20 may be not provided with the regulating member 21.

[0027] The tension applying device 22 applies a predetermined tension to the running yarn Y. In the present embodiment, the tension applying device 22 is of a gate type in which movable comb teeth are arranged with respect to fixed comb teeth. The configuration of the tension applying device 22 is not limited to the gate type, and it may be a tension applying device of other methods such as a disk type, for example.

[0028] The tension detection device 24 detects the tension of the running yarn Y between the yarn feeder 12 and the winding apparatus 14.

[0029] The yarn joining device 26, when the yarn Y is in a state of being severed between the yarn feeder 12 and the winding apparatus 14 for some reason, joins the yarn Y (lower yarn) of the yarn feeder 12 side and the yarn Y (upper yarn) of the winding apparatus 14 side. The yarn joining device 26 is configured as a splicer device that twists together the yarn ends by a swirl airflow generated by compressed air, for example. The configuration of the yarn joining device 26 is not limited thereto, and it may be a disk-type splicer or a knoter.

[0030] The yarn monitoring device 28 monitors (detects) the state of the yarn Y wound by the winding apparatus 14. The yarn monitoring device 28 acquires, as yarn quality of the yarn Y, information concerning at least any of a yarn defect of the yarn Y, hairiness of the yarn Y, and unevenness in thickness of the yarn Y. The yarn monitoring device 28 detects, as the yarn defect, the thickness abnormality of the yarn Y and/or a foreign object that is contained in the yarn Y, for example. Furthermore, the yarn monitoring device 28 detects the yarn breakage, that is, the presence of the yarn Y in the yarn path of the yarn Y, and the like. The yarn monitoring device 28 has a slit on the yarn path of the yarn Y, and monitors the yarn Y passing through the slit with a sensor (not depicted). In the yarn monitoring device 28, a cutter (not depicted) for cutting the yarn Y is provided. The yarn monitoring device 28 activates the cutter, when the yarn defect of the yarn Y is detected. The cutter may be provided in a place other than the yarn monitoring device 28. As the sensor to be provided in the yarn monitoring device 28, an optical type, a capacitance type, a triboelectric type, or another type can be employed.

[0031] The first catching device 30 catches the upper yarn when the yarn Y is in a severed state. The first catching device 30 is, by the control of the unit controller 10, able to swivel (move) from a standby position (solid lines, in FIG. 2) of the yarn feeder 12 side to a catching position (dashed lines, in FIG. 2) of the winding apparatus 14 side. The first catching device 30 is connected to a negative pressure source (not depicted) and generates a suction flow. With this configuration, by catching the upper yarn at the catching position and returning to the standby position, an upper-yarn suction catching portion 33 guides the upper yarn to the yarn joining device 26. The configuration of the first catching device 30 is not limited thereto.

[0032] The second catching device 32 is, by the control of the unit controller 10, able to swivel (move) from a standby position (a solid line, in FIG. 2) of the yarn feeder 12 side to a catching position (a dashed line, in FIG. 2) of the winding apparatus 14 side. The second catching device 32 is connected to a negative pressure source (not depicted) and generates a suction flow. With this configuration, the second catching device 32 catches the lower yarn and guides it to the yarn joining device 26. The configuration of the second catching device 32 is not limited thereto.

[0033] As in the foregoing, the yarn winding unit 3 winds the yarn Y onto the winding bobbin WB and forms the package P. In yarn splicing operation in the yarn joining device 26, the yarn Y of the winding apparatus 14 side is caught by the first catching device 30 and the yarn Y of the yarn feeder 12 side is caught by the second catching device 32. The yarn Y caught by the first catching device 30 and the yarn Y caught by the second catching device 32 are guided to the yarn joining device 26. At this time, the yarn Y is positioned at the slit of the yarn monitoring device 28. The yarn joining device 26 performs yarn splicing of the introduced pieces of the yarn Y.

[0034] Next, the operation of the unit controller 10 will be described further. The unit controller 10 controls the operation of the yarn winding unit 3, on the basis of the state of the yarn Y detected by the yarn monitoring device 28 and the operating conditions of the yarn winding unit 3 so that the yarn quality of the yarn Y wound by the winding apparatus 14 satisfies target quality (results in the target quality). The operating conditions of each yarn winding unit 3 are input to the machine control device 5 via the display operating unit 5a. Upon receiving this input, the machine control device 5 instructs the unit controller 10 of each yarn winding unit 3 to operate under the input operating conditions.

[0035] In the display operating unit 5a, displayed is a setting screen 41 of the operating conditions as illustrated in FIG. 3. On the setting screen 41, a plurality of lots of lot 1, lot 2, lot 3, lot 4, ... are displayed. The lot is a set (group) of a plurality of setting items set as the operating conditions of the yarn winding unit 3. As any of the existing lots is selected on the setting screen 41 or a new lot is created, the operating conditions of the yarn winding unit 3 are set.

[0036] Each lot includes, as the setting items, a count type, a count, and a yarn type of the yarn Y, a weight and a fixed yarn length of the package P, and a type and a length of the supply yarn bobbin SB and the like. In addition, each lot further includes an operation mode as one of the setting items. As the operation mode, a quality emphasis mode, a balance mode, a productivity emphasis mode, and a manual mode are prepared. On each lot, any of a plurality of operation modes of the quality emphasis mode, the balance mode, the productivity emphasis mode, and the manual mode is assigned. In each of those operation modes, target quality is set. The operator can select the operation mode used in each lot by touching (pressing down) the inside of a frame of the operation mode of each lot displayed on the setting screen 41.

[0037] The quality emphasis mode, the balance mode, and the productivity emphasis mode are the modes set in accordance with which of the yarn quality and productivity is emphasized. The quality emphasis mode is a mode that operates with emphasis on the yarn quality rather than the productivity. The productivity emphasis mode is a mode that operates with emphasis on the productivity rather than the yarn quality. The balance mode is a mode that operates without biasing to either of the yarn quality and the productivity. The manual mode is a mode that operates at a winding speed set by the operator.

[0038] Among the quality emphasis mode, the balance mode, and the productivity emphasis mode, the target quality of the quality emphasis mode is the highest, the target quality of the balance mode is the second highest, and the target quality of the productivity emphasis mode is the lowest. The target quality, for example, is a target range having a predetermined scope, but may be a target numerical value.

[0039] Furthermore, among the quality emphasis mode, the balance mode, and the productivity emphasis mode, the winding speed in the productivity emphasis mode is the fastest, the winding speed in the balance mode is the second fastest, and the winding speed in the quality emphasis mode is the slowest.

[0040] In detail, when the operator touches (presses down) the inside of the frame of the operation mode of each lot on the setting screen 41, a selection screen 43 of the operation mode as illustrated in FIG. 4 is displayed on the display operating unit 5a. On the selection screen 43, buttons 44 to 47 corresponding to each of the quality emphasis mode, the balance mode, the productivity emphasis mode, and the manual mode are displayed. The operator can select (switch) the operation mode of the yarn winding unit 3 by touching the inside of the frames of the buttons 44 to 47. In the example in FIG. 3 and FIG. 4, the quality emphasis mode selected as the operation mode of the lot 1 is colored and displayed.

[0041] When a lot for which an operation mode is selected is set as an operating condition, the unit controller 10 controls the operation of the yarn winding unit 3 so

that the yarn quality of the yarn Y wound by the winding apparatus 14 satisfies the target quality corresponding to the relevant operation mode.

[0042] In more detail, the unit controller 10 controls the winding speed at which the winding apparatus 14 winds the yarn Y so that the yarn quality of the yarn Y wound by the winding apparatus 14 satisfies the target quality corresponding to the operation mode. The unit controller 10 controls the winding speed by controlling the rotation speed of the drum drive motor that drives the winding drum 18. When the winding speed is lowered, the hairiness of the yarn Y may be reduced, for example. That is, when the winding speed is lowered, the yarn quality of the yarn Y may be improved. The unit controller 10 maintains the winding speed, when the yarn quality of the yarn Y detected by the yarn monitoring device 28 satisfies the target quality. On the other hand, when the yarn quality of the yarn Y detected by the yarn monitoring device 28 is lower than the target quality, the unit controller 10 decreases the winding speed. When the yarn quality of the yarn Y detected by the yarn monitoring device 28 is higher than the target quality, the unit controller 10 increases the winding speed. Accordingly, while the winding speed is maintained when the yarn quality of the yarn Y satisfies the target quality, the winding speed is changed so that the yarn quality of the yarn Y approaches the target quality when the yarn quality of the yarn Y is out of the target range. As a result, the yarn quality of the yarn Y satisfies the target quality corresponding to the operation mode.

[0043] Moreover, the unit controller 10 controls the tension of the yarn Y so that the yarn quality of the yarn Y wound by the winding apparatus 14 satisfies the target quality corresponding to the operation mode. The unit controller 10 changes the tension of the yarn Y by controlling the operation of the tension applying device 22 on the basis of the tension of the yarn Y detected by the tension detection device 24. When the tension of the yarn Y is weakened, the hairiness of the yarn Y may be reduced, for example. That is, when the tension of the yarn Y is weakened, the yarn quality of the yarn Y may be improved. The unit controller 10 maintains the tension of the yarn Y, when the yarn quality of the yarn Y detected by the yarn monitoring device 28 satisfies the target quality. On the other hand, when the yarn quality of the yarn Y detected by the yarn monitoring device 28 is lower than the target quality, the unit controller 10 weakens the tension of the yarn Y. Furthermore, when the yarn quality of the yarn Y detected by the yarn monitoring device 28 is higher than the target quality, the unit controller 10 strengthens the tension of the yarn Y. Accordingly, while the tension of the yarn Y is maintained when the yarn quality of the yarn Y satisfies the target quality, the tension of the yarn Y is changed so that the yarn quality of the yarn Y approaches the target quality when the yarn quality of the yarn Y is out of the target range. As a result, the yarn quality of the yarn Y satisfies the target quality corresponding to the operation mode.

[0044] When the manual mode is selected as the operation mode on the selection screen 43, the operator inputs a target value of the winding speed (1500 m/min, in FIG. 4) on an input screen of the display operating unit 5a. In this case, the unit controller 10 controls the winding speed so that the winding speed is of the target value. Accordingly, in the manual mode, the winding speed is of the target value that the operator sets, and the yarn quality of the yarn Y results in the quality corresponding to the target value. Each of the above-described control may be executed by not the unit controller 10 but the machine control device 5, or may be executed by cooperation (role sharing) of the unit controller 10 and the machine control device 5.

[0045] As in the foregoing, in the automatic winder 1, the display operating unit 5a configured to receive a setting of target quality of the yarn Y to be wound by the winding apparatus 14 is included, and thus, as the user sets desired target quality via the display operating unit 5a, it is possible to obtain the package P of yarn quality that satisfies the desired target quality.

[0046] Furthermore, in the automatic winder 1, the unit controller 10 controls the operation of the yarn winding unit 3 so that the yarn quality of the yarn Y to be wound by the winding apparatus 14 results in target quality that the display operating unit 5a has received. This makes it possible to surely obtain a package of yarn quality that satisfies the desired target quality.

[0047] In the automatic winder 1, the unit controller 10 acquires information concerning the state of the yarn Y detected by the yarn monitoring device 28 from the yarn monitoring device 28, and controls the operation of the yarn winding unit 3 so that the yarn quality based on the information concerning the state of the yarn Y detected by the yarn monitoring device 28 results in the target quality. This makes it possible, by utilizing the information that the yarn monitoring device 28 has, to obtain a package of yarn quality that satisfies the desired target quality.

[0048] In the automatic winder 1, the unit controller 10 controls the winding speed at which the winding apparatus 14 winds the yarn Y and the tension of the yarn Y to be wound by the winding apparatus 14 so that the yarn quality satisfies the target quality. This makes it possible, by changing the operation of the yarn winding unit 3 that has a great influence on the yarn quality, to surely obtain the package P that satisfies the desired target quality.

[0049] In the automatic winder 1, the yarn quality is a yarn defect of the yarn Y, hairiness of the yarn Y, and unevenness in thickness of the yarn Y. This makes it possible to surely obtain the package P having the desired number of yarn defects, the amount of hairiness, and the degree of unevenness in thickness.

[0050] In the automatic winder 1, the yarn winding unit 3 has a plurality of kinds of operation modes, and the target quality is set in each of the operation modes. This makes it possible to easily obtain the package P of yarn quality that satisfies the desired target quality by merely selecting the operation mode.

[0051] As in the foregoing, one exemplary embodiment of the present invention has been described, but the present invention is not limited to the above-described embodiment. For example, in the above-described embodiment, the unit controller 10 controls the winding speed and the tension so that the yarn quality of the yarn Y satisfies the target quality. However, the unit controller 10 may, in addition, change a threshold value on the determination of the yarn defect detection by the yarn monitoring device 28 so that the yarn quality of the yarn Y satisfies the target quality. The threshold value on the determination of the yarn defect detection is a clearing limit, for example. The clearing limit is made up having, in the two-dimensional field that has each of the length and the thickness of the yarn defect as a coordinate axis, a boundary line for determining whether to remove the yarn defect. The unit controller 10 causes the yarn monitoring device 28 to change the above-described boundary line in accordance with the yarn quality of the yarn Y detected by the yarn monitoring device 28, for example. In this case, it is possible to further surely obtain the package P of the yarn quality corresponding to the operating conditions of the yarn winding unit 3.

[0052] In the above-described embodiment, the unit controller 10 controls both the winding speed and the tension of the yarn Y, but may control only one of the winding speed and the tension of the yarn Y. In the above-described embodiment, the yarn quality is both the hairiness of the yarn Y and the unevenness in thickness, but may be one of the hairiness of the yarn Y and the unevenness in thickness.

[0053] In the above-described embodiment, four kinds of operation modes are prepared, but the prepared operation modes are not limited thereto. For example, there may be no balance mode and/or manual mode, and at least the quality emphasis mode and the productivity emphasis mode may be prepared. In this case, it is preferable that the target quality that is set in the quality emphasis mode be higher than the target quality that is set in the productivity emphasis mode. It is preferable that the winding speed that is set in the productivity emphasis mode be faster than the winding speed that is set in the quality emphasis mode.

[0054] In the above-described embodiment, a plurality of kinds of operation modes are prepared in advance and the target quality corresponding to the operation mode is set by selecting a desired one out of the prepared operation modes, but the yarn winding unit 3 does not necessarily need to have a plurality of kinds of operation modes. In this case, the operator may, on the setting screen 41, input (set) a desired target value/target grade of yarn quality of the yarn Y as the target quality, for example. As the target value, the number of yarn defects per predetermined length (for example, 100 km), the amount of hairiness of the yarn, or the degree of unevenness in yarn thickness may be input, for example. As the target grade, a known yarn quality level may be input, for example. The display operating unit 5a (receiving unit)

may be configured to receive, as a setting of the target value or the target grade (setting of the target quality), an input of a numerical value, a character, or a symbol by the operator (user). The input of the target grade may be to select a desired one out of the yarn quality in a plurality of levels prepared in advance.

[0055] In the above-described embodiment, the yarn winding unit 3 is configured to unwind the yarn Y from the supply yarn bobbin SB and to form the package P, but may be configured to unwind the yarn Y from the package P and to form the package P. That is, the yarn winding unit 3 may be configured to make the fully wound package P from a plurality of packages P in which the amount of winding is below a specified amount. Alternatively, the yarn winding unit 3 may be configured to rewind from the fully wound package P (a dyed package P) into the package P. In this case, the yarn feeder 12 is a support mechanism that supports the package P at a predetermined position, and may be configured to supply the yarn Y from the package P. That is, the yarn feeder 12 may be configured to supply the yarn from a yarn winding body on which the yarn is wound around such as a supply yarn bobbin or a supply yarn package.

[0056] In the above-described embodiment and modifications, the operation (for example, at least one of the winding speed and the tension of the yarn Y) of the yarn winding unit 3 is controlled so that the yarn quality based on the state of the yarn Y detected by the yarn monitoring device 28 results in the set target quality. That is, feedback control (for example, increasing and decreasing of at least one of the winding speed and the tension) is executed on the basis of the current state of the yarn Y. However, not the feedback control but the control (control without feedback) that simply sets target quality of the yarn Y to be wound by the winding apparatus 14 and that merely controls the operation of the yarn winding unit 3 to satisfy the set target quality may be executed.

[0057] Specifically, as the control without feedback, the yarn winding unit may be controlled so that the winding speed is slower than that of the standard when the quality emphasis mode is set, and the yarn winding unit may be controlled so that the winding speed is faster than that of the standard when the productivity emphasis mode is set.

[0058] The setting of the target quality may be received by the display operating unit 5a provided on the machine control device 5 as in the above-described embodiment, or may be received by a receiving unit provided at a place other than the machine control device 5. The configuration of the receiving unit may be a touch panel as in the foregoing, but is not limited thereto and may be a keyboard, an input key, or a push button, for example. When the yarn winding machine is configured to be able to communicate with a mobile terminal or other external devices, the receiving unit may be an input unit (reception unit) that receives input information from the external device and the like.

Industrial Applicability

[0059] According to an aspect of the present invention, it is possible to obtain a package of yarn quality that satisfies desired target quality.

Reference Signs List

[0060] 1: Automatic Winder (Yarn Winding Machine), 3: Yarn Winding Unit, 10: Unit Controller (Control Device), 12: Yarn Feeder, 14: Winding Apparatus, 28: Yarn Monitoring Device, P: Package, Y: Yarn

Claims

1. A yarn winding machine comprising:

a yarn winding unit including a yarn feeder configured to supply yarn and a winding apparatus configured to wind the yarn supplied from the yarn feeder and to form a package; and
a receiving unit configured to receive a setting of target quality of the yarn to be wound by the winding apparatus.

2. The yarn winding machine according to claim 1, further comprising:

a control device configured to control operation of the yarn winding unit, wherein
the control device controls the operation of the yarn winding unit so that yarn quality of the yarn to be wound by the winding apparatus results in the target quality that the receiving unit has received.

3. The yarn winding machine according to claim 2, wherein

the yarn winding unit further includes a yarn monitoring device configured to detect a state of the yarn to be wound by the winding apparatus, and
the control device acquires information concerning the state of the yarn detected by the yarn monitoring device from the yarn monitoring device, and controls the operation of the yarn winding unit so that the yarn quality based on the information concerning the state of the yarn detected by the yarn monitoring device results in the target quality.

4. The yarn winding machine according to claim 3, wherein

the yarn monitoring device detects a yarn defect of the yarn to be wound by the winding apparatus, and
the control device changes a threshold value on determination of yarn defect detection by the yarn monitoring device so that the yarn quality satisfies the target quality.

5. The yarn winding machine according to any one of claims 2 to 4, wherein the control device controls at least one of a winding speed at which the winding apparatus winds the yarn and a tension of the yarn to be wound by the winding apparatus so that the yarn quality satisfies the target quality. 5

6. The yarn winding machine according to any one of claims 2 to 5, wherein the yarn quality is at least any of a yarn defect of the yarn, hairiness of the yarn, and unevenness in thickness of the yarn. 10

7. The yarn winding machine according to claim 6, wherein, when at least any of number of the yarn defects, an amount of the hairiness, and a degree of the unevenness in thickness are set as the target quality, the control device controls the operation of the yarn winding unit to satisfy the set target quality. 15

8. The yarn winding machine according to any one of claims 1 to 7, wherein
the yarn winding unit has a plurality of kinds of operation modes, and
the target quality is set in each of the operation modes. 20 25

9. The yarn winding machine according to claim 8, wherein
the operation modes include at least a quality emphasis mode that emphasizes yarn quality and a productivity emphasis mode that emphasizes productivity, and
the target quality that is set in the quality emphasis mode is higher than the target quality that is set in the productivity emphasis mode. 30 35

10. The yarn winding machine according to claim 9, wherein
in each of the quality emphasis mode and the productivity emphasis mode, a winding speed at which the winding apparatus winds the yarn is set, and
the winding speed that is set in the productivity emphasis mode is faster than the winding speed that is set in the quality emphasis mode. 40 45

11. The yarn winding machine according to any one of claims 1 to 10, wherein the receiving unit receives, as a setting of the target quality, an input of a numerical value, a character, or a symbol. 50

55

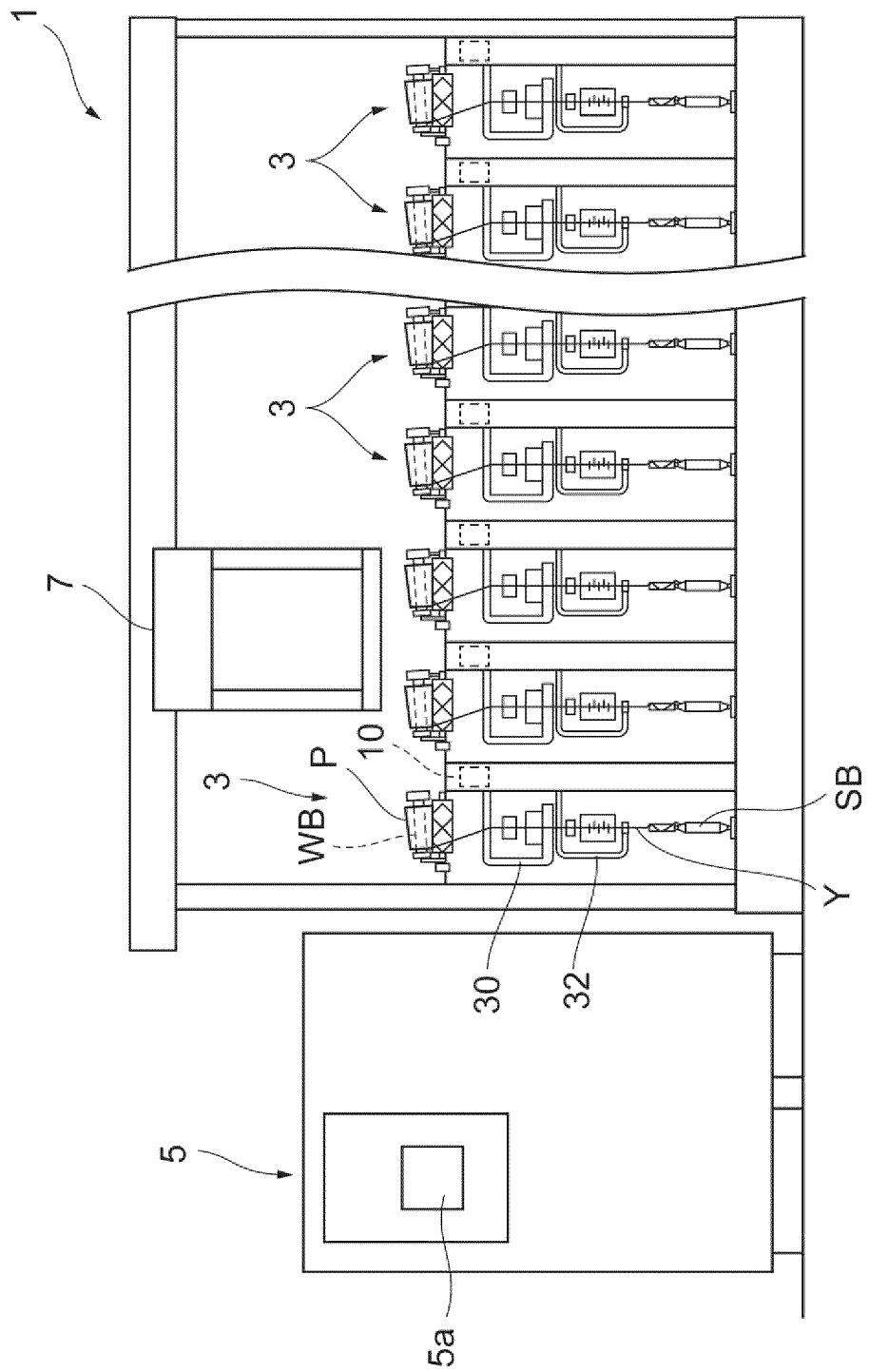


Fig. 1

Fig.2

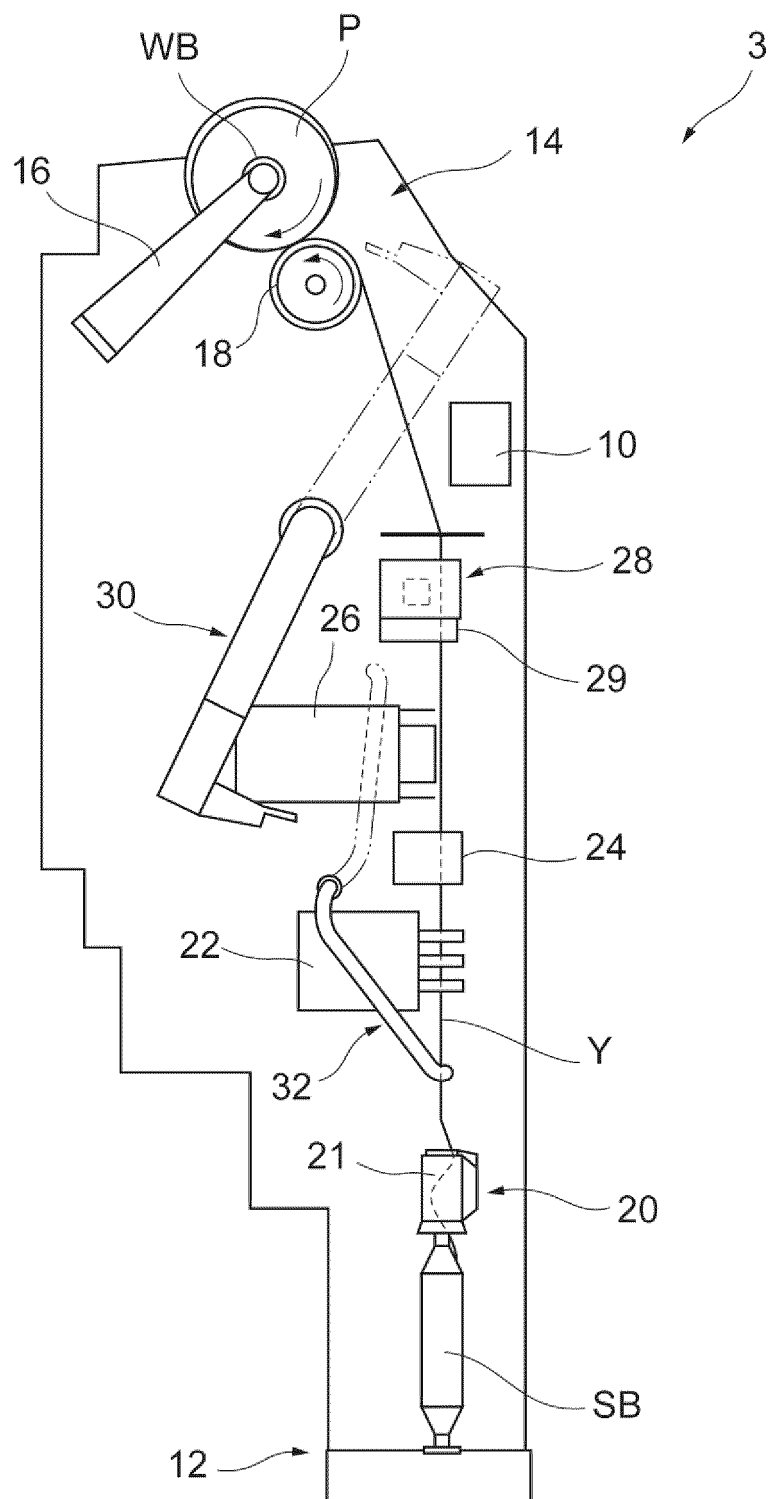
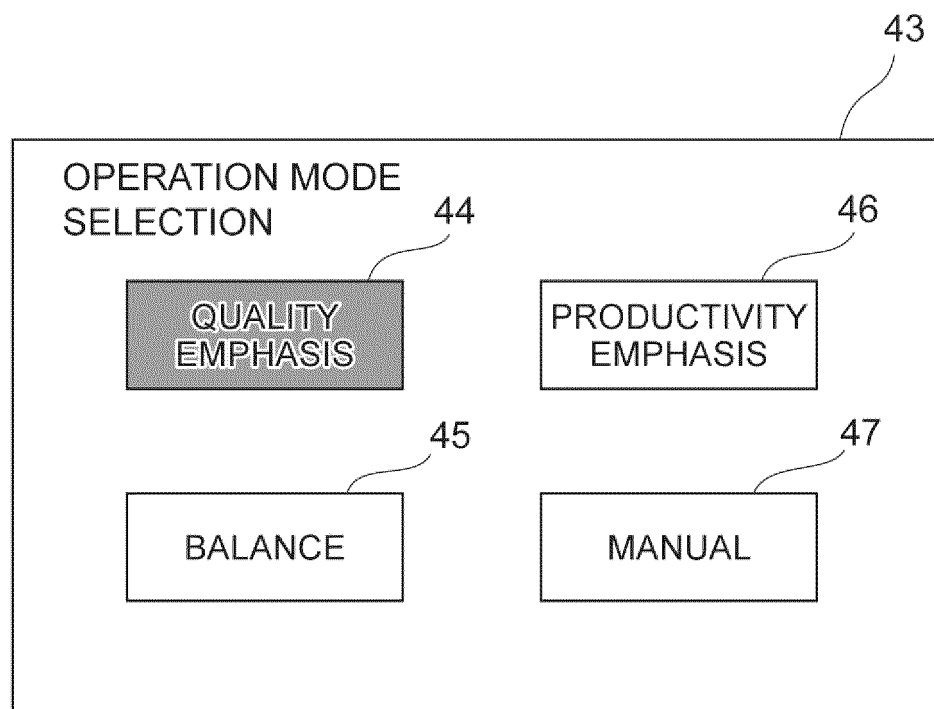


Fig.3

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	LOT 1	LOT 2	LOT 3	LOT 4	
COUNT TYPE	* * *	* * *	* * *	* * *	
COUNT	* * *	* * *	* * *	* * *	
YARN TYPE	* * *	* * *	* * *	* * *	
⋮	⋮	⋮	⋮	⋮	
OPERATION MODE	QUALITY EMPHASIS	BALANCE	PRODUCTIVITY EMPHASIS	MANUAL	
WINDING SPEED	—	—	—	1500 (m/min)	

Fig.4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/041309

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. B65H54/02 (2006.01) i, B65H63/06 (2006.01) i, D01H13/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl. B65H54/00-55/00, 59/00-73/00, 77/00-79/00, D01H1/00-17/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 6-322621 A (MURATA MACHINERY LTD.) 22 November 1994, paragraphs [0011]-[0023], fig. 1-2, 4 (Family: none)	1-9, 11 5-9, 11 10
Y A	JP 2-52865 A (TORAY ENGINEERING CO., LTD) 22 February 1990, page 1, lower left column, lines 5-7 (Family: none)	5-9, 11 10
Y A	JP 2013-249190 A (MURATA MACHINERY LTD.) 12 December 2013, paragraphs [0044]-[0045] & EP 2671832 B1, paragraphs [0042]-[0043] & CN 103449258 A	6-9, 11 10



Further documents are listed in the continuation of Box C.



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document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Patent documents cited in the description

- JP H676177 B [0003]