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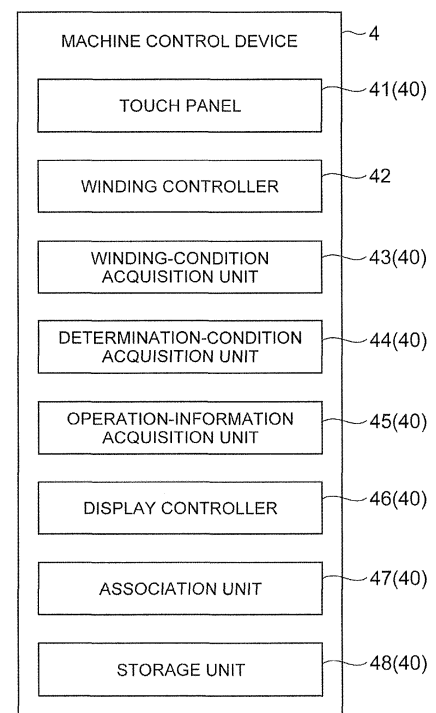
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(54) **CONDITION DISPLAY DEVICE, AND THREAD-WINDING APPARATUS**

(57) A condition display device 40 includes: a winding-condition acquisition unit 43 that acquires the winding condition for forming a package 26a; a determination-condition acquisition unit 44 that acquires a yarn-defect determination condition for determining the presence of a yarn defect; a touch panel 41; and a display controller 46 that causes the touch panel 41 to display the winding condition and the yarn-defect determination condition. The display controller 46 causes touch panel 41 to display the winding condition acquired in the winding-condition acquisition unit 43, and the yarn-defect determination condition for determining presence of the yarn defect for the yarn that is wound under the winding condition acquired.

Fig.3



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Description

Technical Field

[0001] The present disclosure relates to a condition display device and a yarn-winding machine.

Background Art

[0002] There has been a yarn-winding machine that determines the presence of a yarn defect for a yarn drawn from a yarn supplying bobbin and, while removing a yarn defect from the yarn when the yarn defect is present, forms a package by winding the yarn. Such a yarn-winding machine is described in Patent Literature 1, for example.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Publication No. 2014-19541

Summary of Invention

Technical Problem

[0004] In the yarn-winding machine, a winding condition in winding a yarn is set. Similarly, in the yarn-winding machine, a yarn-defect determination condition in determining the presence of a yarn defect is set. These winding condition and the yarn-defect determination condition are separately managed by controllers different from each other provided on the yarn-winding machine. In the present technical field, it is desired that an operator can check both of the winding condition and the yarn-defect determination condition.

[0005] Thus, the present disclosure aims to provide a condition display device and a yarn-winding machine capable of displaying both of the winding condition and the yarn-defect determination condition.

Solution to Problem

[0006] The present disclosure discloses a condition display device provided in a yarn-winding machine that determines presence of a yarn defect for a yarn drawn from a yarn winding body and forms a package by winding the yarn while removing the yarn defect from the yarn when the yarn defect is present. The condition display device includes: a winding-condition acquisition unit configured to acquire a winding condition for winding the yarn to form the package; a determination-condition acquisition unit configured to acquire a yarn-defect determination condition for determining presence of the yarn defect; a display unit configured to display information concerning the winding condition and information concerning the

yarn-defect determination condition; and a display controller configured to cause the display unit to display the information concerning the winding condition and the information concerning the yarn-defect determination condition, in which the display controller causes the display unit to display the information concerning the winding condition acquired in the winding-condition acquisition unit, and the information concerning the yarn-defect determination condition for determining the presence of the yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit, as the information concerning the winding condition and the information concerning the yarn-defect determination condition displayed on the display unit.

[0007] In this condition display device, the winding condition is acquired by the winding-condition acquisition unit and the yarn-defect determination condition is acquired by the determination-condition acquisition unit. On the display unit, displayed are the information concerning the winding condition acquired in the winding-condition acquisition unit, and the information concerning the yarn-defect determination condition for determining the presence of a yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit. As just described, the condition display device can display both of the information concerning the winding condition, and the information concerning the yarn-defect determination condition corresponding to this winding condition. Accordingly, the operator can grasp under what kind of winding condition the yarn is wound, and under what kind of yarn-defect determination condition the presence of a yarn defect for the yarn is determined.

[0008] The yarn-winding machine may include: a yarn monitoring unit configured to monitor a state of the yarn; and a condition setting unit configured to set the yarn-defect determination condition, the yarn monitoring unit may include: a detector configured to detect a state of the yarn; and a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of a detection result by the detector and the yarn-defect determination condition set by the condition setting unit, and the determination-condition acquisition unit may be configured to acquire the yarn-defect determination condition from the condition setting unit. In this case, the determination-condition acquisition unit can easily acquire the yarn-defect determination condition from the condition setting unit that sets the yarn-defect determination condition.

[0009] The yarn-winding machine may include a yarn monitoring unit configured to monitor a state of the yarn, the yarn monitoring unit may include: a detector configured to detect a state of the yarn; and a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of a detection result by the detector and the yarn-defect determination condition set in advance, and the determination-condition acquisition unit may be configured to acquire the yarn-defect deter-

mination condition from the yarn monitoring controller. In this case, the determination-condition acquisition unit can easily acquire the yarn-defect determination condition from the yarn monitoring controller.

[0010] The yarn-winding machine may include: a detector configured to detect a state of the yarn; and a quality information generator configured to generate quality information about the yarn on the basis of a detection result by the detector, and the determination-condition acquisition unit maybe configured to estimate the yarn defect that is a subject to be removed in order to achieve yarn quality indicated in the quality information acquired from the quality information generator and, based on the estimated yarn defect that is the subject to be removed, grasp the yarn-defect determination condition. In this case, even when it is not possible to acquire the yarn-defect determination condition directly, the determination-condition acquisition unit can acquire the yarn-defect determination condition on the basis of the quality information.

[0011] The display controller may be configured to cause the display unit to display the quality information generated by the quality information generator in association with the winding condition and the yarn-defect determination condition. In this case, the operator can visually recognize the winding condition, the yarn-defect determination condition, and the quality information in a comparable manner. Then, the operator can, when it is found that the yarn quality is not satisfactory from the quality information, check the winding condition and the yarn-defect determination condition corresponding thereto and consider a change and the like in each condition, for example.

[0012] The yarn-winding machine may include: a detector configured to detect a state of the yarn; and a quality information generator configured to generate quality information about the yarn on the basis of a detection result by the detector, and the display controller may be configured to cause the display unit to display the quality information generated by the quality information generator in association with the winding condition and the yarn-defect determination condition. In this case, the operator can visually recognize the winding condition, the yarn-defect determination condition, and the quality information in a comparable manner. Then, the operator can, when it is found that the yarn quality is not satisfactory from the quality information, check the winding condition and the yarn-defect determination condition corresponding thereto and consider a change and the like in each condition, for example.

[0013] The yarn-winding machine may include a determination-condition input unit to which an operator inputs the yarn-defect determination condition, and the determination-condition acquisition unit may be configured to acquire the yarn-defect determination condition on the basis of the input to the determination-condition input unit. In this case, the determination-condition acquisition unit can acquire the yarn-defect determination condition

on the basis of the input of the operator. Then, the display controller can cause the display unit to display the information concerning the winding condition acquired in the winding-condition acquisition unit, and the information concerning the yarn-defect determination condition acquired by the determination-condition acquisition unit on the basis of the input of the operator.

[0014] The yarn-winding machine may include: a yarn winding device configured to wind the yarn; and a winding controller configured to operate the yarn winding device on the basis of the winding condition set in advance, and the winding-condition acquisition unit may be configured to acquire the winding condition from the winding controller. In this case, the winding-condition acquisition unit can easily acquire the winding condition from the winding controller.

[0015] The condition display device may further include: a storage unit configured to store therein the winding condition and the yarn-defect determination condition; and an association unit configured to associate the winding condition acquired in the winding-condition acquisition unit and the yarn-defect determination condition acquired in the determination-condition acquisition unit with each other and cause the storage unit to store therein the associated conditions, and the association unit may be configured to associate with each other the winding condition acquired in the winding-condition acquisition unit, and the yarn-defect determination condition for determining presence of the yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit. In this case, the storage unit can store therein the winding condition acquired in the winding-condition acquisition unit, and the yarn-defect determination condition for determining the presence of a yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit, in a state where these conditions are associated with each other.

[0016] The yarn-winding machine may include a winding-condition input unit to which an operator inputs the winding condition, the winding-condition acquisition unit may be configured to acquire the winding condition on the basis of the input to the winding-condition input unit, and the display controller may be configured to extract the yarn-defect determination condition associated with the winding condition acquired in the winding-condition acquisition unit from the storage unit, and cause the display unit to display information concerning the extracted yarn-defect determination condition, and information concerning the winding condition acquired in the winding-condition acquisition unit. In this case, the operator can, by inputting the winding condition, grasp the yarn-defect determination condition associated with the input winding condition. As a result, the operator can grasp the yarn-defect determination condition that was set in the past and the like corresponding to the input winding condition, for example.

[0017] The yarn-defect determination condition ac-

quired by the determination-condition acquisition unit may include at least a name given to the yarn-defect determination condition. In this case, on the display unit, at least the name is displayed as the information concerning the yarn-defect determination condition. As a result, the operator can grasp the yarn-defect determination condition, by visually recognizing the name displayed on the display unit.

[0018] The determination-condition acquisition unit may be configured to acquire a setting value set as the yarn-defect determination condition, together with the name given to the yarn-defect determination condition. In this case, on the display unit, at least the name and the setting value are displayed as the information concerning the yarn-defect determination condition. As a result, the operator can grasp the detail of the yarn-defect determination condition, by visually recognizing the name and the setting value displayed on the display unit.

[0019] The condition display device may further include an operation-information acquisition unit configured to acquire an operation status of the yarn-winding machine, in which the display controller may be configured to cause the display unit to display the operation status acquired by the operation-information acquisition unit, in association with the winding condition and the yarn-defect determination condition. In this case, the operator can visually recognize the winding condition, the yarn-defect determination condition, and the operation status in a comparable manner. Then, the operator can grasp the influence of each condition to the operation status and consider a change and the like in each condition. For example, when the number of times of yarn joining (the number of times of yarn breakage) is large, the operator can check whether there is a problem in the winding condition or whether the yarn-defect determination condition is too strict, and consider a change and the like in each condition.

[0020] The yarn-winding machine may include a yarn breakage detector configured to detect a yarn breakage, and the display controller may be configured to cause the display unit to display the number of times of yarn breakage detected by the yarn breakage detector, together with information concerning the yarn-defect determination condition. Accordingly, the operator can check the number of times of yarn breakage and consider a change and the like in each condition.

[0021] The yarn-winding machine may include: a yarn winding device configured to wind the yarn; a winding controller configured to operate the yarn winding device on the basis of the winding condition; and a monitoring-unit control device configured to set the yarn-defect determination condition for a yarn-monitoring controller configured to determine the presence of the yarn defect, the winding controller and the monitoring-unit control device may be controllers different from each other, the winding controller may be configured to manage the winding condition, the monitoring-unit control device may be configured to manage the yarn-defect determination

condition, the winding-condition acquisition unit may be configured to acquire the winding condition from the winding controller, and the determination-condition acquisition unit may be configured to acquire the yarn-defect determination condition from the monitoring-unit control device. As a result, the condition display device can acquire the winding condition and the yarn-defect determination condition from the winding controller and the monitoring-unit control device, respectively.

[0022] The yarn-winding machine may include: a yarn winding device configured to wind the yarn; a winding controller configured to operate the yarn winding device on the basis of the winding condition; and a yarn monitoring unit including a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of the yarn-defect determination condition, the winding controller and the yarn monitoring controller may be controllers different from each other, the winding controller may be configured to manage the winding condition, the yarn monitoring controller may be configured to manage the yarn-defect determination condition, the winding-condition acquisition unit may be configured to acquire the winding condition from the winding controller, and the determination-condition acquisition unit may be configured to acquire the yarn-defect determination condition from the yarn monitoring controller. As a result, the condition display device can acquire the winding condition and the yarn-defect determination condition from the winding controller and the yarn monitoring controller, respectively.

[0023] A yarn-winding machine of the present disclosure includes: the above-described condition display device; a yarn feeder configured to support the yarn winding body; a winding unit configured to wind a yarn drawn from the yarn winding body and form a package; and a yarn monitoring unit arranged between the yarn feeder and the winding unit and configured to monitor a state of the yarn that runs toward the winding unit from the yarn feeder.

[0024] In this yarn-winding machine, on the display unit, the information concerning the yarn-defect determination condition and the like is displayed. Accordingly, the operator can grasp under what kind of winding condition the yarn is wound, and under what kind of yarn-defect determination condition the presence of a yarn defect for the yarn is determined, by visually recognizing the display unit.

Advantageous Effects of Invention

[0025] According to the present disclosure, it is possible to display both of the winding condition and the yarn-defect determination condition.

Brief Description of Drawings

[0026]

Fig. 1 is a block diagram illustrating a configuration of a yarn-winding machine according to an embodiment.

Fig. 2 is a block diagram illustrating a configuration of a yarn winding unit in Fig. 1.

Fig. 3 is a block diagram illustrating a configuration of a machine control device in Fig. 1.

Fig. 4 is a diagram illustrating an example of a display screen displayed on a touch panel.

Description of Embodiment

[0027] The following describes in detail an exemplary embodiment of a yarn-winding machine to which a condition display device of the present disclosure is applied, with reference to the accompanying drawings. In each of the drawings, identical or equivalent portions are denoted by identical reference signs, and redundant explanations are omitted.

[0028] As illustrated in Fig. 1, a yarn-winding machine 1 includes a plurality of yarn winding units (yarn winding devices) 2, a plurality of unit control devices 3, a machine control device 4, and a monitoring-unit control device (a condition setting unit, a quality information generator) 5. The yarn-winding machine 1 is an automatic winder. Each yarn winding unit 2 winds a yarn drawn from a yarn winding body and forms a package. The yarn winding body is a yarn supplying bobbin 21a (see Fig. 2) or a yarn supplying package, for example. In the present embodiment, as a yarn winding body, the yarn supplying bobbin 21a is used. Each unit control device 3 is provided for each yarn winding unit 2 and controls the operation of the yarn winding unit 2 that is under control. The machine control device 4 performs communication with each unit control device 3 and controls the operation of the yarn winding unit 2. Each unit control device 3 may be provided for each of the multiple yarn winding units 2 and control the operation of the yarn winding units 2 that are under control.

[0029] The unit control device 3, the machine control device 4, and the monitoring-unit control device 5 are each configured as a computer device including, for example, a processor, a memory, a storage, and a communication device. In each control device, the processor executes predetermined software (a program) read into the memory or the like, and controls the reading and writing of data in the memory and the storage, and the communication among the control devices by the communication device, thereby implementing the functions of each control device which will be described later.

[0030] As illustrated in Fig. 2, the yarn winding unit 2 includes a yarn feeder 21, a tension applying unit 22, a tension detection unit 23, a yarn monitoring device (a yarn monitoring unit, a yarn-breakage detection unit) 24, a yarn joining unit 25, and a winding unit 26.

[0031] The yarn feeder 21 supplies a yarn. The yarn feeder 21 is made up of a bobbin supporting device or the like that supports the yarn supplying bobbin 21a. Onto

the yarn supplying bobbin 21a, the yarn is wound. The tension applying unit 22 applies tension to the yarn that is drawn out from the yarn supplying bobbin 21a and is running toward the winding unit 26. The tension applying unit 22 is a gate-type tension applying device, a disk-type tension applying device, or the like. The tension detection unit 23 detects the tension produced on the yarn in winding the yarn. The unit control device 3 performs feedback control of a command value that is input to the tension applying unit 22 on the basis of the tension detected by the tension detection unit 23 such that the tension applied to the yarn by the tension applying unit 22 becomes a target value.

[0032] The yarn monitoring device 24 monitors a state of the yarn that runs toward the winding unit 26 from the yarn feeder 21, and detects a yarn defect. The yarn monitoring device 24 includes a detector 24a and a yarn monitoring controller 24b. The detector 24a detects a state of the yarn. Specifically, the detector 24a is an optical sensor that detects temporal changes in the thickness of the yarn by the changes in the amount of receiving light by irradiating the yarn with light, a capacitance sensor that detects the temporal changes in the amount of fibers of the yarn by the changes in capacitance by passing the yarn through an electric field, or the like. The detector 24a outputs to the yarn monitoring controller 24b a waveform signal indicative of the temporal changes in the thickness of the yarn or the amount of fibers.

[0033] The yarn monitoring controller 24b determines the presence of a yarn defect on the basis of the input waveform signal. If there is a yarn defect, the yarn monitoring controller 24b activates a cutter and cuts the yarn. The cutter may be provided in the yarn monitoring device 24, or may be provided in an appropriate place in the yarn winding unit 2 other than the yarn monitoring device 24.

[0034] In more detail, the yarn monitoring controller 24b determines the presence of a yarn defect on the basis of the input waveform signal (a detection result by the detector 24a) and a yarn-defect determination condition that is set in advance. In the present embodiment, the yarn-defect determination condition is set by the monitoring-unit control device 5. The yarn-defect determination condition is a condition that determines under what kind of state the yarn is determined as a yarn defect. The yarn-defect determination condition includes various setting items (setting values) for determining the presence of a yarn defect. That is, the yarn-defect determination condition is a lump (lot) of various setting items for performing the determination of the presence of a yarn defect. For example, in the yarn-defect determination condition, the length, the thickness, or the fiber amount of a yarn defect that is a subject to be removed may be included. The yarn-defect determination condition is changed according to the quality, specifications, and the like that are desired for the yarn, for example.

[0035] The yarn monitoring controller 24b outputs a yarn-defect detection signal to the unit control device 3,

when a yarn defect is detected. The yarn monitoring controller 24b further outputs a detection result by the detector 24a to the monitoring-unit control device 5. The yarn monitoring device 24 can also detect the speed of yarn that runs toward the winding unit 26 from the yarn feeder 21, a foreign object that is included in the yarn, a yarn breakage, and the like.

[0036] The monitoring-unit control device 5 is communicably connected to a plurality of yarn monitoring controllers 24b, and collectively manages the yarn monitoring controllers 24b. The monitoring-unit control device 5 transmits the yarn-defect determination condition to each yarn monitoring controller 24b, and receives the detection result by the detector 24a from each yarn monitoring controller 24b. That is, the monitoring-unit control device 5 sets the yarn-defect determination condition to the yarn monitoring controller 24b. The monitoring-unit control device 5 outputs the yarn-defect determination condition to the machine control device 4. The monitoring unit device 5 further generates quality information indicative of the quality of yarn on the basis of the detection result by the detector 24a, and outputs the quality information to the machine control device 4.

[0037] The yarn joining unit 25 performs yarn joining operation that joins together the yarn on the yarn feeder 21 side and the yarn on the winding unit 26 side, when the yarn is cut in order to remove a yarn defect detected by the yarn monitoring device 24 or when a yarn breakage is detected by the yarn monitoring device 24. The yarn joining unit 25 is made up of a first yarn catching device, a second yarn catching device, a yarn joining device, and the like. The first yarn catching device catches the yarn on the yarn feeder 21 side by suction and guides it to the yarn joining device. The second yarn catching device catches the yarn on the winding unit 26 side by suction and guides it to the yarn joining device. The yarn joining device is a splicer that uses compressed air, a piecer that uses a seed yarn, or a knoter that mechanically joins yarn, and joins the guided yarns.

[0038] The winding unit 26 winds the yarn onto a bobbin and forms a package 26a. The winding unit 26 is made up of a cradle arm, a winding drum, and the like. The cradle arm rotatively supports the package 26a. The winding drum rotates the package 26a in contact with the surface of the package 26a that is supported by the cradle arm. On the winding drum, a traverse groove is formed, and by the traverse groove, the yarn is traversed at a predetermined width with respect to the rotating package 26a. It may be configured such that a motor directly drives the package 26a to rotate, or may be configured such that the winding drum has no traverse groove and a separate traverse device (for example, a traverse arm) is provided.

[0039] As illustrated in Fig. 3, the machine control device 4 includes a touch panel 41, a winding controller 42, a winding-condition acquisition unit 43, a determination-condition acquisition unit 44, an operation-information acquisition unit 45, a display controller 46, an association

unit 47, and a storage unit 48. The touch panel 41, the winding-condition acquisition unit 43, the determination-condition acquisition unit 44, the operation-information acquisition unit 45, the display controller 46, the association unit 47, and the storage unit 48 function as a condition display device 40 that displays information concerning the winding condition and information concerning the yarn-defect determination condition. That is, in the present embodiment, the condition display device 40 is incorporated in the machine control device 4 that controls the yarn winding units 2.

[0040] The touch panel 41 displays various information presented to an operator and receives the input of various information by the operator. In the present embodiment, the touch panel 41 can display the information concerning the winding condition and the information concerning the yarn-defect determination condition. The touch panel 41 can further receive the input of the winding condition and the input of the yarn-defect determination condition by the operator. The operator can set the winding condition and the yarn-defect determination condition by inputting the winding condition and the yarn-defect determination condition to the touch panel 41. Thus, the touch panel 41 functions as a display unit and also functions as a winding-condition input unit and a determination-condition input unit.

[0041] The winding controller 42 operates the various units in the yarn winding unit 2 on the basis of the winding condition set in advance by the operator and winds the yarn. The winding condition is a condition to determine under what kind of state the yarn is wound. The winding condition includes various setting items (setting values) for winding the yarn. That is, the winding condition is a lump (lot) of various setting items for winding the yarn. For example, in the winding condition, the strength of tension applied to the yarn by the tension applying unit 22, and the winding speed of the yarn in the winding unit 26 may be included. The winding condition is changed according to the quality, specifications, and the like that are desired for the yarn, for example.

[0042] The winding-condition acquisition unit 43 acquires the winding condition with which the yarn winding unit 2 winds the yarn and forms the package 26a. Specifically, the winding-condition acquisition unit 43 can acquire from the winding controller 42 the winding condition set in the winding controller 42, for example. The winding-condition acquisition unit 43 may further acquire the winding condition that the operator input to the touch panel 41. The fact that the operator inputs the winding condition to the touch panel 41 also includes selecting the lump (lot) of various setting items.

[0043] The determination-condition acquisition unit 44 acquires the yarn-defect determination condition with which the yarn monitoring controller 24b of the yarn monitoring device 24 determines the presence of a yarn defect. Specifically, the determination-condition acquisition unit 44 can acquire from the monitoring-unit control device 5 the yarn-defect determination condition set to the

yarn monitoring controller 24b, by performing communication with the monitoring-unit control device 5, for example. The determination-condition acquisition unit 44 may acquire the yarn-defect determination condition that the operator input to the touch panel 41. For example, the determination-condition acquisition unit 44 may acquire the yarn-defect determination condition input to the touch panel 41 (or a dedicated touch panel provided for the yarn monitoring device 24 separately from the touch panel 41), when the operator sets the yarn-defect determination condition to the yarn monitoring controller 24b. The fact that the operator inputs the yarn-defect determination condition to the touch panel 41 also includes selecting the lump (lot) of various setting items.

[0044] The determination-condition acquisition unit 44 may acquire quality information about the yarn from the monitoring-unit control device 5 and, based on the acquired quality information, grasp the yarn-defect determination condition. Specifically, the determination-condition acquisition unit 44 estimates a yarn defect that is a subject to be removed in order to achieve the yarn quality indicated in the acquired quality information and, based on the estimated yarn defect that is the subject to be removed, grasps the yarn-defect determination condition. The quality information that the determination-condition acquisition unit 44 acquires from the monitoring-unit control device 5 may be grade information indicative of a grade of yarn quality. In this case, the determination-condition acquisition unit 44 may estimate a yarn defect that is a subject to be removed in order to achieve the grade of yarn indicated in the grade information and, based on the estimated yarn defect that is the subject to be removed, grasp the yarn-defect determination condition.

[0045] The determination-condition acquisition unit 44 acquires at least a name given to the yarn-defect determination condition, as the yarn-defect determination condition. The name given to the yarn-defect determination condition may be the name of the yarn-defect determination condition itself, or may be identification information such as an identification number for identifying the name of the yarn-defect determination condition. Alternatively, the determination-condition acquisition unit 44 may acquire a setting value set as the yarn-defect determination condition, together with the name given to the yarn-defect determination condition, as the yarn-defect determination condition.

[0046] The operation-information acquisition unit 45 acquires an operation status of the yarn-winding machine 1. The operation status includes information such as the number of times of yarn breakage (the number of times of yarn joining), and an actual winding speed of the yarn, for example. The operation-information acquisition unit 45 acquires the operation information from the yarn monitoring device 24, the winding controller 42, and the like.

[0047] The display controller 46 causes the touch panel 41 to display the information concerning the winding condition acquired in the winding-condition acquisition

unit 43, and the information concerning the yarn-defect determination condition acquired in the determination-condition acquisition unit 44. In more detail, the display controller 46 causes the touch panel 41 to display, as the information concerning the winding condition and the yarn-defect determination condition to be displayed on the touch panel 41, the information concerning the winding condition acquired in the winding-condition acquisition unit 43, and the information concerning the yarn-defect determination condition with which the yarn monitoring controller 24b determines the presence of a yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit 43. As just described, the display controller 46 causes the touch panel 41 to display the information concerning the winding condition, and the information concerning the yarn-defect determination condition corresponding to this winding condition.

[0048] The display controller 46 may cause the touch panel 41 to display the information concerning the yarn-defect determination condition together with the information concerning the winding condition, such that the information concerning the winding condition and the yarn-defect determination condition is simultaneously displayed on the touch panel 41. The display controller 46 may cause, based on a switching operation of the operator, the touch panel 41 to display in a switchable fashion the information concerning the winding condition and the information concerning the yarn-defect determination condition corresponding to this winding condition.

[0049] The display controller 46 can cause the touch panel 41 to display the information concerning the winding condition and the yarn-defect determination condition at any timing before starting the winding of the yarn in the yarn winding unit 2, during the winding, and after ending the winding, as long as after acquiring the winding condition and the yarn-defect determination condition by the respective winding-condition acquisition unit 43 and the determination-condition acquisition unit 44.

[0050] The display controller 46 may, in displaying the information concerning the winding condition and the yarn-defect determination condition on the touch panel 41, cause the touch panel 41 to display the yarn quality information acquired from the monitoring-unit control device 5 in association with the winding condition and the yarn-defect determination condition. This yarn quality information is the yarn quality information when the winding and the determination of the presence of a yarn defect are performed under the winding condition and the yarn-defect determination condition displayed on the touch panel 41.

[0051] The display controller 46 may, in displaying the information concerning the winding condition and the yarn-defect determination condition on the touch panel 41, cause the touch panel 41 to display the operation status acquired in the operation-information acquisition unit 45 in association with the winding condition and the yarn-defect determination condition. The display control-

ler 46 may, in displaying the information concerning the winding condition and the yarn-defect determination condition on the touch panel 41, cause the touch panel 41 to display the number of times of yarn breakage detected in the yarn monitoring device 24. This number of times of yarn breakage may be the number of times of yarn breakage from the winding start of the package 26a when the yarn winding unit 2 is being operated under the winding condition and the yarn-defect determination condition displayed on the touch panel 41, for example.

[0052] The association unit 47 associates the winding condition acquired in the winding-condition acquisition unit 43 and the yarn-defect determination condition acquired in the determination-condition acquisition unit 44 with each other, and causes the storage unit 48 to store therein the associated conditions. In more detail, the association unit 47 associates with each other the winding condition acquired in the winding-condition acquisition unit 43, and the yarn-defect determination condition with which the yarn monitoring controller 24b determines the presence of a yarn defect for the yarn that is wound under the acquired winding condition. The association unit 47 then causes the storage unit 48 to store therein the associated winding condition and the yarn-defect determination condition.

[0053] The association unit 47 may acquire quality information about the yarn from the monitoring-unit control device 5. In this case, the association unit 47 may also associate the yarn quality information, for which the winding and the determination of the presence of a yarn defect are performed under these winding condition and the yarn-defect determination condition, with those winding condition and the yarn-defect determination condition, in addition to the winding condition and the yarn-defect determination condition. Then, the association unit 47 causes the storage unit 48 to store therein the associated winding condition, the yarn-defect determination condition, and the quality information.

[0054] The association unit 47 may also cause the storage unit 48 to store therein the number of times of yarn breakage detected in the yarn monitoring device 24, and the operation information acquired in the operation-information acquisition unit 45, in association with the winding condition and the yarn-defect determination condition, as with the yarn quality information.

[0055] The display controller 46 can cause the touch panel 41 to display the information concerning the winding condition and the yarn-defect determination condition on the basis of the information stored in the association unit 47. For example, a state in which the yarn-defect determination condition is not set in the yarn monitoring controller 24b is assumed. Then, it is assumed that the operator input the winding condition via the touch panel 41 and the winding-condition acquisition unit 43 acquired the winding condition. In this case, the display controller 46 may extract the yarn-defect determination condition associated with the winding condition acquired in the winding-condition acquisition unit 43 from the storage

unit 48, and cause the touch panel 41 to display the information concerning the extracted yarn-defect determination condition, and the information concerning the winding condition acquired in the winding-condition acquisition unit 43. At that time, the display controller 46 may cause the touch panel 41 to also display the yarn quality information associated with the winding condition and the yarn-defect determination condition displayed on the touch panel 41, in association with the winding condition and the yarn-defect determination condition. The display controller 46 may cause the touch panel 41 to also display the number of times of yarn breakage and the yarn quality information, in association with the winding condition and the yarn-defect determination condition, as with the yarn quality information.

[0056] As a result, the operator can, by inputting the winding condition, grasp the information concerning the yarn-defect determination condition, the yarn quality information, and the like corresponding to the input winding condition. That is, the operator can grasp the yarn-defect determination condition that was used by the yarn monitoring controller 24b in the past in determining the presence of a yarn defect for the yarn that is wound under the input winding condition, and grasp the yarn quality information, the number of times of yarn breakage, and the operation status under such a condition.

[0057] The display controller 46 may cause the touch panel 41 to display, as the information concerning the winding condition, the name (for example, a lot name) of the winding condition set (given) for each winding condition. Similarly, the display controller 46 may cause the touch panel 41 to display, as the information concerning the yarn-defect determination condition, the name (for example, a lot name) of the yarn-defect determination condition set (given) for each yarn-defect determination condition. The operator can grasp the winding condition and the yarn-defect determination condition, by checking the name of the winding condition and the name of the yarn-defect determination condition displayed on the touch panel 41.

[0058] The display controller 46 may cause the touch panel 41 to display, as the information concerning the winding condition, the setting values of the setting items of the winding condition set for each winding condition. Similarly, the display controller 46 may cause the touch panel 41 to display, as the information concerning the yarn-defect determination condition, the setting values of the setting items of the yarn-defect determination condition set for each yarn-defect determination condition. The display controller 46 may cause the touch panel 41 to display, as the information concerning the winding condition, the setting values of the setting items of the winding condition together with the name of the winding condition. Similarly, the display controller 46 may cause the touch panel 41 to display, as the information concerning the yarn-defect determination condition, the setting values of the setting items of the yarn-defect determination condition together with the name of the yarn-defect de-

termination condition.

[0059] The association unit 47 may, in associating the winding condition with the yarn-defect determination condition, associate with each other the name of the winding condition and the name of the yarn-defect determination condition, but not the various setting items. The association unit 47 may cause the storage unit 48 to store therein the associated name of the winding condition and the name of the yarn-defect determination condition.

[0060] Fig. 4 illustrates an example of a display screen displayed on the touch panel 41. In the example illustrated in Fig. 4, a plurality of yarn winding units 2 are divided into "group 1" and "group 2", and the winding condition and the yarn-defect determination condition are displayed for each group. For example, as for the group 1, displayed are the name of the winding condition "winding lot setting 1" and the setting values of various setting items (winding condition 1, winding condition 2, ..., winding condition X) in this winding condition. In addition, displayed is the name of the yarn-defect determination condition "determination lot setting A" corresponding to this winding condition.

[0061] The display screen example illustrated in Fig. 4 may be a display screen example at the time the operator input the winding condition, the display controller 46 extracted from the storage unit 48 the yarn-defect determination condition corresponding to the input winding condition, and then the display controller 46 caused the touch panel 41 to display the input information concerning the winding condition and the information concerning the extracted yarn-defect determination condition, for example. The display screen example illustrated in Fig. 4 may be a display screen example at the time the winding-condition acquisition unit 43 and the determination-condition acquisition unit 44 acquired the respective winding condition and the yarn-defect determination condition set to the current yarn winding unit 2 and the display controller 46 caused the touch panel 41 to display the acquired information concerning the winding condition and the information concerning the yarn-defect determination condition, for example.

[0062] As just described, in the condition display device 40, the winding condition is acquired by the winding-condition acquisition unit 43 and the yarn-defect determination condition is acquired by the determination-condition acquisition unit 44. On the touch panel 41, displayed are the information concerning the winding condition acquired in the winding-condition acquisition unit 43, and the information concerning the yarn-defect determination condition with which the yarn monitoring controller 24b determines the presence of a yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit 43. As just described, the display controller 40 can display both of the information concerning the winding condition, and the information concerning the yarn-defect determination condition corresponding to this winding condition. Accordingly, the operator can grasp under what kind of

winding condition the yarn is wound, and under what kind of yarn-defect determination condition the presence of a yarn defect for the yarn is determined.

[0063] The determination-condition acquisition unit 44 can acquire from the monitoring-unit control device 5 the yarn-defect determination condition set to the yarn monitoring controller 24b. In this case, the determination-condition acquisition unit 44 can easily acquire the yarn-defect determination condition from the monitoring-unit control device 5.

[0064] The determination-condition acquisition unit 44 can acquire the yarn quality information from the monitoring-unit control device 5 and, based on the acquired quality information, grasp the yarn-defect determination condition. In this case, even when it is not possible to acquire the yarn-defect determination condition directly, the determination-condition acquisition unit 44 can acquire the yarn-defect determination condition on the basis of the quality information.

[0065] The determination-condition acquisition unit 44 may acquire the yarn-defect determination condition on the basis of the input to the touch panel 41 by the operator. In this case, even when it is not possible to perform communication with the monitoring-unit control device 5, the determination-condition acquisition unit 44 can acquire the yarn-defect determination condition on the basis of the input of the operator. Then, the display controller 46 can cause the touch panel 41 to display the information concerning the winding condition acquired in the winding-condition acquisition unit 43, and the information concerning the yarn-defect determination condition acquired in the determination-condition acquisition unit 44 on the basis of the input of the operator.

[0066] The winding-condition acquisition unit 43 can acquire from the winding controller 42 the winding condition set in the winding controller 42. In this case, the winding-condition acquisition unit 43 can easily acquire the winding condition from the winding controller 42.

[0067] The association unit 47 associates with each other the winding condition acquired in the winding-condition acquisition unit 43, and the yarn-defect determination condition with which the yarn monitoring controller 24b determines the presence of a yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit 43. The association unit 47 can cause the storage unit 48 to store therein the associated winding condition and the yarn-defect determination condition. In this case, the storage unit 48 can store therein these conditions in a state where the winding condition and the yarn-defect determination condition corresponding to this winding condition are associated with each other.

[0068] When the winding-condition acquisition unit 43 acquired the winding condition on the basis of the input to the touch panel 41 of the operator, the display controller 46 extracts from the storage unit 48 the yarn-defect determination condition associated with the acquired winding condition. Then, the display controller 46 causes

the touch panel 41 to display the information concerning the extracted yarn-defect determination condition, and the information concerning the winding condition acquired in the winding-condition acquisition unit 43. In this case, the operator can, by inputting the winding condition, grasp the yarn-defect determination condition associated with the input winding condition. For example, the operator may, after inputting the winding condition, check the yarn-defect determination condition displayed on the touch panel 41 and set the yarn-defect determination condition for the yarn monitoring controller 24b. As a result, the operator can grasp the yarn-defect determination condition that was set in the past and the like corresponding to the input winding condition, for example.

[0069] When the determination-condition acquisition unit 44 acquired the yarn-defect determination condition on the basis of the input to the touch panel 41 of the operator, the display controller 46 extracts from the storage unit 48 the winding condition associated with the acquired yarn-defect determination condition. Then, the display controller 46 may cause the touch panel 41 to display the information concerning the extracted winding condition, and the information concerning the yarn-defect determination condition acquired in the determination-condition acquisition unit 44.

[0070] The display controller 46 causes the touch panel 41 to display the yarn quality information in association with the winding condition and the yarn-defect determination condition. In this case, the operator can visually recognize the winding condition, the yarn-defect determination condition, and the quality information in a comparable manner. Then, the operator can, when it is found that the yarn quality is not satisfactory from the quality information, check the winding condition and the yarn-defect determination condition corresponding thereto and consider a change and the like in each condition, for example.

[0071] The display controller 46 causes the touch panel 41 to display, as the information concerning the yarn-defect determination condition, the name of the yarn-defect determination condition. In this case, the operator can grasp the yarn-defect determination condition, by visually recognizing the name displayed on the touch panel 41.

[0072] The display controller 46 causes the touch panel 41 to display, as the information concerning the yarn-defect determination condition, the setting values set as the yarn-defect determination condition together with the name of the yarn-defect determination condition. As a result, the operator can grasp the detail of the yarn-defect determination condition, by visually recognizing the name and the setting values displayed on the touch panel 41.

[0073] The display controller 46 causes the touch panel 41 to display the operation information acquired by the operation-information acquisition unit 45, together with the information concerning the yarn-defect determination condition. In this case, the operator can visually recog-

nize the winding condition, the yarn-defect determination condition, and the operation status in a comparable manner. Then, the operator can grasp the influence of each condition to the operation status and consider a change and the like in each condition. For example, when the number of times of yarn joining (the number of times of yarn breakage) is large, the operator can check whether there is a problem in the winding condition or whether the yarn-defect determination condition is too strict, and consider a change and the like in each condition.

[0074] The display controller 46 causes the touch panel 41 to display the number of times of yarn breakage detected by the yarn monitoring device 24, together with the information concerning the yarn-defect determination condition and the like. In this case, the operator can check the number of times of yarn breakage and consider a change and the like in each condition.

[0075] As in the foregoing, the embodiment of the present disclosure has been described. The disclosure, however, is not limited to the above-described embodiment. For example, the condition display device 40 is not limited to being provided in the machine control device 4. The condition display device 40 may be provided in the unit control device 3, or may be provided independently of the unit control device 3, the machine control device 4, and the like. The winding-condition input unit to which the operator inputs the winding condition and the determination-condition input unit to which the yarn-defect determination condition is input may be configured by an operation button and the like separately from the touch panel 41. The touch panel may be provided individually for the machine control device 4 and the monitoring-unit control device 5.

[0076] The yarn monitoring device 24 may be not provided with the yarn monitoring controller 24b that determines the presence of a yarn defect. In this case, the unit control device 3, the machine control device 4, or the monitoring-unit control device 5 may determine the presence of a yarn defect on the basis of the detection result by the detector 24a and the yarn-defect determination condition, for example. The yarn-winding machine 1 may be not provided with the monitoring-unit control device 5. In this case, the yarn monitoring controller 24b performs communication directly with the unit control device 3 or the machine control device 4, or performs communication with the machine control device 4 via the unit control device 3, and the yarn monitoring controller 24b outputs the detection result by the detector 24a or the yarn-defect determination condition to the unit control device 3 or the machine control device 4. As a result, the determination-condition acquisition unit 44 can acquire the yarn-defect determination condition from the yarn monitoring device 24.

[0077] The winding condition and the yarn-defect determination condition stored in the storage unit 48 are not limited to being available to the machine control device 4, and may be available to the yarn monitoring device 24 also.

[0078] The winding condition and the yarn-defect determination condition are managed by controllers different from each other (for example, controllers provided away from each other, or controllers configured on separate substrates; in the above-described embodiment, the winding controller 42 and the monitoring-unit control device 5, or the winding controller 42 and the yarn monitoring controller 24b). That is, the winding condition and the yarn-defect determination condition are stored in the storage units that the respective controllers include, for example. In the above-described embodiment, as for the winding condition, the storage unit 48 that stores therein the winding condition and the yarn-defect determination condition in association with each other may also have a function of storing the winding condition. The condition display device 40 of the present embodiment can acquire the winding condition and the yarn-defect determination condition from the respective controllers (read out from the respective storage units), cause the storage unit 48 to store therein both of the acquired conditions, and cause the touch panel 41 to display the conditions.

Reference Signs List

[0079]

1 Yarn-Winding Machine
 2 Yarn Winding Unit (Yarn Winding Device)
 5 Monitoring-Unit Control Device (Condition Setting Unit, Quality Information Generator)
 21a Yarn Supplying Bobbin
 24 Yarn Monitoring Device (Yarn Monitoring Unit, Yarn Breakage Detector)
 24a Detector
 24b Yarn Monitoring Controller
 26a Package
 40 Condition Display Device
 41 Touch Panel (Display Unit, Winding-Condition Input Unit, Determination-Condition Input Unit)
 42 Winding Controller
 43 Winding-Condition Acquisition Unit
 44 Determination-Condition Acquisition Unit
 45 Operation-Information Acquisition Unit
 46 Display Controller
 47 Association Unit
 48 Storage Unit

Claims

1. A condition display device provided in a yarn-winding machine that determines presence of a yarn defect for a yarn drawn from a yarn winding body and forms a package by winding the yarn while removing the yarn defect from the yarn when the yarn defect is present, the condition display device comprising:

a winding-condition acquisition unit configured

to acquire a winding condition for winding the yarn to form the package;
 a determination-condition acquisition unit configured to acquire a yarn-defect determination condition for determining presence of the yarn defect;
 a display unit configured to display information concerning the winding condition and information concerning the yarn-defect determination condition; and
 a display controller configured to cause the display unit to display the information concerning the winding condition and the information concerning the yarn-defect determination condition, wherein
 the display controller causes the display unit to display, as the information concerning the winding condition and the information concerning the yarn-defect determination condition displayed on the display unit, the information concerning the winding condition acquired in the winding-condition acquisition unit, and the information concerning the yarn-defect determination condition for determining the presence of the yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit.

2. The condition display device according to claim 1, wherein
 the yarn-winding machine includes:

a yarn monitoring unit configured to monitor a state of the yarn; and
 a condition setting unit configured to set the yarn-defect determination condition,

the yarn monitoring unit includes:

a detector configured to detect a state of the yarn; and
 a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of a detection result by the detector and the yarn-defect determination condition set by the condition setting unit, and

the determination-condition acquisition unit is configured to acquire the yarn-defect determination condition from the condition setting unit.

3. The condition display device according to claim 1, wherein
 the yarn-winding machine includes a yarn monitoring unit configured to monitor a state of the yarn,
 the yarn monitoring unit includes:

a detector configured to detect a state of the

- yarn; and
a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of a detection result by the detector and the yarn-defect determination condition set in advance, and
- the determination-condition acquisition unit is configured to acquire the yarn-defect determination condition from the yarn monitoring controller.
4. The condition display device according to claim 1, wherein
the yarn-winding machine includes:
- a detector configured to detect a state of the yarn; and
a quality information generator configured to generate quality information about the yarn on the basis of a detection result by the detector, and
- the determination-condition acquisition unit is configured to estimate the yarn defect that is a subject to be removed in order to achieve yarn quality indicated in the quality information acquired from the quality information generator and, based on the estimated yarn defect that is the subject to be removed, grasp the yarn-defect determination condition.
5. The condition display device according to claim 4, wherein the display controller is configured to cause the display unit to display the quality information generated by the quality information generator in association with the winding condition and the yarn-defect determination condition.
6. The condition display device according to any one of claims 1 to 3, wherein
the yarn-winding machine includes:
- a detector configured to detect a state of the yarn; and
a quality information generator configured to generate quality information about the yarn on the basis of a detection result by the detector, and
- the display controller is configured to cause the display unit to display the quality information generated by the quality information generator in association with the winding condition and the yarn-defect determination condition.
7. The condition display device according to claim 1, wherein
the yarn-winding machine includes a determination-condition input unit to which an operator inputs the
- yarn-defect determination condition, and
the determination-condition acquisition unit is configured to acquire the yarn-defect determination condition on the basis of the input to the determination-condition input unit.
8. The condition display device according to one of claims 1 to 7, wherein the yarn-winding machine includes:
- a yarn winding device configured to wind the yarn; and
a winding controller configured to operate the yarn winding device on the basis of the winding condition set in advance, and
- the winding-condition acquisition unit is configured to acquire the winding condition from the winding controller.
9. The condition display device according to any one of claims 1 to 8, further comprising:
- a storage unit configured to store therein the winding condition and the yarn-defect determination condition; and
an association unit configured to associate the winding condition acquired in the winding-condition acquisition unit and the yarn-defect determination condition acquired in the determination-condition acquisition unit with each other and cause the storage unit to store therein the associated conditions, wherein
the association unit is configured to associate with each other the winding condition acquired in the winding-condition acquisition unit, and the yarn-defect determination condition for determining presence of the yarn defect for the yarn that is wound under the winding condition acquired in the winding-condition acquisition unit.
10. The condition display device according to claim 9, wherein
the yarn-winding machine includes a winding-condition input unit to which an operator inputs the winding condition,
the winding-condition acquisition unit is configured to acquire the winding condition on the basis of the input to the winding-condition input unit, and
the display controller is configured to extract the yarn-defect determination condition associated with the winding condition acquired in the winding-condition acquisition unit from the storage unit, and cause the display unit to display information concerning the extracted yarn-defect determination condition, and information concerning the winding condition acquired in the winding-condition acquisition unit.

11. The condition display device according to any one of claims 1 to 10, wherein the yarn-defect determination condition acquired by the determination-condition acquisition unit includes at least a name given to the yarn-defect determination condition. 5
12. The condition display device according to claim 11, wherein the determination-condition acquisition unit is configured to acquire a setting value set as the yarn-defect determination condition, together with the name given to the yarn-defect determination condition. 10
13. The condition display device according to any one of claims 1 to 12, further comprising an operation-information acquisition unit configured to acquire an operation status of the yarn-winding machine, wherein the display controller is configured to cause the display unit to display the operation status acquired by the operation-information acquisition unit, in association with the winding condition and the yarn-defect determination condition. 15 20
14. The condition display device according to any one of claims 1 to 13, wherein the yarn-winding machine includes a yarn breakage detector configured to detect a yarn breakage, and the display controller is configured to cause the display unit to display the number of times of yarn breakage detected by the yarn breakage detector, together with information concerning the yarn-defect determination condition. 25 30
15. The condition display device according to claim 1, wherein the yarn-winding machine includes: 35
- a yarn winding device configured to wind the yarn; 40
 - a winding controller configured to operate the yarn winding device on the basis of the winding condition; and
 - a monitoring-unit control device configured to set the yarn-defect determination condition for a yarn-monitoring controller configured to determine the presence of the yarn defect, 45
- the winding controller and the monitoring-unit control device are controllers different from each other, 50
- the winding controller is configured to manage the winding condition,
- the monitoring-unit control device is configured to manage the yarn-defect determination condition,
- the winding-condition acquisition unit is configured to acquire the winding condition from the winding controller, and 55
- the determination-condition acquisition unit is configured to acquire the yarn-defect determination condition from the monitoring-unit control device.
16. The condition display device according to claim 1, wherein the yarn-winding machine includes:
- a yarn winding device configured to wind the yarn;
 - a winding controller configured to operate the yarn winding device on the basis of the winding condition; and
 - a yarn monitoring unit including a yarn monitoring controller configured to determine the presence of the yarn defect on the basis of the yarn-defect determination condition,
- the winding controller and the yarn monitoring controller are controllers different from each other, the winding controller is configured to manage the winding condition, the yarn monitoring controller is configured to manage the yarn-defect determination condition, the winding-condition acquisition unit is configured to acquire the winding condition from the winding controller, and the determination-condition acquisition unit is configured to acquire the yarn-defect determination condition from the yarn monitoring controller.
17. A yarn-winding machine comprising:
- the condition display device according to any one of claims 1 to 16;
 - a yarn feeder configured to support the yarn winding body;
 - a winding unit configured to wind a yarn drawn from the yarn winding body and form a package; and
 - a yarn monitoring unit arranged between the yarn feeder and the winding unit and configured to monitor a state of the yarn that runs toward the winding unit from the yarn feeder.

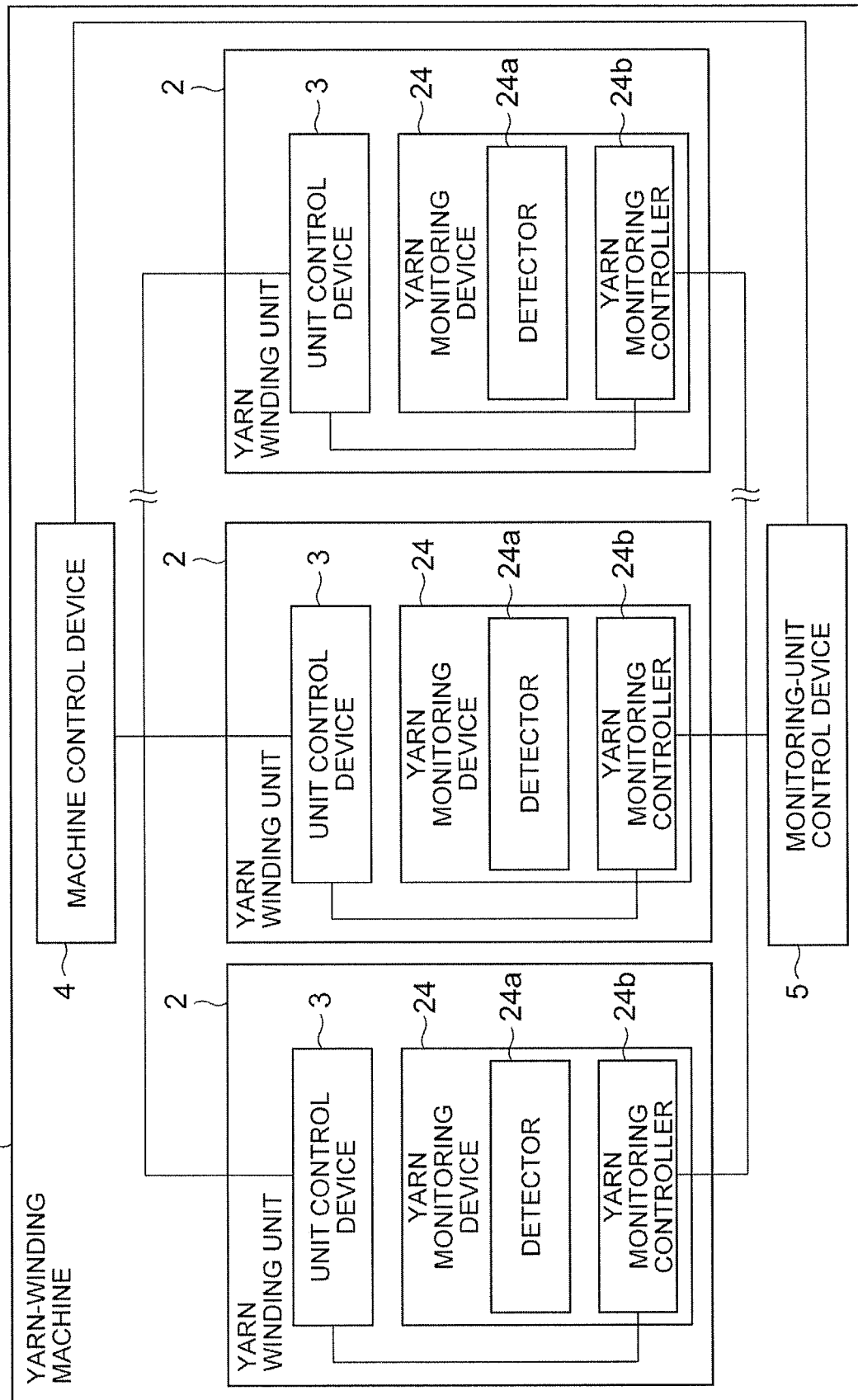
Fig.1

Fig.2

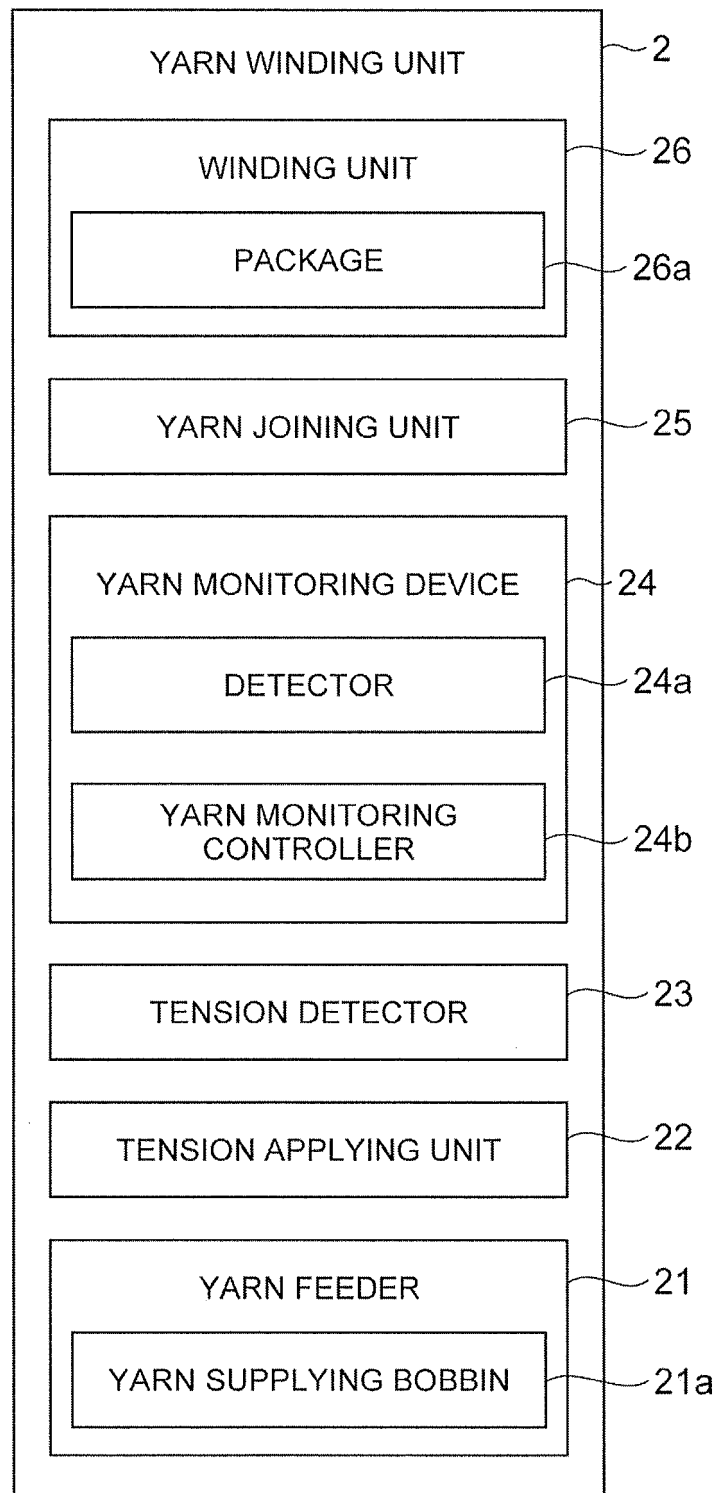


Fig.3

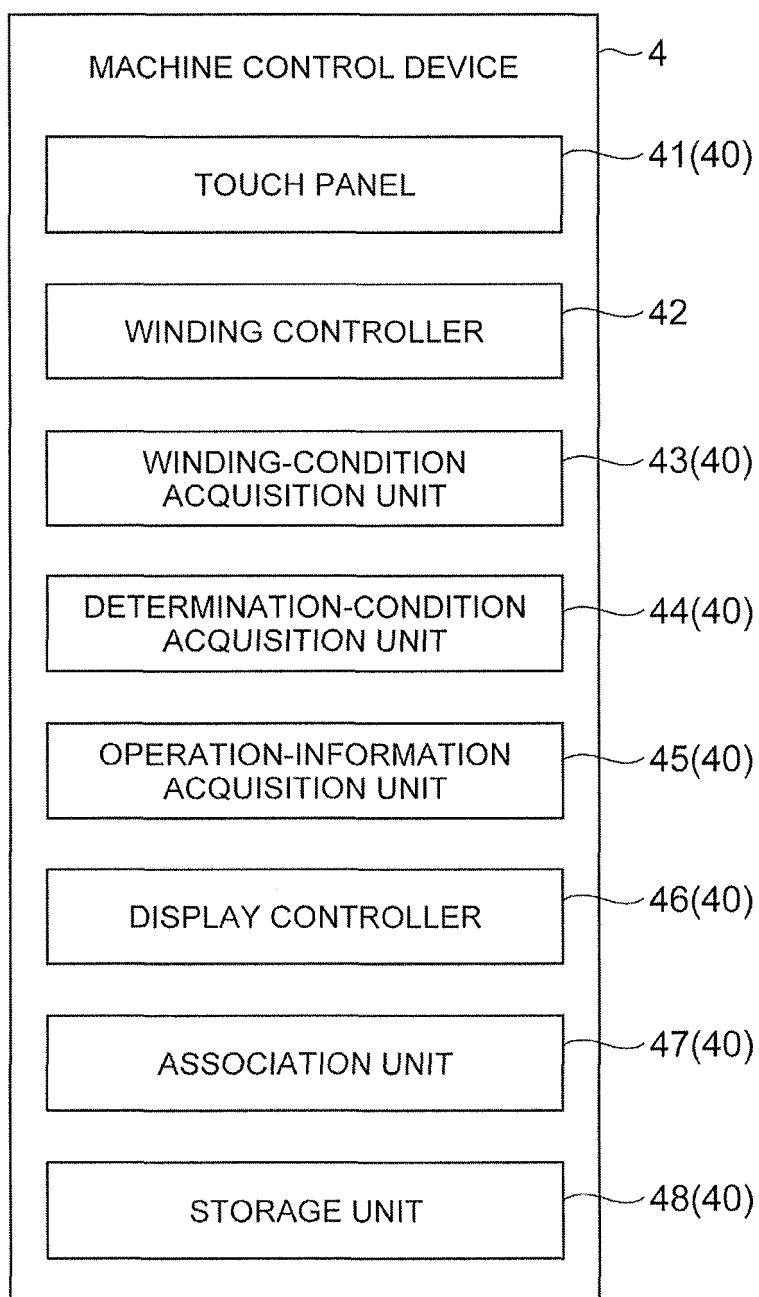


Fig.4

	GROUP 1		GROUP 2	
	WINDING LOT SETTING 1		WINDING LOT SETTING 2	
WINDING CONDITION 1	OOO		△△△	
WINDING CONDITION 2	ON		OFF	
WINDING CONDITION 3	□□□		□□□	
⋮	⋮		⋮	
WINDING CONDITION X	△△		× ×	
YARN-DEFECT DETERMINATION CONDITION NAME	DETERMINATION LOT SETTING A		DETERMINATION LOT SETTING B	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/014089

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B65H63/00 (2006.01) i, D01H13/22 (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. B65H63/00, D01H13/22

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	JP 2002-87703 A (MURATA MACHINERY, LTD.) 27 March 2002, paragraphs [0010]-[0029], fig. 1-11 & EP 1186977 A2, paragraphs [0016]-[0053], fig. 1-11	1-3, 6-13 4-5, 8-17
Y	JP 2016-657 A (SAURER GERMANY GMBH & CO. KG.) 07 January 2016, paragraphs [0033]-[0035] & EP 2955143 A1	4-5, 8-14, 17
Y	JP 10-312213 A (TOSHIBA CORP.) 24 November 1998, paragraphs [0057]-[0068], fig. 9-11 (Family: none)	11-14, 17
Y	JP 2015-140252 A (MURATA MACHINERY, LTD.) 03 August 2015, paragraphs [0028]-[0103], fig. 1-7 & DE 102014019229 A1	15-17
A	JP 2010-269915 A (MURATA MACHINERY, LTD.) 02 December 2010, paragraphs [0056]-[0057] & WO 2010/134294 A1 & EP 2433889 A1, paragraphs [0056]-[0057]	1-17
A	JP 2004-352465 A (MURATA MACHINERY, LTD.) 16 December 2004 & EP 1481932 A1	1-17

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11 May 2018 (11.05.2018)

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