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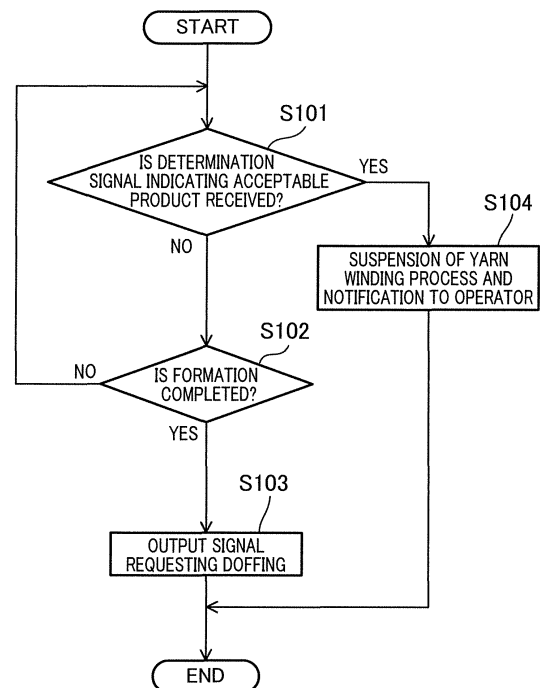
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(54) **TEXTILE MACHINE**

(57) The present invention addresses the problem of making it possible to distinguish a good package and a semi-good package. This textile machine is provided with a winding unit which performs a yarn winding process for forming a package by winding a yarn supplied from a yarn supply part around a winding tube. The winding unit has: a yarn clearer that is provided with a clearer body, which monitors a traveling yarn and detects non-allowable defects that require removal and allowable defects that do not require removal, and a cutter that cuts the yarn when the non-allowable defects are detected; a clearer control part which, on the basis of data about the allowable defects, determines whether the package is a good product, in which the amount of the allowable defects is no greater than a threshold value, or a semi-good product, in which the amount of the allowable defects exceeds the threshold value; and a unit control part. When the package is determined by the clearer control part to be the semi-good product, the unit control part causes the winding unit to perform an operation different from that performed when the package is a good product.

FIG.8



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Description**[Summary of Invention]****[Technical Field]****[Technical Problem]**

[0001] The present invention relates to a textile machine.

[Background Art]

[0002] Patent Literature 1 recites an automatic winder which includes winding units which are configured to form packages by winding yarns supplied from a yarn supplying unit onto take up tubes and a doffing wagon which is configured to doff the formed packages. Each winding unit includes a yarn quality measuring device (clearer) which is configured to detect a yarn defect by monitoring a yarn running from the yarn supplying unit to the take up tube, a cutter by which the yarn is cut when a yarn defect is found, and a yarn joining device configured to join the yarn having been cut. For example, when a part of a yarn, which is too thick or too thin as compared to a target thickness, is determined as a yarn defect as a result of monitoring of the thickness of the yarn, the clearer causes the cutter to cut the yarn. The yarn is cut by the cutter into a yarn part on the yarn supplying unit side and a yarn part on the take up tube side in the yarn running direction. After the yarn parts are joined by the yarn joining device, it becomes possible to wind the yarn onto the take up tube again. In this way, the winding unit winds the yarn onto the bobbin while removing the yarn defect. The doffing wagon runs between plural winding units, and performs doffing of detaching a fully-wound package from a winding unit.

[0003] To be more specific, in the clearer, an upper limit and a lower limit are set for determining whether a yarn defect is generated in a running yarn, as described in Patent Literature 2, for example. When the difference between the thickness of a running yarn and the target thickness does not fall within the range between the upper and lower limits, the clearer determines that an unacceptable yarn defect is generated and causes the cutter to cut the yarn. When the difference falls within the range, the clearer allows the yarn to continue the running, without cutting the yarn. Furthermore, the clearer determines that a part of the yarn having thickness with which the difference falls within the range, which part is close to the limit, is an acceptable yarn defect, and stores information of such a yarn defect.

[Citation List]**[Patent Literatures]****[0004]**

[Patent Literature 1] Japanese Laid-Open Patent Publication No. 2017-190210

[Patent Literature 2] Japanese Patent No. 5224200

[0005] A part of the yarn, which is determined as an unacceptable yarn defect, is cut and removed. Meanwhile, a part which is determined as an acceptable yarn defect is not cut and wound onto the take up tube, and is consequently included in the package. Preferably, a package including a predetermined amount or more of the acceptable yarn defects is considered as an acceptable product which is lower in yarn quality than a good product including a small amount of the acceptable yarn defects, and is treated in a way different from the good product. The doffing wagon recited in Patent Literature 1, however, typically doffs packages which are good products and packages which are acceptable products, without sorting them. For this reason, good products and acceptable products may be disadvantageously shipped in a mixed manner.

[0006] An object of the present invention is to make it possible to sort packages into good products and acceptable products.

[Solution to Problem]

[0007] According to a first aspect of the invention, a textile machine includes at least one winding unit which performs a yarn winding process of forming at least one package by winding a yarn supplied from a yarn supplying unit onto a take up tube, the at least one winding unit including: a yarn quality measuring device which is configured to detect, by monitoring a running yarn, an unacceptable defect which needs to be removed and an acceptable defect which does not need to be removed and to cut the yarn when the unacceptable defect is detected; a determination unit which is configured to determine whether the at least one package is a good product in which the total amount of acceptable defects is not larger than a predetermined reference value or an acceptable product in which the total amount of acceptable defects is larger than the reference value, based on data of the acceptable defect; and a unit controller, when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller causing the at least one winding unit to perform an operation different from an operation performed when the at least one package is the good product.

[0008] According to the present invention, when the yarn quality measuring device determines that the package is an acceptable product, the winding unit performs an operation different from the operation performed in the normal state (when the package is a good product). This, for example, notifies the operator that the package is not a good product. It is therefore possible to sort packages into packages which are good products and packages which are acceptable products.

[0009] According to a second aspect of the invention,

the textile machine of the first aspect is arranged such that the yarn quality measuring device includes the determination unit.

[0010] When the yarn quality measuring device detecting the acceptable defect and the determination unit determining the quality of the package are provided to be independent from each other, problems such as increase in data communication amount and cost increase may occur. The occurrence of such problems can be suppressed by the present invention, because the yarn quality measuring device includes the determination unit.

[0011] According to a third aspect of the invention, the textile machine of the first or second aspect is arranged such that the at least one winding unit includes a notification unit configured to output information, and when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller causes the notification unit to notify that the at least one package is the acceptable product.

[0012] In the present invention, because the notification unit notifies that the package is an acceptable product, the operator is promptly notified of this information and is demanded to immediately perform a response.

[0013] According to a fourth aspect of the invention, the textile machine of any one of the first to third aspects is arranged such that, while the at least one package is being formed by the at least one winding unit, the determination unit increments the amount of acceptable defects detected by the yarn quality measuring device, and determines that the at least one package is the acceptable product when the total amount of acceptable defects in the package exceeds the reference value.

[0014] In the present invention, when it is determined that the package being formed is an acceptable product, it is possible to cause the winding unit to perform the operation different from the normal operation (when the package is a good product). It is therefore possible to swiftly sort the acceptable products.

[0015] According to a fifth aspect of the invention, the textile machine of the fourth aspect is arranged such that, when it is determined by the determination unit that the at least one package is the acceptable product while the at least one package is being formed, the unit controller causes the at least one winding unit to suspend the yarn winding process.

[0016] For example, when it is determined that the package is an acceptable product immediately after the start of the yarn winding process performed by the winding unit, the package which is an acceptable product but includes a large amount of acceptable defects and is low in quality may be formed if the yarn winding process is continued. In the present invention, because the yarn winding process can be suspended when it is determined that the package is an acceptable product, it is possible to detach the low-quality package even if the formation of the package is still in progress.

[0017] According to a sixth aspect of the invention, the textile machine of the fourth aspect is arranged such that,

even when it is determined by the determination unit that the at least one package is the acceptable product while the at least one package is being formed, the unit controller causes the at least one winding unit to continue formation of the at least one package.

[0018] In the present invention, even if it is found that the package is an acceptable product while the formation of the package is still in progress, the formation of the package is continued. With this, as compared to the case where the yarn winding process is suspended, the formation of the package is done quickly and the deterioration in production efficiency is suppressed.

[0019] According to a seventh aspect of the invention, the textile machine of any one of the first to sixth aspects further includes a doffing device which is configured to doff the at least one package, the unit controller outputting a doffing request signal which requests the doffing device to perform doffing, when the at least one package is the good product, and not outputting the doffing request signal when it is determined by the determination unit that the at least one package is the acceptable product.

[0020] In the present invention, because it is possible to prevent an acceptable product from being doffed by the doffing device, prevention of mixture of good products and acceptable products is ensured as the operator detaches acceptable products from the winding unit and treats them differently from good products.

[0021] According to an eighth aspect of the invention, the textile machine of the seventh aspect is arranged such that, when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller outputs a signal which requests the doffing device to add identification information based on which the acceptable product is distinguished from the good product.

[0022] In the present invention, it is possible to cause the doffing device to perform addition of the identification information based on which acceptable products can be distinguished from good products, and hence it is possible to sort packages into acceptable products from good products even if they are mixed. Furthermore, it is possible to save the operator's labor of adding the identification information.

[0023] According to a ninth aspect of the invention, the textile machine of any one of the first to sixth aspects further includes a doffing device which is configured to doff the at least one package, when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller outputting a signal which requests the doffing device to add identification information based on which the acceptable product is distinguished from the good product, before a signal requesting the doffing device to perform doffing is output.

[0024] In the present invention, before the doffing is performed, it is possible to cause the doffing device to perform addition of the identification information based on which acceptable products can be distinguished from good products, and hence it is possible to sort packages

into acceptable products and good products even if they are mixed. Furthermore, it is possible to save the operator's labor of adding the identification information. Furthermore, as compared to a case where the doffing request signal is not output, it is possible to save the operator's labor of detaching a package which is an acceptable product.

[0025] According to a tenth aspect of the invention, the textile machine of any one of the first to sixth aspects further includes a doffing device which is configured to doff the at least one package, the at least one winding unit including an operation unit in which a doffing request operation for outputting a doffing request signal which requests the doffing device to perform doffing is performed by an operator, and when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller outputting the doffing request signal only when the operator has performed the doffing request operation.

[0026] In the present invention, an acceptable product is not doffed until the operator makes a doffing request. In this way, before the doffing request operation is performed, the operator is able to perform a process for making it possible to distinguish good products from acceptable products. On this account, it is possible to sort packages into acceptable products and good products even if they are mixed due to the doffing of the acceptable products. Furthermore, as the doffing device performs doffing, it is possible to save the operator's labor of detaching a package which is an acceptable product.

[0027] According to an eleventh aspect of the invention, the textile machine of any one of the first to tenth aspects further includes: a plurality of the at least one winding unit; a conveyor which is configured to convey a plurality of the at least one package formed by the winding units; individual passages each of which is provided between each of the winding units and the conveyor, the packages moving on the individual passages from the winding units toward the conveyor; and a stopper which is provided between each of the individual passages and the conveyor, the stopper being switchable between an allowing position where each of the packages is allowed to roll on to the conveyor and a preventing position where each of the packages is not allowed to roll on to the conveyor, and when it is determined by the determination unit that each of the packages is the acceptable product, the unit controller positioning the stopper at the preventing position.

[0028] According to the present invention, before a formed package heading toward the conveyor is mixed with another package on the conveyor or at a conveyance destination, it is possible to stop each package on the individual passage by the stopper. It is therefore possible for the operator to add information based on which an acceptable product and a good product are identified to a package which is an acceptable product, before packages are mixed on the conveyor or at a conveyance destination. Furthermore, the operator is able to remove the

stopped acceptable product.

[0029] According to a twelfth aspect of the invention, the textile machine of any one of the first to eleventh aspects is arranged such that the determination unit determines whether the unacceptable defect is generated and whether the acceptable defect is generated, based on thickness of the yarn monitored by the yarn quality device.

[0030] When the thickness of a yarn is inconsistent in a package, uneven dyeing tends to occur. It is therefore effective to monitor the thickness of the yarn when the package is formed. In the present invention, determination of the generation of the unacceptable defect and determination of the generation of the acceptable defect are performed based on the thickness of the yarn. It is therefore possible to properly detect a yarn defect which needs to be removed and determine the quality of a formed package.

[Brief Description of Drawings]

[0031]

FIG. 1 is a front elevation of an automatic winder of an embodiment.

FIG. 2 is a block diagram of an electric configuration of the automatic winder.

FIG. 3 is a front elevation which schematically shows a winding unit.

FIG. 4 is an explanatory view of a display.

FIG. 5(a) and FIG. 5(b) show an unacceptable defect and an acceptable defect of a yarn.

FIG. 6 shows a graph indicating the distribution of thickness of the yarn.

FIG. 7 shows a graph indicating increase in the total amount of acceptable defects in accordance with increase in yarn winding length.

FIG. 8 is a flowchart showing a process performed by a unit controller.

FIG. 9(a), FIG. 9(b), and FIG. 9(c) are explanatory views of images displayed by the display.

FIG. 10 relates to a modification and is a flowchart showing a process performed by a unit controller.

FIG. 11 relates to another modification and is a flowchart showing a process performed by a unit controller.

FIG. 12 relates to another modification and is a flowchart showing a process performed by a unit controller.

Each of FIGs. 13(a) to 13(c) relates to another modification and shows the structure of a rear portion of an automatic winder.

[Description of Embodiments]

[0032] The following will describe an embodiment of the present invention with reference to FIG. 1 to FIG. 9(c). As shown in FIG. 1, a direction in which winding

units 2 are aligned will be referred to as a left-right direction, whereas a direction in which the gravity acts will be referred to as an up-down direction.

(Outline of Automatic Winder)

[0033] To begin with, an automatic winder 1 (a textile machine of the present invention) will be outlined with reference to FIG. 1 and FIG. 2. FIG. 1 is a front elevation of the automatic winder 1 of the present embodiment. FIG. 2 is a block diagram of an electric configuration of the automatic winder 1. The automatic winder 1 includes a plurality of winding units 2, a doffing device 3, and a machine controller 4.

[0034] The winding units 2 are aligned in the left-right direction and each of these units performs a yarn winding process of forming a package P by winding a yarn Y unwound from a yarn supplying bobbin Bk onto a winding bobbin Bm (see FIG. 3; a take up tube of the present invention). The doffing device 3 is provided above the winding units 2 and is arranged to be movable in the left-right direction between the winding unit 2 provided at the left end (or the right end) and the winding unit 2 provided at the right end (or the left end). When receiving a signal (doffing request signal) indicating that the formation of a package is completed from a winding unit 2, the doffing device 3 moves to a location above and/or in front of that winding unit 2 and performs operations such as detachment of the fully-wound package P and attachment of an empty winding bobbin Bm to the winding unit 2.

[0035] The machine controller 4 is provided to the left of the winding units 2. The machine controller 4 is electrically connected to a unit controller 60 of each winding unit 2 and a doffing controller 61 of the doffing device 3 and communicates with these controllers.

(Winding Unit)

[0036] The structure of the winding unit 2 will be described with reference to FIG. 2 to FIG. 4. FIG. 3 is a front elevation which schematically shows the winding unit 2. FIG. 4 is a front elevation of a later-described display 50.

[0037] As shown in FIG. 3, the winding unit 2 includes members such as a unit main body 10, a yarn supplying unit 20, a yarn processing execution unit 30, a winding unit 40, the display 50, and the unit controller 60. The unit main body 10 is a pillar-shaped member and is long in the up-down direction. The yarn supplying unit 20, the yarn processing execution unit 30, and the winding unit 40 are provided in the unit main body 10 in this order. The yarn supplying unit 20 is the lowest in position whereas the winding unit 40 is the highest in position. The display 50 is provided at a front surface of an upper end portion of the unit main body 10.

[0038] The yarn supplying unit 20 is provided to supply the yarn Y while unwinding the yarn Y wound on the yarn supplying bobbin Bk. The yarn supplying unit 20 includes a yarn supplying bobbin supporter 21 and a yarn unwind-

ing assisting device 22. The yarn supplying bobbin supporter 21 supports a yarn supplying bobbin Bk to be substantially in an upright state. The yarn supplying bobbin supporter 21 is arranged to be able to eject an empty yarn supplying bobbin Bk. When an empty yarn supplying bobbin Bk is ejected, a new yarn supplying bobbin Bk supplied from a yarn feeding bobbin supplier (not illustrated) is conveyed by a bobbin conveyance device (not illustrated) and supplied to the yarn supplying bobbin supporter 21. The yarn unwinding assisting device 22 adjusts, by an adjusting cylinder 23, a bulge which is formed when the yarn Y is unwound from the yarn supplying bobbin Bk.

[0039] The yarn processing execution unit 30 is arranged to execute various processes regarding the yarn Y. The yarn processing execution unit 30 includes a yarn feeler 31, a tensioner 32, a yarn joining device 33, and a yarn clearer 34.

[0040] The yarn feeler 31 is configured to detect the existence of a running yarn Y between the yarn unwinding assisting device 22 and the tensioner 32. The tensioner 32 is configured to apply predetermined tension to a running yarn Y. The tensioner 32 is, for example, a gate-type device. As shown in FIG. 3, fixed gate members 32a and movable gate members 32b are alternately arranged in the up-down direction. By adjusting the horizontal positions of the movable gate members 32b, tension is applied to the yarn Y running between the fixed gate members 32a and the movable gate members 32b. The yarn joining device 33 is configured to join a yarn Y (lower yarn Y1) on the yarn supplying unit 20 side with a yarn Y (upper yarn Y2) on the winding unit 40 side when the yarn Y is disconnected between the yarn supplying unit 20 and the winding unit 40. For example, the yarn Y is disconnected in the following cases: the yarn is cut by a cutter 34b as the later-described yarn clearer 34 detects a yarn defect, yarn breakage occurs during the winding to a package P, and the yarn supplying bobbin Bk is replaced. The yarn joining device 33 is, for example, of a compressed-air type. The yarn joining device 33 performs yarn joining in such a way that compressed air is blown onto the lower yarn Y1 and the upper yarn Y2 in order to disentangle the yarn ends of these yarns and then compressed air is blown onto the yarn ends again in order to entangle the yarn ends.

[0041] A lower yarn capturing guide member 35 which is configured to capture the lower yarn Y1 on the yarn supplying bobbin Bk side and guides the captured yarn to the yarn joining device 33 is provided below the yarn joining device 33, whereas an upper yarn capturing guide member 36 which captures the upper yarn Y2 on the package P side and guides the captured yarn to the yarn joining device 33 is provided above the yarn joining device 33. The lower yarn capturing guide member 35 is rotatable about a shaft 35a, and is configured to swing upward and downward when rotationally driven by a motor (not illustrated). The lower yarn capturing guide member 35 has, at its leading end portion, a sucking unit 35b

configured to suck a yarn end portion of the lower yarn Y1 to catch the yarn end portion. The upper yarn capturing guide member 36 is rotatable about a shaft 36a, and is configured to swing upward and downward when rotationally driven by a motor (not illustrated). The upper yarn capturing guide member 36 has, at its leading end portion, a sucking unit 36b configured to suck a yarn end portion of the upper yarn Y2 to catch the yarn end portion. The lower yarn capturing guide member 35 and the upper yarn capturing guide member 36 are connected to unillustrated negative pressure sources, respectively. The lower yarn capturing guide member 35 guides the lower yarn Y1 to the yarn joining device 33 in such a way that the lower yarn capturing guide member 35 is driven by the motor and swings upward while the sucking unit 35b has captured the yarn end portion of the lower yarn Y1. To begin with, the upper yarn capturing guide member 36 is driven by the motor and swings upward. With this, the sucking unit 36b is positioned near the package P, and the sucking unit 36b sucks and captures the yarn end portion of the upper yarn Y2 adhered to the surface of the package P. After capturing the upper yarn Y2, the upper yarn capturing guide member 36 is driven by the motor to swing downward, thereby to guide the upper yarn Y2 to the yarn joining device 33. The yarn joining device 33 performs yarn joining of the lower yarn Y1 and the upper yarn Y2 which have been guided.

[0042] The yarn clearer 34 (a yarn quality measuring device of the present invention) includes a clearer main body 34a and a cutter 34b. The yarn clearer 34 acquires information of the thickness of the running yarn Y and detects a yarn defect based on this information. The cutter 34b is provided in the vicinity of the yarn clearer 34. When the yarn clearer 34 detects a yarn defect, the cutter 34b immediately cuts the yarn Y and the yarn clearer 34 outputs a detection signal to the unit controller 60. The yarn clearer 34 will be detailed later.

[0043] The winding unit 40 is provided to form a package P by winding the yarn Y onto the winding bobbin Bm. The winding unit 40 includes a cradle 41 which retains the winding bobbin Bm to be rotatable, a traversing drum 42, and a drum driving motor 43 configured to rotate the traversing drum 42. A traversing groove 42a is formed in the outer circumferential surface of the traversing drum 42. The traversing drum 42 rotates while the yarn Y is inserted into the traversing groove 42a. As a result, the yarn Y is traversed with a predetermined width. As the traversing drum 42 in contact with the package P formed on the winding bobbin Bm rotates while the yarn Y is traversed by the traversing groove 42a, the package P and the winding bobbin Bm are passively rotated due to frictional contact with the traversing drum 42, and the yarn Y is wound onto the winding bobbin Bm.

[0044] The display 50 (a notification unit of the present invention) is configured to display information of the winding unit 2. As shown in FIG. 3 and FIG. 4, the display 50 includes lamps 51 and a text display unit 52.

[0045] The lamps 51 are, for example, LED lamps, and

each of these lamps is arranged to be able to output red light and blue light. The lamps 51a and 51b are provided to notify an operator of a change of a state of the winding unit 2. As shown in FIG. 4, the lamp 51a is provided at a left end portion of the display and substantially at the center in the up-down direction, and the lamp 51b is similarly provided at a right end portion. The lamps 51c to 51e are provided to notify in which one of parts of the winding unit 2, i.e., an upper portion, a middle portion, and a lower portion, a defect has occurred. The lamp 51c is provided at around the center in the up-down direction of the display 50. The lamp 51d is provided above the lamp 51c. The lamp 51e is provided below the lamp 51c.

[0046] An operation button 53 is provided below the five lamps 51. The operation button 53 is, for example, operated by an operator to resume the yarn winding process, when the yarn winding operation by the winding unit 2 is suspended. The operation button 53 is electrically connected to the unit controller 60. The text display unit 52 is provided above the five lamps 51 in order to display a text indicating a specific state of the winding unit 2. The text display unit 52 is, for example, a liquid crystal display with 3 digits and 7 segments. The text display unit 52 displays a text based on a control signal supplied from the unit controller 60.

[0047] The unit controller 60 is accommodated in the unit main body 10 and includes members such as a CPU, a ROM, and a RAM. The unit controller 60 is configured to control members by the CPU, based on a program stored in the ROM. To be more specific, the unit controller 60 receives signals from members such as the yarn clearer 34 and controls members such as the yarn unwinding assisting device 22, the yarn joining device 33, the drum driving motor 43, and the display 50. Furthermore, the unit controller 60 outputs a signal requesting the doffing device 3 to perform doffing, through the machine controller 4.

[0048] In the winding unit 2 having the above-described structure, the yarn winding process of forming the package P by winding the yarn Y unwound from the yarn supplying bobbin Bk onto the winding bobbin Bm is performed, as the unit controller 60 drives the drum driving motor 43 to rotate the traversing drum 42 while keeping the package P to be in contact with the traversing drum 42.

(Details of Yarn Clearer)

[0049] The yarn clearer 34 will be detailed with reference to FIGs. 5(a) and 5(b) and FIG. 6. FIG. 5(a) shows a yarn Y having an unacceptable defect Yb which needs to be removed. FIG. 5(b) shows a yarn Y having an acceptable defect Yc which does not need to be removed. FIG. 6 shows a graph indicating the distribution of thickness of the yarn in a package P.

[0050] The clearer main body 34a (a yarn quality measurement unit of the present invention) of the yarn clearer 34 includes, for example, an unillustrated optical sensor

and a clearer controller 37 (a determination unit of the present invention) which is configured to acquire information of the thickness of a yarn based on a detection result of the sensor. The clearer controller 37 is accommodated in the clearer main body 34a and includes members such as a CPU, a ROM, and a RAM. The clearer controller 37 is configured to detect a difference (deviation) between the thickness of a running yarn Y and a target yarn thickness. When the deviation falls within a range between predetermined upper and lower limits, the clearer controller 37 allows the yarn Y to pass through. When the deviation is out of the range between the limits, the clearer controller 37 determines that an unacceptable defect which needs to be removed has been generated, and causes the cutter 34b (a cutting unit of the present invention) to cut the yarn Y. The unacceptable defect is sucked and removed by the upper yarn capturing guide member 36, when the yarn Y having been cut is joined by the yarn joining device 33. The clearer main body 34a and the cutter 34b may be integrated with a frame (unillustrated), or may be independent from the frame.

[0051] A defect of the yarn Y will be simply explained with reference to FIG. 5(a) and FIG. 5(b). As shown in FIG. 5(a), in the running yarn Y, a part of the yarn Y, which has a thickness T_a more or less similar to a target thickness, is regarded as a normal yarn Y_a . When, in the yarn Y, a part having a thickness T_b which is significantly longer than the target thickness is detected by the yarn clearer 34, the clearer controller 37 determines that an unacceptable defect Y_b has been generated, and causes the cutter 34b to cut the yarn Y. Meanwhile, as shown in FIG. 5(b), when a part having a thickness T_c which is slightly longer than the target thickness is detected by the yarn clearer 34, the clearer controller 37 determines that the part is normal or is an acceptable defect Y_c on condition that the thickness T_c does not exceed the upper limit, and allows the part to run toward the downstream side in the yarn running direction. In this way, the clearer controller 37 determines whether an unacceptable defect Y_b has been generated and whether an acceptable defect Y_c has been generated, based on the thickness of the yarn Y monitored by the yarn clearer 34.

[0052] The clearer controller 37 stores reference values for identifying the normal yarn Y_a , the unacceptable defect Y_b , and the acceptable defect Y_c . FIG. 6 will be specifically described below. In the graph shown in FIG. 6, the horizontal axis indicates the length of the monitored yarn Y, whereas the vertical axis indicates the thickness of the yarn (to be more specific, a deviation (%) from the target yarn thickness). In the vertical axis, a value 0% indicates the target yarn thickness. For example, when the value is 100%, it is indicated that the yarn is thicker by 100% than the target yarn thickness (i.e., the yarn is twice as thick as the target yarn thickness). For example, when the value is -30%, it is indicated that the yarn is narrower by 30% than the target yarn thickness.

[0053] In the graph of FIG. 6, a blackened region 101

indicates the distribution of the normal yarn Y_a . A polygonal line 102 depicted above the region 101 in the graph indicates an upper limit of yarn cutting. A polygonal line 103 depicted below the region 101 in the graph indicates a lower limit of yarn cutting. The upper and lower limits vary in accordance with the length of the monitored yarn Y. The limits are arranged so that a relatively large deviation is allowed when a detected yarn defect is short. Meanwhile, when a long yarn defect is detected, whether to remove this long yarn defect is determined based on a range of limits narrower than the range of limits corresponding to short yarn defects. For example, when a yarn defect in which a deviation of the yarn thickness is 100 to 150% is detected, the yarn defect is accepted when the length is just over 1 centimeter at the maximum, but is not accepted when the yarn defect is longer than this maximum length. The upper and lower limits may not be fixed, and may vary in accordance with, for example, an average thickness of the yarn Y, during the formation of the package P. (Details are not given.) For the details of detection of information of a yarn defect by the yarn clearer 34, see, e.g., Japanese Patent No. 5680653. In addition to this, Japanese Laid-Open Patent Publication No. 2013-227155 recites a method of processing and displaying information of thickness and length of a detected yarn defect.

[0054] In the yarn Y, a part having a defect which exceeds the upper limit indicated by the polygonal line 102 or is lower than the lower limit indicated by the polygonal line 103 is cut and removed as described above, as the unacceptable defect Y_b . On this account, no unacceptable defect Y_b remains in the package P. Each rectangular mark 201 in the graph indicates the unacceptable defect Y_b . For example, a mark 201 which is at an intersection between 3cm on the horizontal axis and 100% on the vertical axis indicates that a yarn defect which is thicker by 100% than the target yarn thickness and is 3 centimeters in length has occurred. In this way, the clearer controller 37 stores information of the unacceptable defect Y_b .

[0055] Information of the acceptable defect Y_c is shown in a region 104 between the region 101 and the polygonal line 102 and a region 105 between the region 101 and the polygonal line 103. Each triangular mark 202 in the graph indicates the acceptable defect Y_c . The acceptable defect Y_c is not removed, but information thereof is stored in the clearer controller 37 as a defect remaining in the package P.

[0056] Frames 106 formed by dotted lines indicate classes of the defects. The level of a defect is high when the deviation of the yarn thickness is remote from 0. For example, the defect level of an acceptable defect Y_c indicated by a mark 203 in a frame 107 which is the first frame from the left end and is the third frame from the upper end is higher than the defect level of an acceptable defect Y_c indicated by a mark 204 in a frame 108 which is the first mark from the left end and is the fourth frame from the upper end.

[0057] In connection with the above, preferably, a package P including a predetermined amount or more of the acceptable defects Yc is considered as an acceptable product which is lower in yarn quality than a good product including a small amount of the acceptable defects Yc, and is treated in a way different from the good product. If the doffing device 3 doffs packages which are good products and packages which are acceptable products without sorting them, the good products and the acceptable products are disadvantageously shipped in a mixed manner. In the automatic winder 1 of the present embodiment, in order to sort packages into good products and acceptable products, the clearer controller 37 and the unit controller 60 perform processes described below.

(Process Performed by Clearer Controller)

[0058] A process performed by the clearer controller 37 will be described with reference to FIG. 6 and FIG. 7. FIG. 7 shows a graph indicating the degree of progress of the yarn winding process (i.e., increase in the yarn winding length) in the package P and the increase in the total amount of the acceptable defects Yc in accordance with the progress.

[0059] The clearer controller 37 determines whether a package P is an acceptable product, in the following manner. While a package P is being formed by the winding unit 2, the clearer controller 37 stores data regarding yarn defects as shown in FIG. 6. When an acceptable defect Yc is detected during the formation of the package P, the clearer controller 37 increments the amount of the acceptable defects Yc. The horizontal axis of the graph shown in FIG. 7 indicates the yarn winding length of the package P which is being formed. The vertical axis indicates the total amount (acceptable defect total amount) of the acceptable defects Yc remaining in the package P. FIG. 7 shows transitions of acceptable defect total amounts of two different packages P (a full line and a dotted line).

[0060] As the formation of the package P progresses and the yarn winding length increases, the acceptable defect total amount increases each time the acceptable defect Yc is detected. When the acceptable defect total amount exceeds a predetermined reference value (see a two-dot chain line in the graph of FIG. 7) during the formation of the package P, it is determined that the package P is an acceptable product. When the acceptable defect total amount exceeds the predetermined reference value during the formation of the package P (see a full line in the graph of FIG. 7), the clearer controller 37 determines that the package P is an acceptable product at this point, and sends a determination signal indicating that the package P is an acceptable product to the unit controller 60. Meanwhile, when the acceptable defect total amount does not exceed the reference value until the formation is completed (see a dotted line in the graph of FIG. 7), the package P is a good product. In other words, when the formation of the package P is completed or

almost completed and the clearer controller 37 does not determine that the package P is an acceptable product, the package P is a good product. In this case, no determination signal is sent from the clearer controller 37.

[0061] There are several methods for specifically incrementing the amount of the acceptable defects Yc by the clearer controller 37. For example, the number of the acceptable defects Yc may be incremented each time the defect occurs, and when the total number of the acceptable defects Yc exceeds a reference number, it may be determined that the package P being formed is an acceptable product.

[0062] Alternatively, in accordance with the classes indicated by the frames 106 shown in FIG. 6, each acceptable defect Yc may be weighted, the number of defects may be added as a defect point, and the package P may be regarded as an acceptable product when the defect point exceeds a predetermined reference point. For example, the above-described frame 107 is closer to the polygonal line 102 indicating the upper limit than the frame 108 is to the line. On this account, the defect level of the acceptable defect Yc indicated by the mark 203 in the frame 107 is higher than the defect level of the acceptable defect Yc indicated by the mark 204 in the frame 108. On this account, for example, the amount of the acceptable defects Yc indicated by the mark 203 may be regarded to be larger than the amount of the acceptable defects Yc indicated by the mark 204, and a more defect point may be added to the former.

[0063] Alternatively, because the length and thickness of each acceptable defect Yc are known as indicated by the marks 203 and 204, the amount of the acceptable defects Yc may be calculated based on these sets of data (e.g., a result of multiplication of length and thickness is set as a defect amount), and the amount of the acceptable defects Yc is incremented.

(Process Performed by Unit Controller)

[0064] A process performed by the unit controller 60 when the clearer controller 37 has determined whether a package P is an acceptable product will be described with reference to FIG. 8 and FIGs. 9(a) to 9(c). FIG. 8 is a flow chart which relates to determination by the clearer controller 37 and shows an example of the process performed by the unit controller 60. FIG. 9(a) shows image display by the display 50 when the winding unit 2 operates normally (i.e., is forming a package P). FIG. 9(b) shows image display by the display 50 when a completed package P is a good product and the doffing device 3 is required to perform doffing. FIG. 9(c) shows image display by the display 50 when a package P is an acceptable product.

[0065] In an initial state, the winding unit 2 has started winding of the yarn onto the winding bobbin Bm (yarn winding process) and the formation of the package P is in progress. When the yarn winding process by the winding unit 2 is normally in progress, the display 50 displays

nothing as shown in FIG. 9(a). During the formation of the package P, when the yarn clearer 34 detects an unacceptable defect Yb, yarn cutting and yarn joining are performed. When an acceptable defect Yc is detected by the yarn clearer 34, the clearer controller 37 increments the amount of the acceptable defects Yc as described above.

[0066] The unit controller 60 determines whether a determination signal indicating that the package P is an acceptable product is supplied from the clearer controller 37 (S101). When the determination signal has not been supplied, the unit controller 60 determines whether the formation of the package P has been completed (S102). When the formation of the package P has not been completed, the routine goes back to S101 and the formation of the package P is continued. When the formation of the package P is almost completed while the determination signal has not been supplied from the clearer controller 37, it is determined that the package P is a good product. In this case, the unit controller 60 outputs a signal (doffing request signal) requesting the doffing device 3 to perform doffing, via the machine controller 4, for example (S103). When the doffing request signal is being output, the unit controller 60 causes the display 50 to display information indicating that the winding unit 2 is making a doffing request, as shown in FIG. 9(b). (To be more specific, the lamps 51a and 51b emit blue light.)

[0067] During the formation of the package P, when the clearer controller 37 determines that the package P is an acceptable product and the determination signal is sent from the clearer controller 37 to the unit controller 60, the unit controller 60 performs the following process. The unit controller 60 controls the winding unit 2 to suspend the yarn winding process and causes the display 50 to display information indicating that an acceptable product has been formed (S104). To be more specific, as shown in FIG. 9(c), for example, the lamps 51a, 51b, and 51d emit red light or blink, and the text display unit 52 displays a text. At this stage, the process which is performed when the package P is an acceptable product ends for the time being. Then an operator may manually detach the package P which is an acceptable product. Alternatively, the operator may press the operation button 53 of the display 50 to resume the yarn winding process and then manually detach the package P after the formation of the package P is completed. When receiving the determination signal indicating that the package P is an acceptable product from the clearer controller 37, the unit controller 60 does not output the doffing request signal. This prevents the acceptable product from being doffed. In this way, when it is determined that the package P is an acceptable product, the unit controller 60 causes the winding unit 2 to perform an operation different from the operation performed when the package P is a good product.

[0068] As described above, when the yarn clearer 34 determines that the package P is an acceptable product, the winding unit 2 performs an operation different from

the operation performed in the normal state (when the package P is a good product). This, for example, notifies the operator that the package P is not a good product. It is therefore possible to sort packages into packages P which are good products and packages P which are acceptable products.

[0069] In addition to the above, because the yarn clearer 34 includes the clearer controller 37, problems such as increase in data communication amount and cost increase are suppressed as compared to a case where a determination device for determining whether a package P is an acceptable product is provided to be independent from the yarn clearer 34.

[0070] In addition to the above, because the display 50 notifies that the package P is an acceptable product, the operator is promptly notified of this information and is demanded to immediately perform a response.

[0071] In addition to the above, when it is determined that the package P being formed is an acceptable product, it is possible to cause the winding unit 2 to perform the operation different from the normal operation. It is therefore possible to swiftly sort the acceptable products.

[0072] In addition to the above, because the yarn winding process can be suspended when it is determined that the package P is an acceptable product, it is possible to detach the low-quality package P even if the formation of the package is still in progress.

[0073] Furthermore, because it is possible to prevent an acceptable product from being doffed by the doffing device 3, prevention of mixture of good products and acceptable products is ensured as the operator detaches acceptable products from the winding unit 2 and treats them differently from good products.

[0074] In addition to the above, determination of the generation of the unacceptable defect Yb and determination of the generation of the acceptable defect Yc are performed based on the thickness of the yarn Y. It is therefore possible to properly detect a yarn defect which needs to be removed and determine the quality of a formed package P.

[0075] The following will describe modifications of the above-described embodiment. The members identical with those in the embodiment above will be denoted by the same reference numerals and the explanations thereof are not repeated.

(1) While in the embodiment above the unit controller 60 suspends the yarn winding process when receiving the determination signal indicating that the package P is an acceptable product from the clearer controller 37, the disclosure is not limited to this arrangement. As shown in FIG. 10, the unit controller 60 may continue the yarn winding process until the formation of the package P is completed even if the determination signal is supplied from the clearer controller 37 (S105). When the formation of the package P is completed, the display 50 may display notification for the operator (S106). As such, even if it is found

that the package P is an acceptable product while the formation of the package P is still in progress, the formation of the package P is continued. With this, as compared to the case where the yarn winding process is suspended, the formation of the package P is done quickly and the deterioration in production efficiency is suppressed. In other words, when it is determined that the package P is an acceptable product, the unit controller 60 may cause the winding unit 2 to perform the operation different from the operation when the package P is a good product, when or after the formation of the package P is completed. It is possible to prevent good products and acceptable products from being mixed also in this modification, because the unit controller 60 does not output the doffing request signal. The unit controller 60 may perform notification for the operator by the display 50 before the formation of the package P which is an acceptable product is completed (e.g., when the determination signal is received).

(2) While in the embodiment above the doffing device 3 does not doff a package P which is an acceptable product, the disclosure is not limited to this arrangement. For example, when a winding unit 2 retains a package P which is an acceptable product and the operation button 53 (an operation unit of the present invention) of the display 50 of that winding unit 2 is pressed, the unit controller 60 determines that a doffing request has been made, and outputs the doffing request signal. According to this arrangement, an acceptable product is not doffed until the operator makes a doffing request. On this account, sorting of products can be done even if good products and acceptable products are mixed, in the following manner: the operator stamps or puts stickers on packages P which are acceptable products in advance in order to make it possible to identify acceptable products from good products, and then presses the operation button 53. Furthermore, as the doffing device 3 performs doffing, it is possible to save the operator's labor of detaching a package P which is an acceptable product. The operation may be done by an operation unit different from the operation button 53.

(3) While in the modification (2) the operator performs the operation such as stamping the package P which is an acceptable product, the doffing device 3 may include a stamp unit (not illustrated) which is configured to stamp the surface of the package P. Furthermore, the unit controller 60 may perform the following operation. As shown in FIG. 11, when the clearer controller 37 determines that the package P is an acceptable product, the unit controller 60 causes the winding unit 2 to continue the yarn winding process until the formation of the package is completed (S106). Thereafter, the unit controller 60 outputs, via the machine controller 4, a signal which requests the doffing device 3 to stamp the surface of the package P which is an acceptable product

(i.e., requests addition of identification information) (S107). With this arrangement, it is possible to cause the doffing device 3 to perform stamping based on which acceptable products can be distinguished from good products, and hence it is possible to sort packages into acceptable products and good products even if they are mixed. Furthermore, it is possible to save the operator's labor of performing stamping.

The identification information is not limited to the stamp. For example, the doffing device 3 may put a sticker (not illustrated) onto a package P which is an acceptable product. Alternatively, for example, the doffing device 3 may be arranged such that an IC tag (not illustrated) storing individual information is provided in the winding bobbin Bm and information indicating that the package P is an acceptable product can be written into the IC tag of the winding bobbin Bm on which the package P which is an acceptable product is formed.

(4) When the doffing device 3 is configured to stamp the surface of the package P as in the modification (3) described above, the unit controller 60 may perform the following process. As shown in FIG. 12, when the clearer controller 37 determines that the package P is an acceptable product, the unit controller 60 may output a signal requesting the addition of identification information to the package P which is an acceptable product (S107) and then output the doffing request signal (S103). With this arrangement, because it is possible to distinguish acceptable products from good products even if they are mixed, it is possible to sort packages into acceptable products and good products. Furthermore, it is possible to save the operator's labor of adding the identification information. Furthermore, as compared to a case where the doffing request signal is not output, it is possible to save the operator's labor of detaching a package P which is an acceptable product. Alternatively, the unit controller 60 may output the doffing request signal before outputting the signal requesting the addition of the identification information to the package P which is an acceptable product. In this case, the doffing device 3 performs the addition of the identification information before the doffing.

(5) Alternatively, packages may be sorted into good products and acceptable products by an arrangement shown in FIG. 13(a) to FIG. 13(c). FIG. 13(a) is a plan view of an automatic winder 1b. FIG. 13(b) shows a state in which a later-described stopper 73 is at an allowing position. FIG. 13(c) shows a state in which the stopper 73 is at a preventing position. The doffing device 3 is not shown in these figures. As shown in FIG. 13(a), a conveyor 71 which is configured to convey packages P (as indicated by an arrow in FIG. 13(a)) doffed from the winding units 2 is provided behind the automatic winder 1b. Furthermore, as shown in FIG. 13(a) to FIG. 13(c), an indi-

vidual passage 72 in which a doffed package P moves rearward is provided between each winding unit 2 and the conveyor 71 in the front-rear direction. Furthermore, a gap is formed between the conveyor 71 and the individual passage 72 in the front-rear direction and the stopper 73 is provided in this gap. The stopper 73 is, for example, a plate-shaped member and is movable in the up-down direction by an air cylinder 74 (see full lines and dotted lines in FIG. 13(b)). The air cylinder 74 can be driven by the unit controller 60 of the winding unit 2 to move the stopper 73 in the up-down direction. When the stopper 73 is at the lowest position (see the full lines in FIG. 13(b)), a doffed package P is allowed to roll on the individual passage 72 and reach the conveyor 71. At this stage, the stopper 73 is at the allowing position where the rolling of the package P is allowed. Meanwhile, when the stopper 73 protrudes upward (see FIG. 13(c)), the stopper 73 prevents the package P from rolling. At this stage, the stopper 73 is at the preventing position where the rolling of the package P is prevented. In this way, the stopper 73 is positionally switchable between the allowing position and the preventing position.

In the automatic winder 1b arranged as described above, when a package P of a winding unit 2 is a good product (i.e., no determination signal is sent from the clearer controller 37 to the unit controller 60), the stopper 73 is at the allowing position (see FIG. 14(b)). Meanwhile, when the clearer controller 37 determines that the package P is an acceptable product, the unit controller 60 drives the air cylinder 74 to move the stopper 73 to the preventing position. On this account, even if a package P which is an acceptable product is doffed, the package P is stopped on the individual passage 72 by the stopper 73. It is therefore possible for the operator to add information based on which an acceptable product and a good product are identified to a package P which is an acceptable product, before packages are mixed on the conveyor 71 or at a conveyance destination. Furthermore, the operator is able to remove the stopped acceptable product.

(6) While in the embodiment above whether a package P is an acceptable product is determined based on the total amount of the acceptable defects Yc, the disclosure is not limited to this arrangement. For example, the clearer controller 37 may determine whether a package P is an acceptable product, based on the amount of specific acceptable defects Yc in addition to or in place of the total amount of the acceptable defects Yc. The amount of the specific acceptable defects Yc is, for example, the amount of parts each thicker than the target thickness, the amount of parts each narrower than the target thickness, or the amount of fluffs. Alternatively, the clearer controller 37 may determine whether a package P is an acceptable product, based on the number of

times of yarn cutting by the cutter 34b. When the number of times of the cutting of the yarn Y by the cutter 34b (i.e., the number of times of detection of the unacceptable defect Yb) is large, the number of times of yarn joining by the yarn joining device 33 is large and the package P includes a large number of parts where the yarn joining was performed. Because such a package P is not good in quality, whether the package P is an acceptable product may be determined based on the counted number of times of yarn cutting by the cutter 34b. In other words, the amount of the acceptable defects Yc based on which the clearer controller 37 performs the determination may include the number of times of yarn cutting by the cutter 34b, in addition to or in place of the total amount of the acceptable defects Yc and/or the amount of the specific acceptable defects Yc. The clearer controller 37 may determine whether a package P is an acceptable product, based on the number of times of yarn cutting by the cutter 34b.

(7) While in the embodiment above the clearer controller 37 sorts packages P into good products and acceptable products, the disclosure is not limited to this arrangement. In other words, acceptable products may be further ranked based on the amount of the acceptable defects Yc. For example, among the acceptable products, an acceptable product in which the amount of the acceptable defects Yc is relatively small may be ranked as a pre-1 grade, whereas an acceptable product in which the amount of the acceptable defects Yc is relatively large may be ranked as a pre-2 grade. In this case, in the modifications (2) to (5) described above, the identification information added to a package P which is an acceptable product is differentiated between the ranks. This makes it possible to identify the rank of each acceptable product. For example, in accordance with the rank of each acceptable product, the color and/or shape of the stamp, the color and/or shape of the sticker, or information written into the IC tag may be differentiated. The acceptable products may be classified into more ranks (i.e., 3 or more ranks).

(8) While in the embodiment above the clearer controller 37 sends the determination signal to the unit controller 60 only when a package P is an acceptable product, the disclosure is not limited to this arrangement. For example, when the unit controller 60 and the clearer controller 37 are able to mutually communicate with each other, a signal which indicates that the formation of a package P is almost completed may be sent from the unit controller 60 to the clearer controller 37 when the formation of the package P is completed. If the package P is not regarded as an acceptable product at this stage, a signal indicating that package P is a good product may be sent from the clearer controller 37 to the unit controller 60.

(9) While in the embodiment above the clearer con-

troller 37 determines whether a package P being formed is an acceptable product, the disclosure is not limited to this arrangement. For example, the unit controller 60 may receive information of yarn defect from the clearer controller 37 and performs the above-described determination. In this case, the unit controller 60 is equivalent to a determination unit of the present invention.

(10) While in the embodiment above notification to the operator is performed by the display 50, the disclosure is not limited to this arrangement. For example, notification may be done by using an unillustrated tower lamp on the machine controller 4, or notification may be done by sound.

(11) The present invention is applicable to machines different from the automatic winder 1. For example, the present invention is applicable to a textile machine including a yarn quality measuring device such as the yarn clearer 34 (e.g., an air spinner and/or an open - end spinning machine).

[Reference Signs List]

[0076]

1	automatic winder (textile machine)	
2	winding unit	
3	doffing device	
20	yarn supplying unit	
34	yarn clearer (yarn quality measuring device)	
34a	clearer main body (yarn quality measurement unit)	
34b	cutter (cutting unit)	
37	clearer controller (determination unit)	
50	display (notification unit)	
60	unit controller	
71	conveyor	
72	individual passage	
73	stopper	
Bm	winding bobbin (take up tube)	
P	package	
Y	yarn	
Yb	unacceptable defect	
Yc	acceptable defect	

Claims

1. A textile machine including at least one winding unit which performs a yarn winding process of forming at least one package by winding a yarn supplied from a yarn supplying unit onto a take up tube, the at least one winding unit including:

a yarn quality measuring device which includes a yarn quality measurement unit configured to detect, by monitoring a running yarn, an unacceptable defect which needs to be removed and

an acceptable defect which does not need to be removed and a cutting unit configured to cut the yarn when the unacceptable defect is detected; a determination unit which is configured to determine whether the at least one package is a good product in which the amount of acceptable defects is not larger than a predetermined reference value or an acceptable product in which the amount of acceptable defects is larger than the reference value, based on data of the acceptable defect; and a unit controller, when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller causing the at least one winding unit to perform an operation different from an operation performed when the at least one package is the good product.

2. The textile machine according to claim 1, wherein, the yarn quality measuring device includes the determination unit.
3. The textile machine according to claim 1 or 2, wherein, the at least one winding unit includes a notification unit configured to output information, and when it is determined by the determination unit that the at least one package is the acceptable product, the unit controller causes the notification unit to notify that the at least one package is the acceptable product.
4. The textile machine according to any one of claims 1 to 3, wherein, while the at least one package is being formed by the at least one winding unit, the determination unit increments the amount of acceptable defects detected by the yarn quality measuring device, and determines that the at least one package is the acceptable product when the total amount of acceptable defects in the package exceeds the reference value.
5. The textile machine according to claim 4, wherein, when it is determined by the determination unit that the at least one package is the acceptable product while the at least one package is being formed, the unit controller causes the at least one winding unit to suspend the yarn winding process.
6. The textile machine according to claim 4, wherein, even when it is determined by the determination unit that the at least one package is the acceptable product while the at least one package is being formed, the unit controller causes the at least one winding unit to continue formation of the at least one package.
7. The textile machine according to any one of claims 1 to 6, further comprising a doffing device which is configured to doff the at least one package,

the unit controller
outputting a doffing request signal which requests
the doffing device to perform doffing, when the at
least one package is the good product, and
not outputting the doffing request signal when it is
determined by the determination unit that the at least
one package is the acceptable product.

8. The textile machine according to claim 7, wherein,
when it is determined by the determination unit that
the at least one package is the acceptable product,
the unit controller outputs a signal which requests
the doffing device to add identification information
based on which the acceptable product is distin-
guished from the good product.
9. The textile machine according to any one of claims
1 to 6, further comprising a doffing device which is
configured to doff the at least one package,
when it is determined by the determination unit that
the at least one package is the acceptable product,
the unit controller outputting a signal which requests
the doffing device to add identification information
based on which the acceptable product is distin-
guished from the good product, before the doffing
device performs doffing.
10. The textile machine according to any one of claims
1 to 6, further comprising a doffing device which is
configured to doff the at least one package,
the at least one winding unit including an operation
unit in which a doffing request operation for output-
ting a doffing request signal which requests the doff-
ing device to perform doffing is performed by an op-
erator, and
when it is determined by the determination unit that
the at least one package is the acceptable product,
the unit controller outputting the doffing request sig-
nal only when the operator has performed the doffing
request operation.
11. The textile machine according to any one of claims
1 to 10, further comprising:

a plurality of the at least one winding unit;
a conveyor which is configured to convey a plu-
rality of the at least one package formed by the
winding units;
individual passages each of which is provided
between each of the winding units and the con-
veyor, the packages moving on the individual
passages from the winding units toward the con-
veyor; and
a stopper which is provided between each of the
individual passages and the conveyor,
the stopper being switchable between
an allowing position where each of the packages
is allowed to roll on to the conveyor and

a preventing position where each of the pack-
ages is not allowed to roll on to the conveyor, and
when it is determined by the determination unit
that each of the packages is the acceptable
product, the unit controller positioning the stop-
per at the preventing position.

12. The textile machine according to any one of claims
1 to 11, wherein, the determination unit determines
whether the unacceptable defect is generated and
whether the acceptable defect is generated, based
on thickness of the yarn monitored by the yarn quality
device.

FIG.1

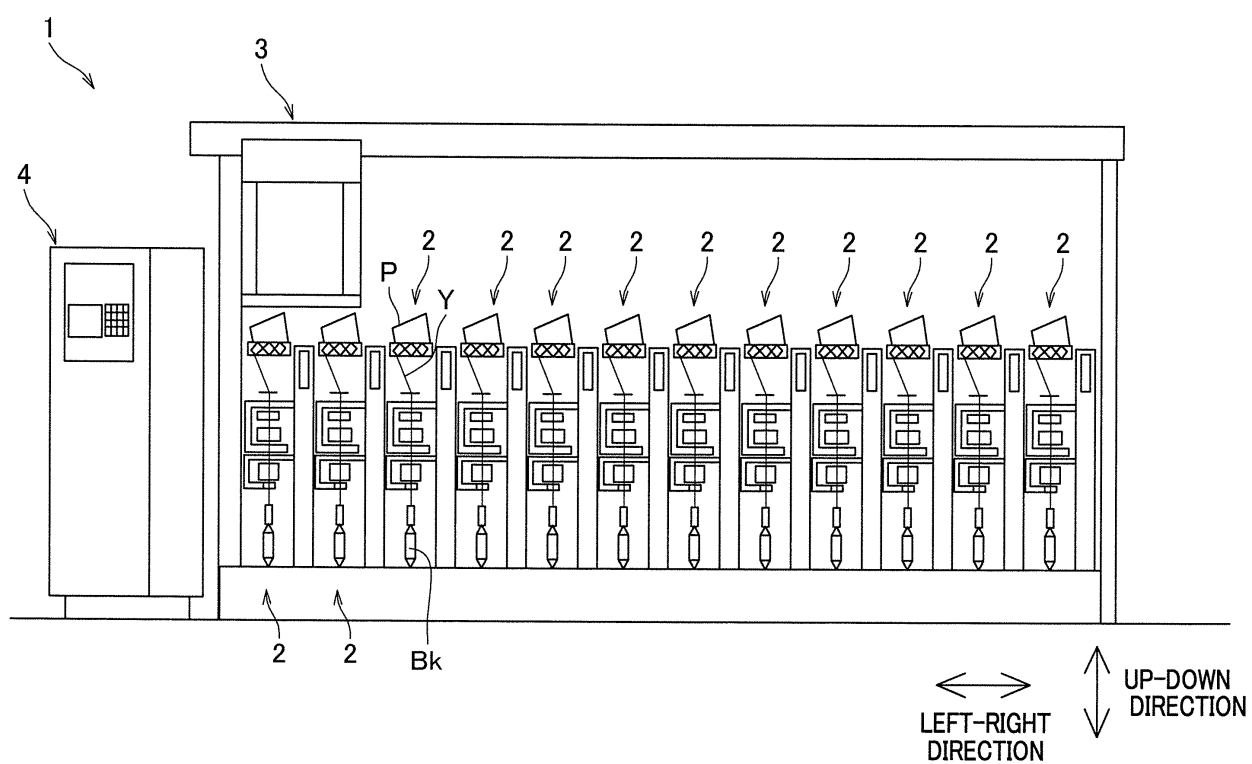


FIG.2

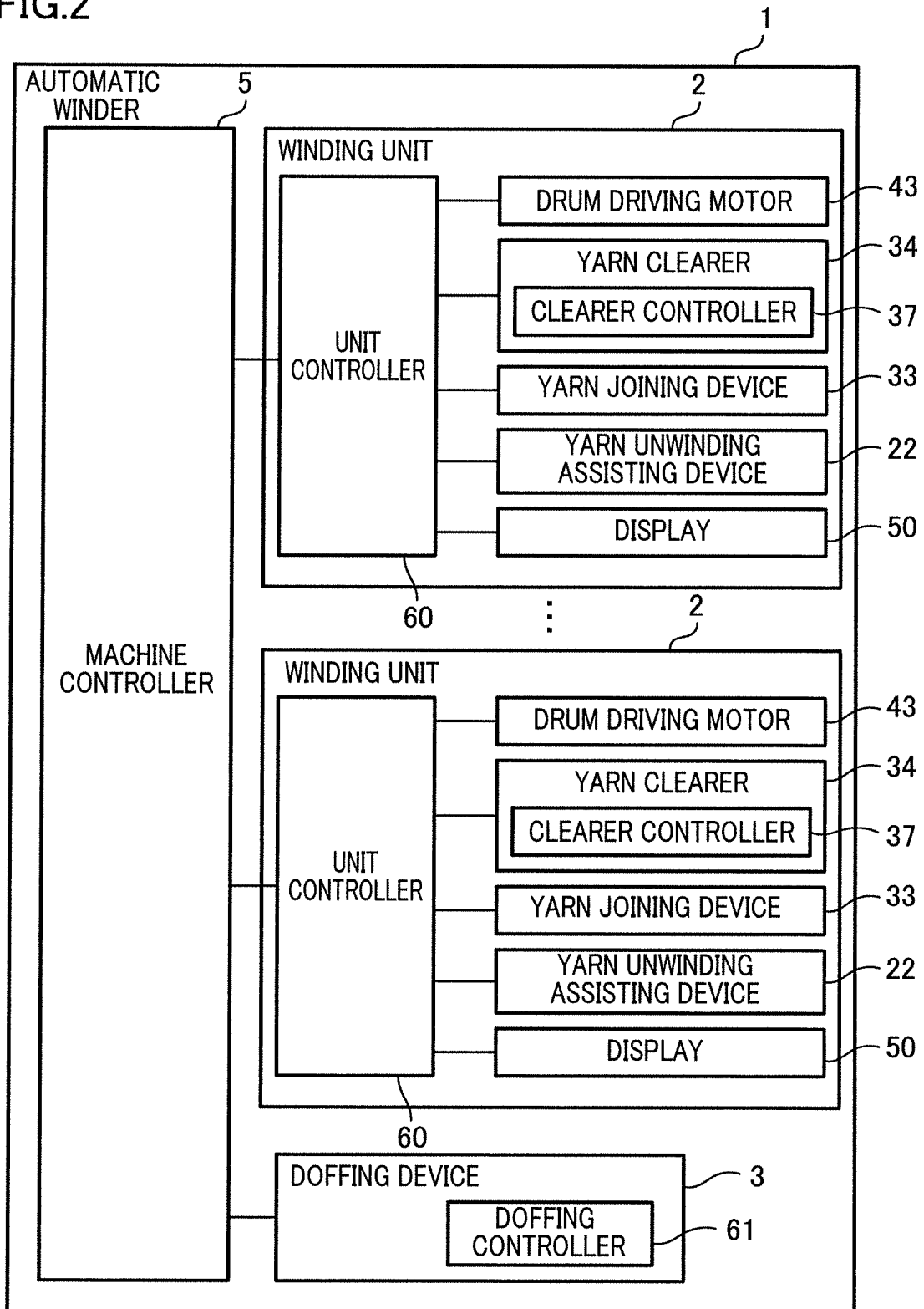


FIG.3

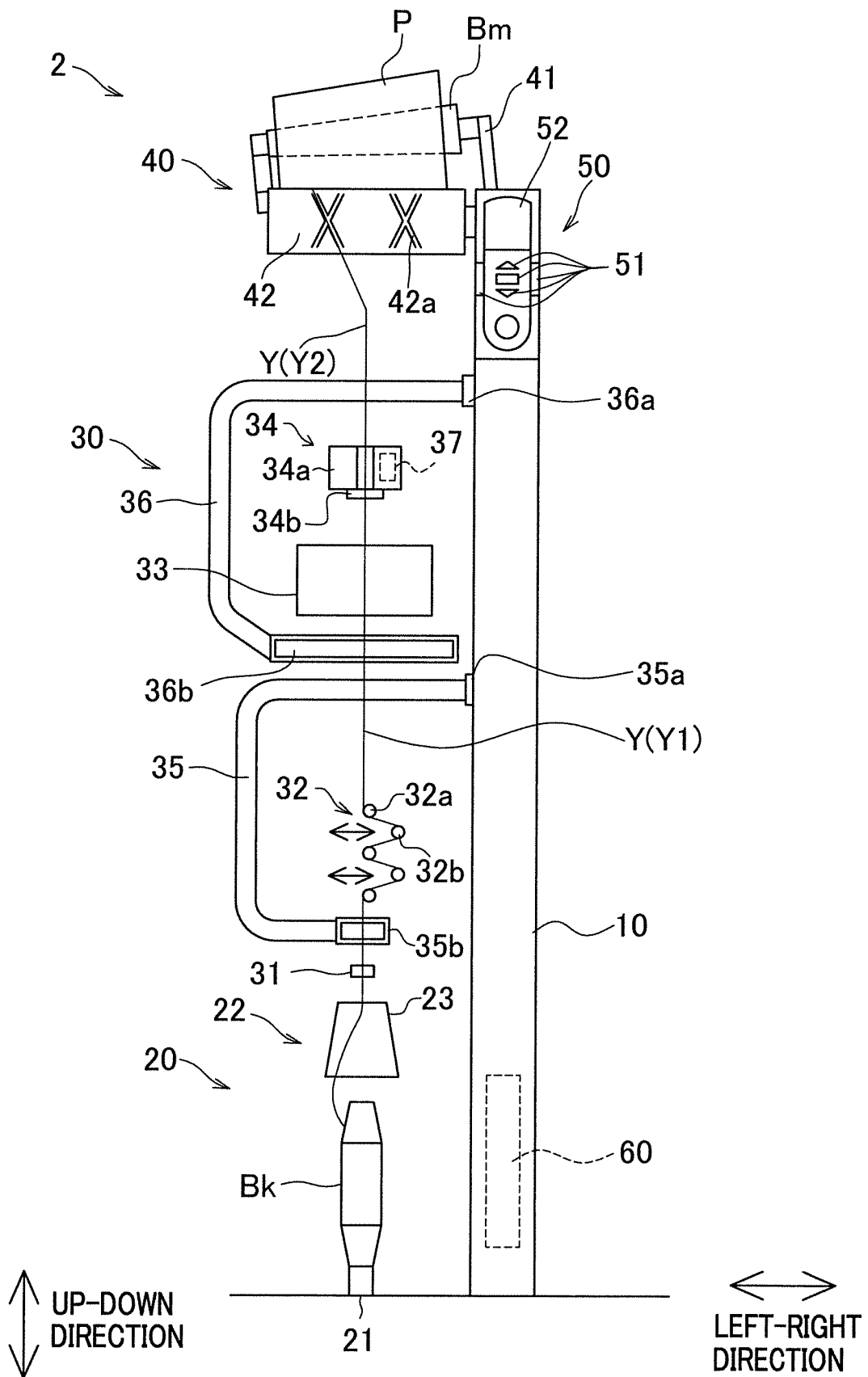


FIG.4

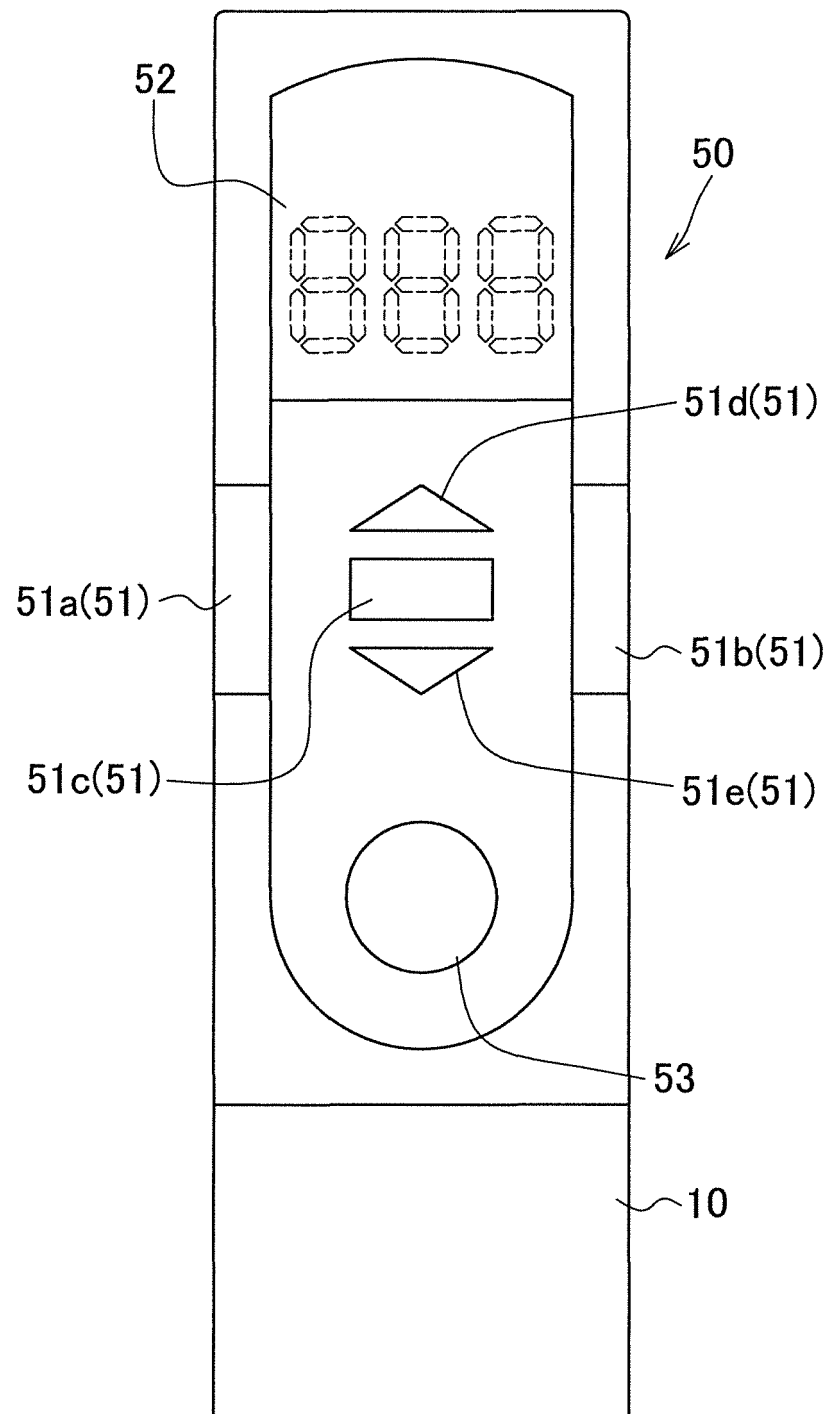
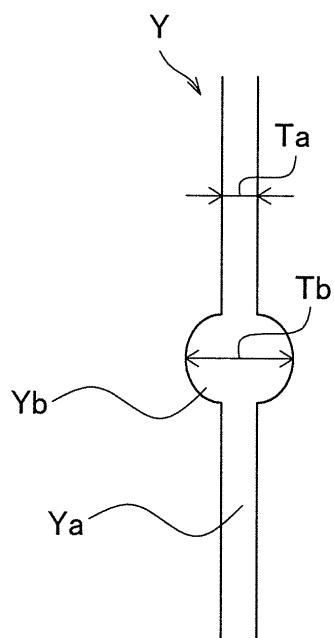


FIG.5

(a)



(b)

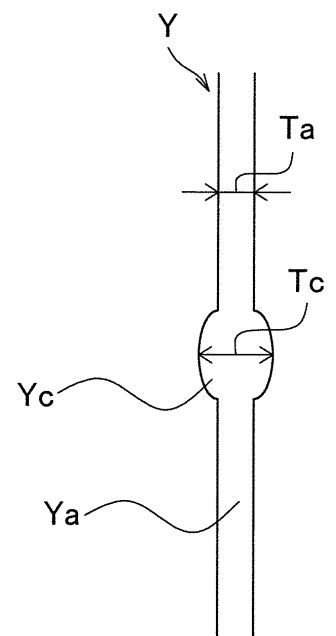
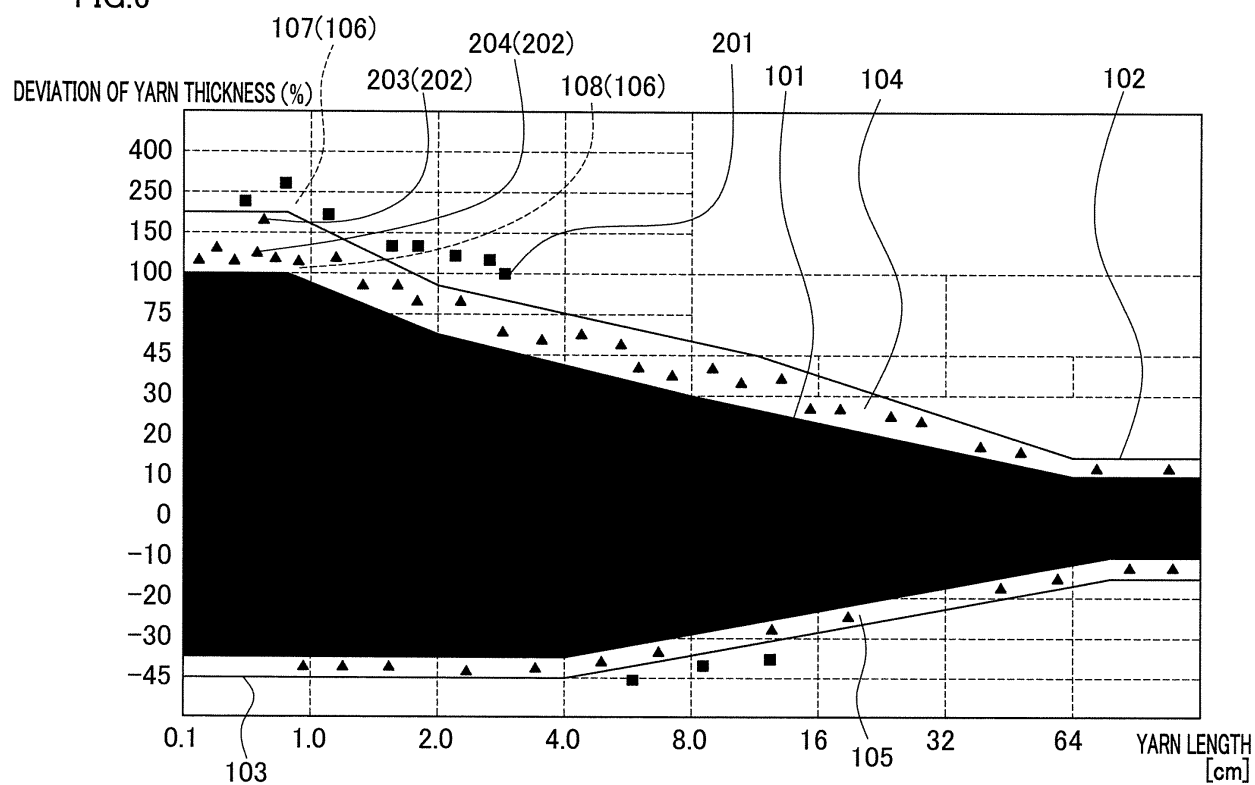


FIG.6



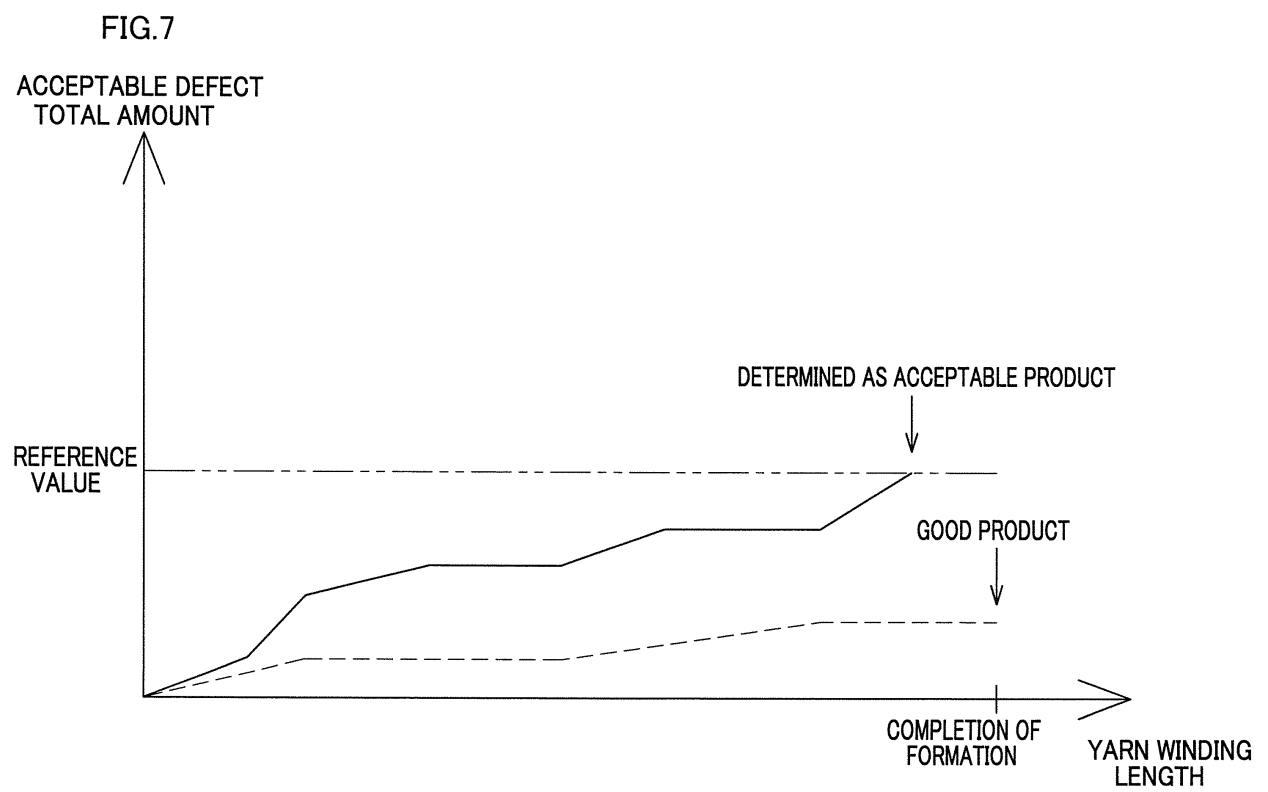


FIG.8

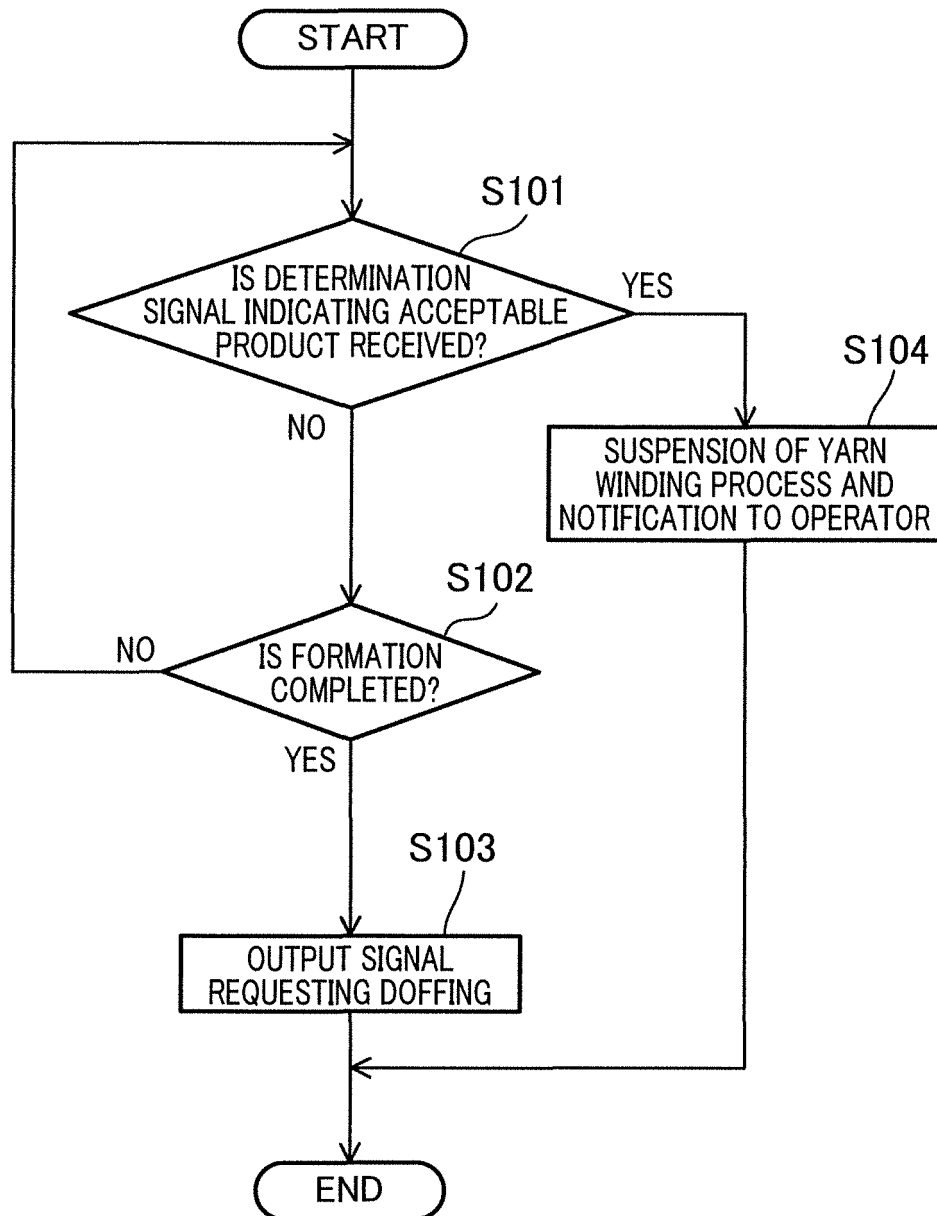


FIG.9

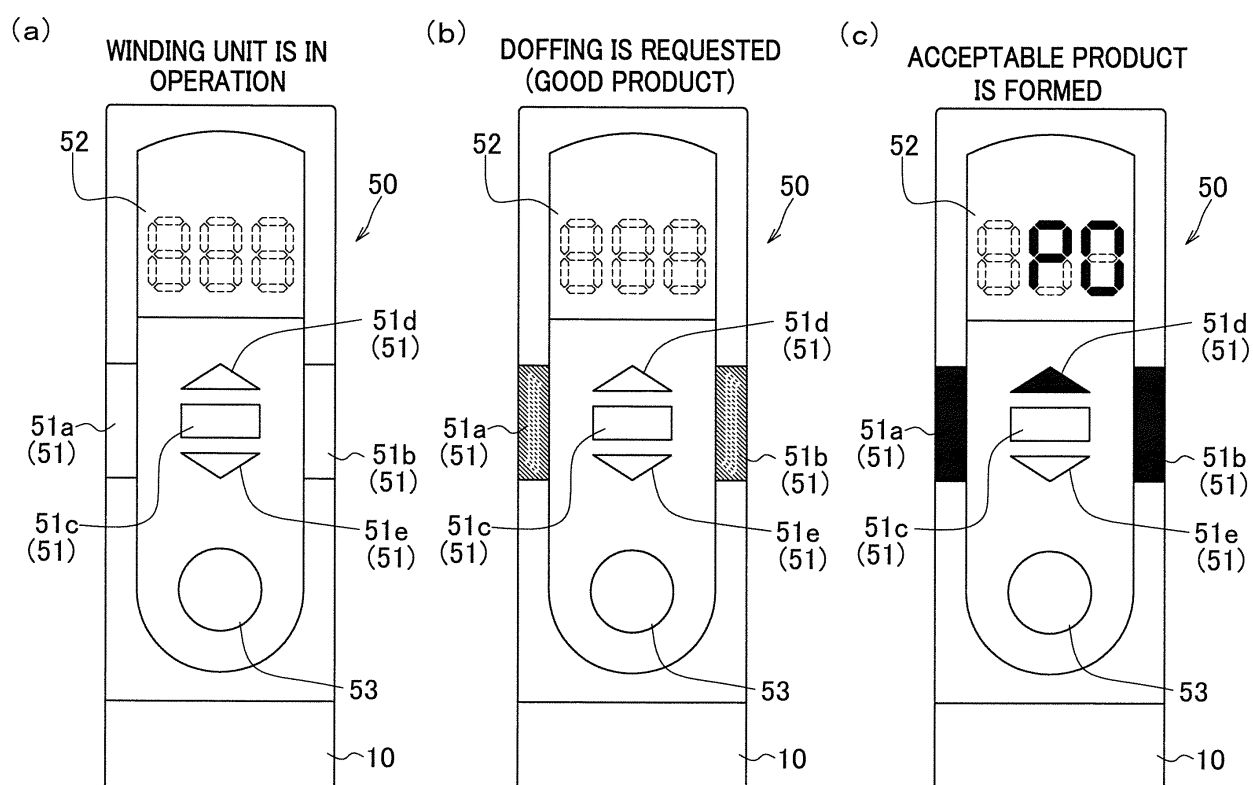


FIG.10

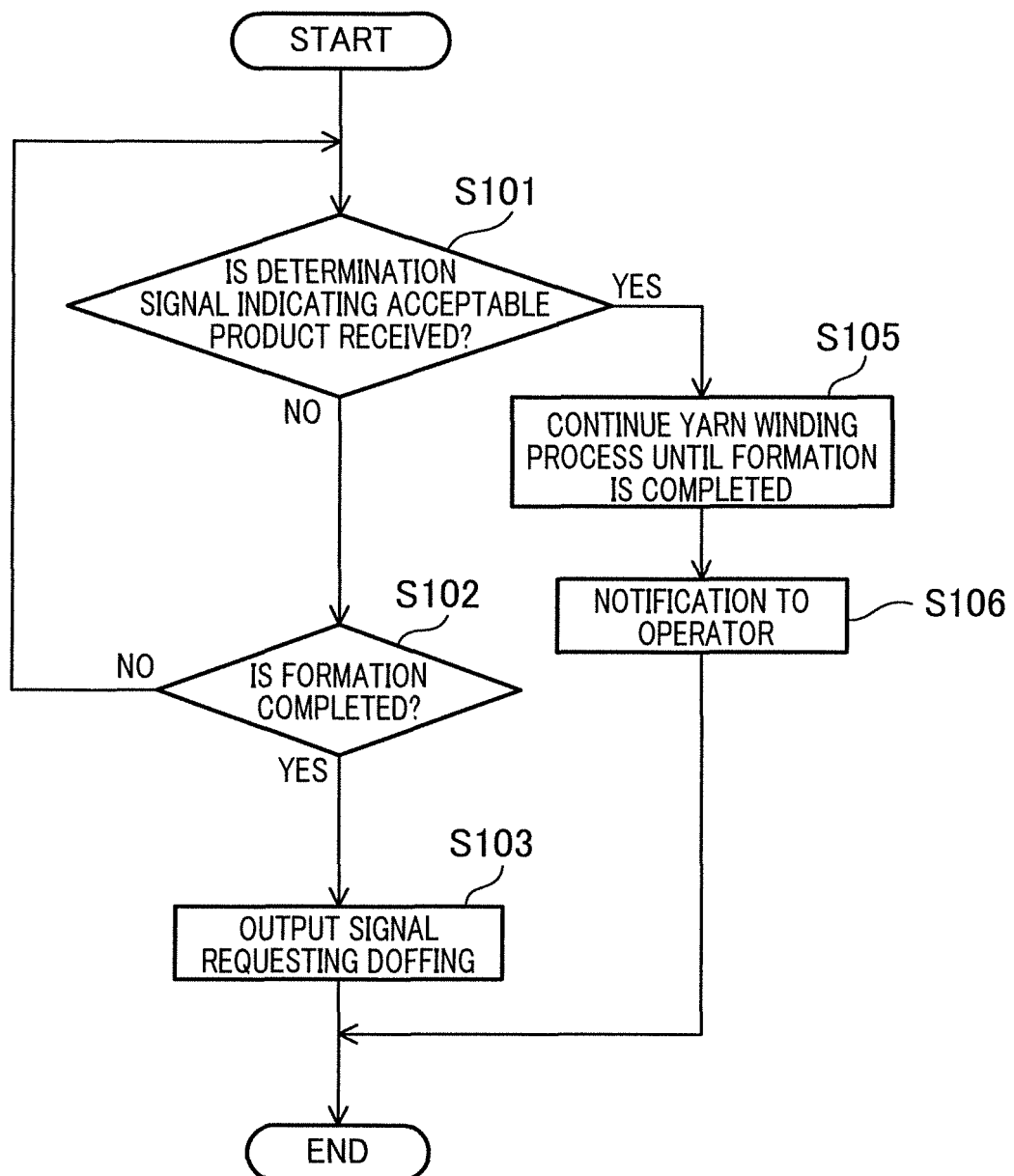


FIG.11

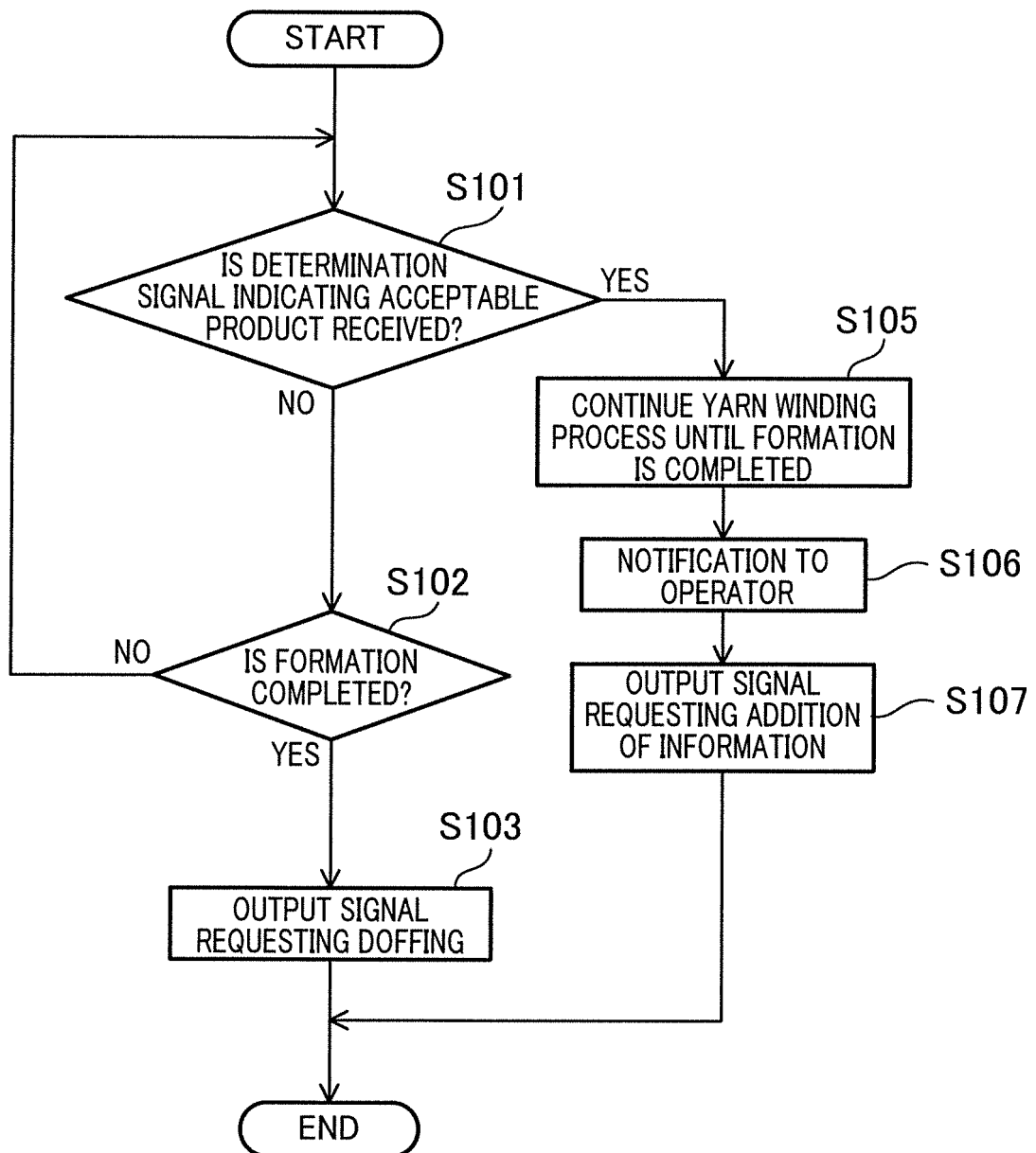


FIG.12

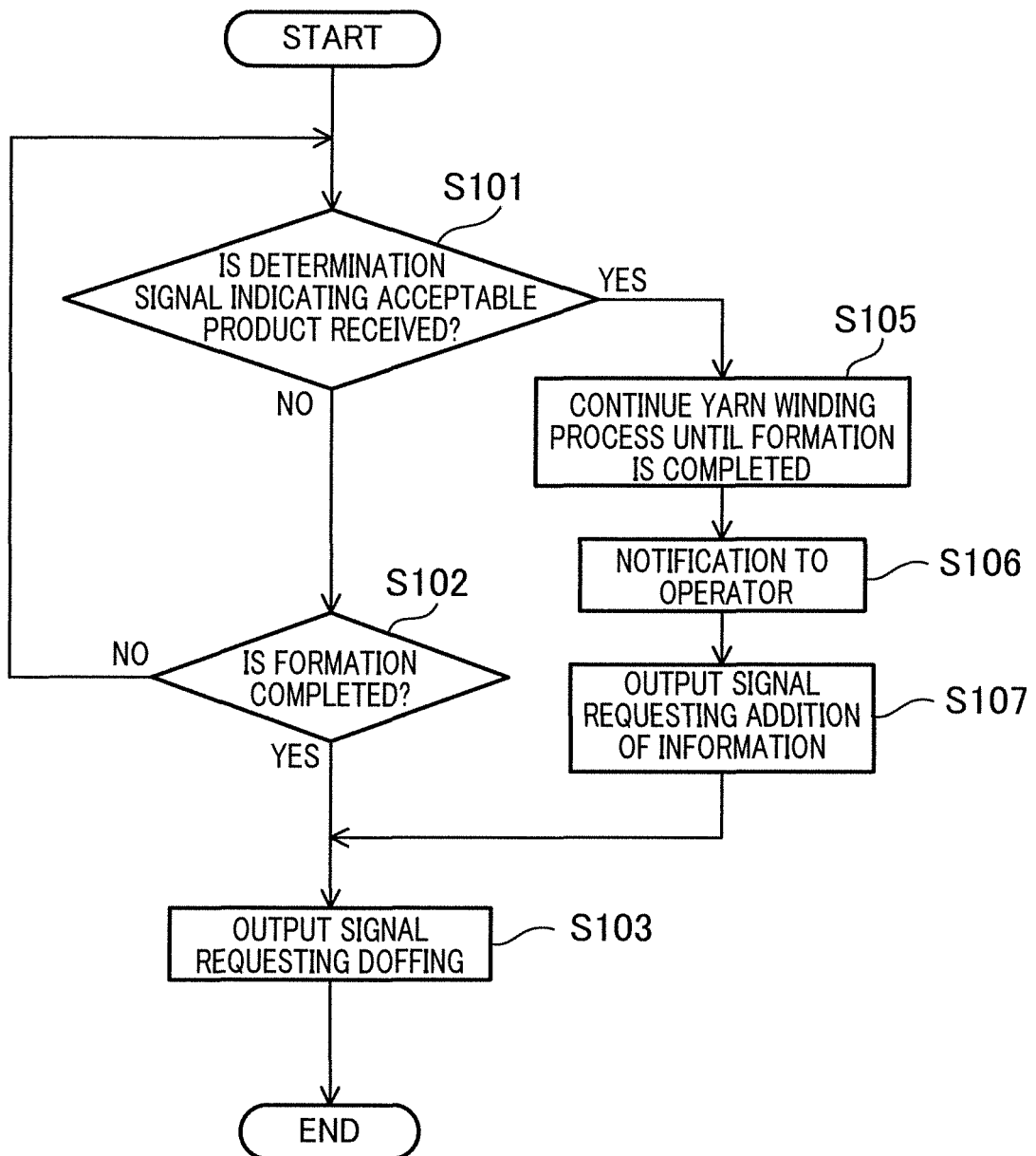
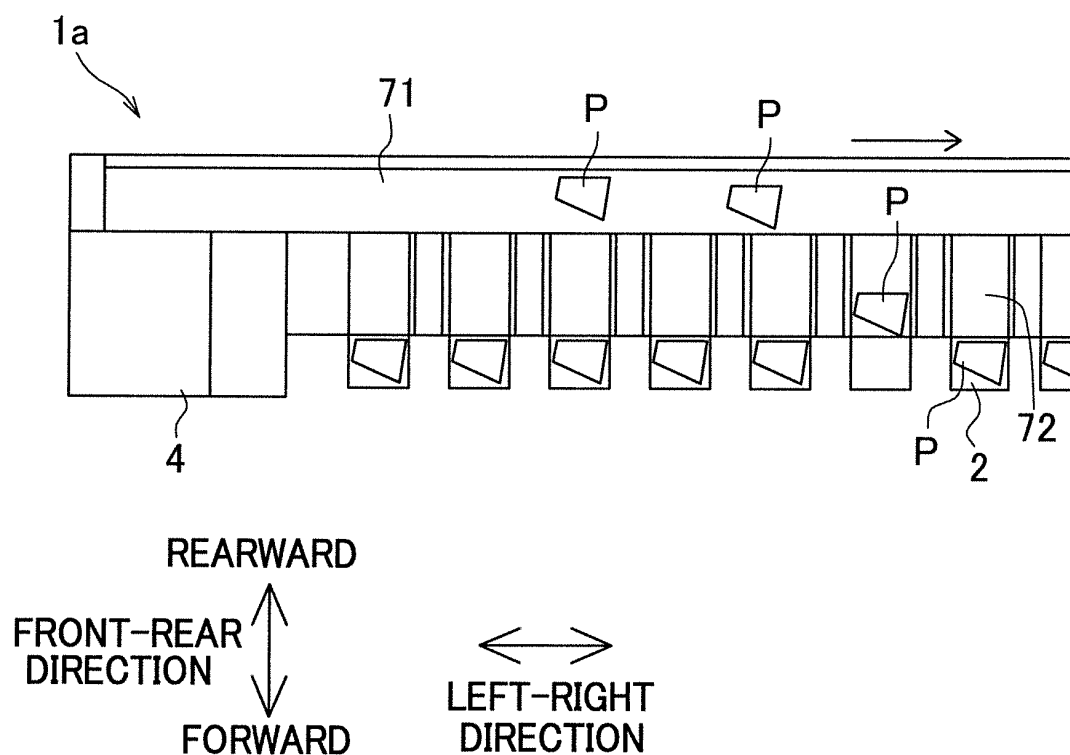


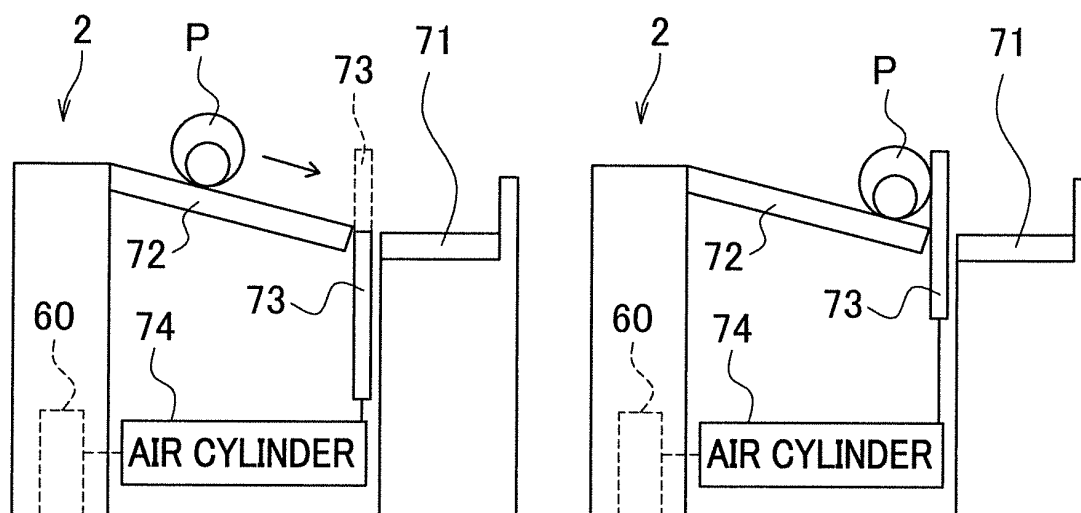
FIG.13

(a)



(b)

(c)



FORWARD $\longleftrightarrow$ REARWARD
FRONT-REAR DIRECTION

FORWARD $\longleftrightarrow$ REARWARD
FRONT-REAR DIRECTION

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/045923

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B65H63/06 (2006.01) i, B65H67/06 (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. B65H61/00-63/08, B65H67/00-67/08, 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 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

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.
A	JP 8-040643 A (MURATA MACHINERY LTD.) 13 February 1996, entire text (Family: none)	1-12
A	JP 10-203725 A (MURATA MACHINERY LTD.) 04 August 1998, entire text & EP 854107 A1, whole document & TW 340104 B	1-12

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
20.02.2019Date of mailing of the international search report
05.03.2019Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/045923

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2014-024651 A (MURATA MACHINERY LTD.) 06 February 2014, entire text & EP 2690394 A1, whole document & CN 103569795 A	1-12

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2017190210 A [0004]
- JP 5224200 B [0004]
- JP 5680653 B [0053]
- JP 2013227155 A [0053]