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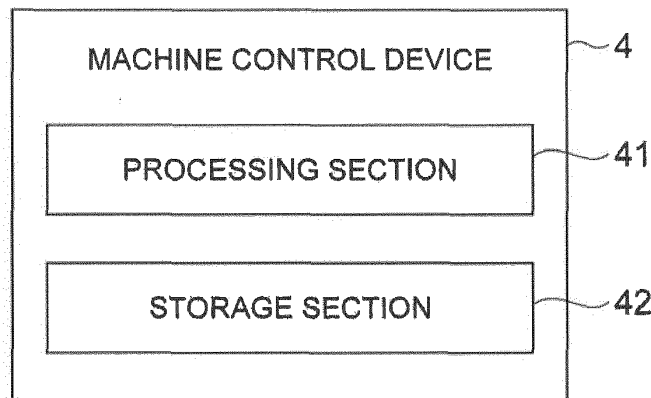
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(54) **YARN INFORMATION ACQUIRING DEVICE, YARN WINDING MACHINE, AND TEXTILE MACHINE SYSTEM**

(57) A yarn information acquiring device (4) includes a yarn information acquiring section (41) that, when yarn is wound to form a package in a yarn winding machine (1), acquires yarn information indicating a state of the yarn. The yarn information acquiring section (41) man-

ages the yarn information by the package, and acquires the yarn information for each of divided yarn lengths that are a plurality of lengths into which a fully wound yarn length in the package fully wound is divided.

Fig.3



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a yarn information acquiring device, a yarn winding machine, and a textile machine system.

BACKGROUND

[0002] In a yarn winding machine such as an automatic winder and a spinning machine, when yarn is wound to form a package, yarn information indicating the state of the yarn may be acquired at regular time intervals (e.g., for each shift) (see Japanese Unexamined Patent Publication No. H7-138822, for example).

SUMMARY

[0003] If some event occurs in a package formed by a yarn winding machine described above in a subsequent process, it is difficult to identify the cause of occurrence of the event on the basis of yarn information acquired at regular time intervals.

[0004] In view of this, an object of the present disclosure is to provide a yarn information acquiring device, a yarn winding machine, and a textile machine system that, if some event occurs in a package in a subsequent process after a process of forming the package, enables the cause of occurrence of the event to be easily identified.

[0005] A yarn information acquiring device according to embodiments of the present disclosure includes a yarn information acquiring section that, when yarn is wound to form a package in a yarn winding machine, acquires yarn information indicating a state of the yarn. The yarn information acquiring section manages the yarn information by the package, and acquires the yarn information for each of divided yarn lengths that are a plurality of lengths into which a fully wound yarn length in the package fully wound is divided.

[0006] With this yarn information acquiring device, the yarn information is acquired for each divided yarn length to be managed on a package-by-package basis, and thus if some event occurs in a package in a subsequent process after the process of forming the package, the cause of occurrence of the event can be easily identified.

[0007] The yarn information acquiring device according to embodiments of the present disclosure may further include a yarn information storage section that stores the yarn information by the package and for each divided yarn length. By this configuration, the cause of occurrence of an event that occurs in a package can be identified in the yarn information acquiring device.

[0008] In the yarn information acquiring device according to embodiments of the present disclosure, the divided yarn lengths may be lengths into which the fully wound yarn length is divided by a value within a range equal to or larger than 10 and equal to or smaller than 1000. By

this setting, even with a limited storage capacity (memory), temporal change of the yarn information can be acquired in an identifiable manner (in a visualized manner) while the memory is being efficiently used.

[0009] In the yarn information acquiring device according to embodiments of the present disclosure, the yarn information acquiring section may acquire first yarn information that is the yarn information for each of first yarn lengths that are the divided yarn lengths, and acquire second yarn information that is the yarn information for each of second yarn lengths that are the divided yarn lengths. While the pattern of temporal change of yarn information to be acquired is being focused on, the number of divisions is reduced (i.e., the divided yarn length is increased) for yarn information temporal change of which is small, whereby the amount of yarn information acquired for one package can be reduced. Thus, even with a limited storage capacity (memory), the number of types of yarn information to be acquired can be increased. Thus, the divided yarn length for acquiring yarn information can be set from the viewpoint of temporal changes, and temporal changes of respective pieces of yarn information of various types can be acquired in an identifiable manner (each in a visualized manner) while the memory is being efficiently used.

[0010] In the yarn information acquiring device according to embodiments of the present disclosure, the second yarn lengths may be longer than the first yarn lengths, the first yarn information may be information indicating tension generated in the yarn when the yarn is wound, and the second yarn information may be information indicating thickness of the yarn. By this setting, change in tension and change in the thickness of yarn that are pieces of important information for grasping quality of a package can be acquired such that each change can be identified (each in a visualized manner) while the memory is being efficiently used.

[0011] In the yarn information acquiring device according to embodiments of the present disclosure, the yarn information acquiring section may acquire, for each divided yarn length, environmental information indicating at least one of temperature and humidity in an area where the yarn winding machine is installed. By this configuration, whether at least one of the temperature and the humidity is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0012] In the yarn information acquiring device according to embodiments of the present disclosure, the yarn information acquiring section may acquire, for each divided yarn length, operating information indicating at least one of an operating condition and an operating state of the yarn winding machine. By this configuration, whether at least one of the operating condition and the operating state is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0013] In the yarn information acquiring device according to embodiments of the present disclosure, when each package is formed with a plurality of yarn supplying bob-

bins, the yarn information acquiring section may acquire the yarn information by the yarn supplying bobbin. By this configuration, whether a certain yarn supplying bobbin is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0014] In the yarn information acquiring device according to embodiments of the present disclosure, when each package is formed with at least one can, the yarn information acquiring section may acquire the yarn information by the can. By this configuration, whether a certain can is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0015] In the yarn information acquiring device according to embodiments of the present disclosure, the yarn information acquiring section may acquire event information indicating an event that occurs in the yarn together with time information when the yarn is wound to form the package in the yarn winding machine. By this configuration, whether an event that occurs in yarn when a package is formed is concerned as a cause of occurrence of an event that occurs in the package can be analyzed.

[0016] In the yarn information acquiring device according to embodiments of the present disclosure, the event information may be information indicating joining of the yarn. By this setting, whether joining of yarn is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0017] A yarn information acquiring device according to embodiments of the present disclosure includes a yarn information acquiring section that, when yarn formed with a sliver in one can is wound to form a plurality of packages in a yarn winding machine, acquires yarn information indicating a state of the yarn by the can.

[0018] With this yarn information acquiring device, yarn information is acquired on a can-by-can basis, and thus if some event occurs due to a certain can in a package in a subsequent process, the cause of occurrence of the event can be easily identified.

[0019] A yarn winding machine according to embodiments of the present disclosure includes: a yarn supplying section that supplies yarn; a winding section that winds the yarn and forms a package; and the yarn information acquiring device described above.

[0020] A textile machine system according to embodiments of the present disclosure includes: a yarn winding machine including a yarn supplying section that supplies yarn and a winding section that winds the yarn and forms a package; and the yarn information acquiring device described above.

[0021] With the yarn winding machine and the textile machine system, the yarn information acquiring device described above is provided therein, and thus if some event occurs in a package in a subsequent process after the process of forming the package, the cause of occurrence of the event can be easily identified.

[0022] According to the present disclosure, it is possible to provide the yarn information acquiring device, the yarn winding machine, and the textile machine system

that, if some event occurs in a package in a subsequent process after the process of forming the package, enables the cause of occurrence of the event to be easily identified.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a block diagram illustrating a configuration of a yarn winding machine according to one 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 graph illustrating one example of first yarn information;

FIG. 5 is a graph illustrating one example of second yarn information and environmental information; and FIG. 6 is a graph illustrating one example of operating information.

DETAILED DESCRIPTION

[0024] An embodiment of the present disclosure will now be described in detail with reference to the drawings. In the drawings, like or equivalent elements are designated by like numerals, and duplicate description is omitted.

[0025] As depicted in FIG. 1, a yarn winding machine 1 includes a plurality of yarn winding units 2, a plurality of unit control devices 3, and a machine control device (yarn information acquiring device) 4. The yarn winding machine 1 is an automatic winder. Each yarn winding unit 2 winds yarn to form a package. Each unit control device 3 is provided for every certain number of yarn winding units 2, and controls operation of the yarn winding units 2 under management thereof. The machine control device 4 communicates with each unit control device 3 to control operation of the yarn winding machine 1.

[0026] The unit control devices 3 and the machine control device 4 are each configured as a computer device including a processor, a memory, a storage, and a communication device. In each control device, the processor executes predetermined software (program) read in the memory, for example, reads and writes data in the memory and the storage, and controls communication between the control devices performed by the communication device, whereby functions of the respective control devices described later are implemented. Each unit control device 3 may be provided for every yarn winding unit 2.

[0027] As depicted in FIG. 2, each yarn winding unit 2 includes a yarn supplying section 21, a tension applying section 22, a tension detecting section 23, a yarn monitoring section 24, a joining section 25, and a winding section 26.

[0028] The yarn supplying section 21 supplies yarn. The yarn supplying section 21 includes a bobbin supporting device that supports a yarn supplying bobbin. The tension applying section 22 applies tension to yarn travelling from the yarn supplying section 21 toward the winding section 26. The tension applying section 22 is a gate-type tension applying device or a disk-type tension applying device, for example. The tension detecting section 23 detects tension generated in yarn when the yarn is wound. Based on the tension detected by the tension detecting section 23, the unit control device 3 feedback-controls a command value to be input to the tension applying section 22 such that the tension applied to yarn by the tension applying section 22 becomes a target value.

[0029] The yarn monitoring section 24 monitors the yarn travelling from the yarn supplying section 21 toward the winding section 26 to detect a yarn defect. The yarn monitoring section 24 includes a detection device 24a and a control device 24b. The detection device 24a is, for example, an optical sensor that emits light to yarn and detects temporal change in thickness of the yarn on the basis of change in amount of received light or a capacitive sensor that causes yarn to pass through an electric field and detects temporal change in fiber volume (thickness) of the yarn on the basis of change in capacitance. The detection device 24a outputs a waveform signal indicating temporal change in yarn thickness or fiber volume to the control device 24b. Based on the waveform signal, the control device 24b calculates yarn defect information indicating the length and the thickness or the fiber volume of the yarn defect in the yarn, and outputs the yarn defect information to the unit control device 3. If the unit control device 3 has determined based on the yarn defect information that the yarn defect needs to be removed, the yarn is cut by, for example, a cutter provided to the yarn winding unit 2. The yarn monitoring section 24 can also detect the speed of the yarn travelling from the yarn supplying section 21 toward the winding section 26, a foreign matter contained in the yarn, and yarn breakage, for example.

[0030] When the yarn has been cut in order to remove a yarn defect detected by the yarn monitoring section 24 or yarn breakage has been detected by the yarn monitoring section 24, the joining section 25 performs joining operation of joining the yarn on the yarn supplying section 21 side and the yarn on the winding section 26 side. The joining section 25 includes a first yarn catching-and-guiding device, a second yarn catching-and-guiding device, and a joining part. The first yarn catching-and-guiding device catches the yarn on the yarn supplying section 21 side by suction, and guides the yarn to the joining part. The second yarn catching-and-guiding device catches the yarn on the winding section 26 side by suction, and guides the yarn to the joining part. The joining part is, for example, a splicer using compressed air, a piecer using a seed yarn, or a knotter that mechanically joins yarns, and joins the yarns thus guided.

[0031] The winding section 26 winds yarn around a bobbin to form a package. The winding section 26 includes a cradle arm, a winding drum, and a traverse device. The cradle arm rotatably supports the package. The winding drum comes into contact with a surface of the package supported by the cradle arm to rotate the package. The traverse device traverses the yarn by a predetermined width with respect to the rotating package. When a motor directly drives and rotates the package, the winding drum may have a traverse groove, for example.

[0032] As depicted in FIG. 3, the machine control device 4 includes a processing section (yarn information acquiring section) 41 and a storage section (yarn information storage section) 42.

[0033] When yarn is wound to form a package in the yarn winding machine 1, the processing section 41 acquires each of yarn information, environmental information, and operating information, and manages each of the yarn information, the environmental information, and the operating information by the package (i.e., in a manner associated with individual packages). The yarn information is information indicating a state of yarn (state of yarn travelling from the yarn supplying section 21 toward the winding section 26). The environmental information is information indicating at least one of temperature and humidity in an area where the yarn winding machine 1 is installed. The operating information is information indicating at least one of an operating condition and an operating state of the yarn winding machine 1.

[0034] The processing section 41 acquires each of the yarn information, the environmental information, and the operating information for each of divided yarn lengths. The divided yarn lengths are a plurality of lengths into which a fully wound yarn length in a package fully wound is divided (i.e., the length of yarn that forms one complete package). Specifically, the divided yarn lengths are lengths into which the fully wound yarn length is divided by a value within a range equal to or larger than 10 and equal to or smaller than 1000. Herein, the fully wound yarn length is equally divided. In other words, the yarn lengths (divided yarn lengths) of the respective segments after division are equal to each other.

[0035] When one package is formed with a plurality of yarn supplying bobbins, the processing section 41 acquires each of the yarn information, the environmental information, and the operating information by the yarn supplying bobbin (i.e., in a manner associated with individual yarn supplying bobbins). When yarn is wound to form a package in the yarn winding machine 1, the processing section 41 acquires event information indicating an event (e.g., joining performed by the joining section 25, sudden tension change detected by the tension detecting section 23, correction for a value detected by the tension detecting section 23 such as temperature correction) that has occurred in the yarn and also time information (time when the event has occurred). The processing section 41 also acquires winding start time

and winding end time for each package. The processing section 41 acquires pieces of information described above from each unit control device 3.

[0036] The storage section 42 stores each of the yarn information, the environmental information, and the operating information acquired by the processing section 41 on a package-by-package basis (i.e., in a manner associated with individual packages) and for each divided yarn length. When one package is formed with a plurality of yarn supplying bobbins, the storage section 42 stores each of the yarn information, the environmental information, and the operating information on a yarn supplying bobbin-by-yarn supplying bobbin basis (i.e., in a manner associated with individual yarn supplying bobbins). The storage section 42 also stores the event information with the time information. The storage section 42 stores winding start time and winding end time for each package.

[0037] As one example as depicted in FIG. 4, the processing section 41 acquires pieces of information (first yarn information) indicating tension strength, speed, and tension for each of divided yarn lengths (first yarn lengths) into which the fully wound yarn length is equally divided by 100, and the storage section 42 stores these pieces of information. The tension strength is an average value of command values that are input to the tension applying section 22 of each yarn winding unit 2 by the corresponding unit control device 3. The speed is an average value of speeds of yarn travelling from the yarn supplying section 21 toward the winding section 26, and is detected by the yarn monitoring section 24 of the yarn winding unit 2. The tension is an average value of tensions that are generated in yarn when the yarn is wound, and is detected by the tension detecting section 23. In FIG. 4, the left ordinate represents values of the tension strength and the speed, and the right ordinate represents values of the tension.

[0038] As depicted in FIG. 5, the processing section 41 acquires pieces of information (second yarn information) indicating thickness, hairiness quantity, uniformity, a residual yarn defect (A1), a residual yarn defect (Thin), a residual yarn defect (Thick), and a residual yarn defect (Nep) for each of divided yarn lengths (second yarn lengths that are longer than the first yarn lengths) into which the fully wound yarn length is equally divided by 20, and also acquires information (environmental information) indicating temperature. The storage section 42 stores these pieces of information. The thickness is an average value of yarn thicknesses (apparent thicknesses), and is detected by the yarn monitoring section 24 of each yarn winding unit 2. The hairiness quantity is an average value of yarn hairiness quantities, and is detected by the yarn monitoring section 24. The uniformity is an average value of yarn uniformities, and is detected by the yarn monitoring section 24. The residual yarn defect (A1) is the number of A1-class yarn defects that have not been removed, and is detected by the yarn monitoring section 24 of the yarn winding unit 2. The residual yarn defect (Thin) is the number of thin-yarn defects that have

not been removed, and is detected by the yarn monitoring section 24 of the yarn winding unit 2. The residual yarn defect (Thick) is the number of thick-yarn defects that have not been removed, and is detected by the yarn monitoring section 24 of the yarn winding unit 2. The residual yarn defect (Nep) is the number of yarn defects corresponding to neps that have not been removed, and is detected by the yarn monitoring section 24 of the yarn winding unit 2. Each of the residual yarn defect (A1), the residual yarn defect (Thin), the residual yarn defect (Thick), and the residual yarn defect (Nep) is a value obtained by converting the number thereof detected for each of divided yarn lengths into which the fully wound yarn length is equally divided by 20 into the number thereof for a predetermined length (e.g., 100 kilometers). The temperature is an average value of temperatures in an area where the yarn winding machine 1 is installed, and is detected by a temperature sensor (not depicted). In FIG. 5, the left ordinate represents values of the thickness, the hairiness quantity, the uniformity, the residual yarn defect (A1), the residual yarn defect (Thin), the residual yarn defect (Thick), and the residual yarn defect (Nep), and the right ordinate represents values of the temperature.

[0039] As depicted in FIG. 6, the processing section 41 acquires pieces of information (operating information indicating operating states of the yarn winding machine 1) indicating an A-axis average, an A-axis maximum, a B-axis average, and a B-axis maximum of vibrations of the yarn winding unit 2 for each of divided yarn lengths into which the fully wound yarn length is equally divided by 100, and also acquires information (operating information indicating an operating condition of the yarn winding machine 1) indicating rotation speed of a package. The storage section 42 stores these pieces of information. The A-axis average is an average value of vibrations in an A-axis direction, and is detected by an acceleration sensor attached to the unit control device 3, for example. The A-axis maximum is a maximum value of vibrations in the A-axis direction, and is detected by an acceleration sensor attached to the unit control device 3, for example. The B-axis average is an average value of vibrations in a B-axis direction, and is detected by an acceleration sensor attached to the unit control device 3, for example. The B-axis maximum is a maximum value of vibrations in the B-axis direction, and is detected by an acceleration sensor attached to the unit control device 3, for example. The rotation speed is a rotation speed of a package that is being wound, and is detected by a rotation speed sensor, for example. In FIG. 6, the left ordinate represents values of the A-axis average, the A-axis maximum, the B-axis average, and the B-axis maximum, and the right ordinate represents values of the rotation speed.

[0040] As described in the foregoing, the machine control device 4 includes the processing section 41 that, when yarn is wound to form a package in the yarn winding machine 1, acquires yarn information indicating a state of the yarn. The processing section 41 manages the yarn

information by the package, and acquires the yarn information for each of divided yarn lengths that are a plurality of lengths into which a fully wound yarn length in the package fully wound is divided. In the machine control device 4, the yarn information is acquired for each divided yarn length to be managed on a package-by-package basis as described above, and thus if some event occurs in a package in a subsequent process after a process of forming the package, the cause of occurrence of the event can be easily identified. This applies to the yarn winding machine 1 including the machine control device 4.

[0041] The machine control device 4 further includes the storage section 42 that stores the yarn information indicating the state of the yarn by the package and for each divided yarn length. By this configuration, the cause of occurrence of an event that occurs in a package can be identified in the machine control device 4.

[0042] In the machine control device 4, the divided yarn lengths are lengths into which the fully wound yarn length is divided by a value within the range equal to or larger than 10 and equal to or smaller than 1000. By this setting, even with a limited storage capacity (memory), temporal change of the yarn information can be acquired in an identifiable manner (in a visualized manner) while the memory is being efficiently used.

[0043] In the machine control device 4, the processing section 41 acquires the first yarn information for each first yarn length, and acquires the second yarn information that is different from the first yarn information for each second yarn length that is different from the first yarn length. While the pattern of temporal change of yarn information to be acquired is being focused on, the number of divisions is reduced (i.e., the divided yarn length is increased) for yarn information temporal change of which is small, whereby the amount of yarn information acquired for one package can be reduced. Thus, even with a limited storage capacity (memory), the number of types of yarn information to be acquired can be increased. Thus, the divided yarn length for acquiring yarn information can be set from the viewpoint of temporal changes, and temporal changes of respective pieces of yarn information of various types can be acquired in an identifiable manner (each in a visualized manner) while the memory is being efficiently used.

[0044] In the machine control device 4, the processing section 41 acquires information indicating tension generated in yarn when the yarn is wound as the first yarn information for each first yarn length, and acquires information indicating thickness of the yarn as the second yarn information for each second yarn length that is longer than the first yarn length. By this configuration, change in tension and change in the thickness of yarn that are pieces of important information for grasping quality of a package can be acquired such that each change can be identified (each in a visualized manner) while the memory is being efficiently used.

[0045] In the machine control device 4, the processing

section 41 acquires environmental information indicating at least one of temperature and humidity in an area where the yarn winding machine 1 is installed, for each of divided yarn lengths into which the length of yarn that forms one package is divided. By this configuration, whether at least one of the temperature and the humidity is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0046] In the machine control device 4, the processing section 41 acquires operating information indicating at least one of an operating condition and an operating state of the yarn winding machine 1, for each of divided yarn lengths into which the length of yarn that forms one package is divided. By this configuration, whether at least one of the operating condition and the operating state is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0047] In the machine control device 4, when each package is formed with a plurality of yarn supplying bobbins, the processing section 41 acquires the yarn information indicating the state of the yarn by the yarn supplying bobbin. By this configuration, whether a certain yarn supplying bobbin is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0048] In the machine control device 4, the processing section 41 acquires event information indicating an event that occurs in the yarn together with time information when the yarn is wound to form the package in the yarn winding machine 1. By this configuration, whether an event that occurs in yarn when a package is formed is concerned as a cause of occurrence of an event that occurs in the package can be analyzed. In particular, when information indicating joining of yarn is acquired as the event information together with the time information, whether joining of yarn is concerned as a cause of occurrence of the event that occurs in the package can be analyzed.

[0049] The types of pieces of information to be acquired and stored can be changed by mode setting. By changing the types of pieces of information to be acquired and stored depending on purposes, the minimum necessary amount of information can be acquired and stored. Depending on the number of joining operations, the number of residual yarn defects, or the like, the quality of each package can be evaluated. By checking, for a plurality of packages, pieces of information on catching of yarn on the winding section 26 side performed by the second yarn catching-and-guiding device, catching positions depending on diameters of the packages (positions where the second yarn catching-and-guiding device stops to catch the yarn on the winding section 26 side) can be optimized. By checking the speed of yarn with respect to wound lengths, variations in adjustment of the angle of the cradle arm in the winding section 26 can be grasped. By utilizing event information (information indicating an event that occurs in yarn) together with time information, change in quality data when a certain alarm

is issued can be grasped, whereby the abnormality location in the yarn winding machine 1 can be easily identified.

[0050] Although one embodiment of the present disclosure has been described above, the present disclosure is not limited to the embodiment.

[0051] The yarn winding machine 1 is not limited to the automatic winder, and may be an air spinning machine, an open-end spinning machine, or a ring spinning machine, for example. When the yarn winding machine 1 is an air spinning machine, for example, each yarn winding unit 2 does not include the tension applying section 22, but further includes a yarn storage device that stores yarn and a waxing device that applies wax to the yarn. When the yarn winding machine 1 is the air spinning machine, each yarn supplying section 21 includes a drafting device that drafts a fiber band and an air spinning device that generates yarn by twisting the drafted fiber band using swirling airflow. When the yarn winding machine 1 is a spinning machine, the joining section 25 may be configured as a joining carrier that can travel with respect to the yarn winding units 2.

[0052] For example, when the yarn winding machine 1 is the spinning machine and one package is formed with at least one can (sliver can), the yarn information indicating the state of yarn may be acquired on a can-by-can basis. By this setting, whether a certain can is concerned as a cause of occurrence of an event that occurs in a package can be analyzed.

[0053] The speed of yarn travelling from the yarn supplying section 21 toward the winding section 26 is not limited to that detected by the yarn monitoring section 24, and may be detected by a speed sensor provided separately, or may be calculated based on the rotation speed of the winding drum in the winding section 26. When the yarn winding machine 1 is the air spinning machine, the speed of the corresponding yarn may be calculated based on a speed at which the air spinning machine forms yarn.

[0054] In the embodiment, the machine control device 4 includes the processing section 41 having a function as the yarn information acquiring section and the storage section 42 having a function as the yarn information storage section. However, the yarn information acquiring device, the yarn winding machine, and the textile machine system according to the present disclosure are not limited to this. For example, each unit control device (yarn information acquiring device) 3 may include the yarn information acquiring section, and the machine control device 4 may include the yarn information storage section. Alternatively, each unit control device (yarn information acquiring device) 3 or the machine control device (yarn information acquiring device) 4 may include the yarn information acquiring section, and a management device that is a host control device of the yarn winding machine 1 may include the yarn information storage section. Alternatively, each unit control device (yarn information acquiring device) 3, the machine control device (yarn information acquiring device) 4, or the management device

(yarn information acquiring device) that is a host control device of the yarn winding machine 1 may include the yarn information acquiring section, and a management device located in another place may include the yarn information storage section.

[0055] For example, when the management device that is a host control device of the yarn winding machine 1 functions as the yarn information acquiring device, the yarn winding machine 1 and the management device may constitute a textile machine system. With the textile machine system thus configured, if some event occurs in a package in a subsequent process after a process of forming the package, the cause of occurrence of the event can be easily identified.

[0056] The yarn information acquiring device such as the unit control device 3, the machine control device 4, or the management device that is a host control device of the yarn winding machine 1 may include a yarn information acquiring section that, when yarn formed with a sliver (fiber band) in one can is wound to form a plurality of packages in the yarn winding machine 1, acquires yarn information indicating a state of the yarn by the can. With the yarn information acquiring device thus configured, the yarn information is acquired on a can-by-can basis, and thus if some event occurs due to a certain can in a package in a subsequent process, the cause of occurrence of the event can be easily identified.

[0057] The number by which the length of yarn to form one package is divided may be optionally set depending on the yarn information. Specifically, the divided yarn lengths are not limited to the lengths into which the fully wound yarn length is divided by a value within the range equal to or larger than 10 and equal to or smaller than 1000, and may be lengths into which the fully wound yarn length is divided by a value outside the range equal to or larger than 10 and equal to or smaller than 1000. Values of the yarn information, the environmental information, and the operating information to be acquired for each divided yarn length may be optionally set to average values, maximum values, minimum values, median values, or cumulative values, for example, depending on the yarn information.

[0058] The yarn information acquiring device such as the unit control device 3, the machine control device 4, or the management device that is a host control device of the yarn winding machine 1 may include a display unit that displays pieces of yarn information acquired for each divided yarn length. Pieces of yarn information acquired for each divided yarn length may be displayed as trend data on a package-by-package basis by the display unit as depicted in FIG. 4 and FIG. 5.

[0059] The yarn information acquiring device such as the unit control device 3, the machine control device 4, or the management device that is a host control device of the yarn winding machine 1 may include a setting section that sets a fully wound yarn length. The fully wound yarn length is set generally to a length equal to or greater than 100 kilometers, and is set to, depending on yarn

count, for example, about 200 kilometers for medium count yarn (e.g., Ne 40) and about 300 to 500 kilometers for fine count yarn (e.g., Ne 100). For example, the fully wound yarn length of a package is order-of-magnitudes longer than the fully wound yarn length of a yarn supplying bobbin that is about 4 kilometers for medium count yarn. With the yarn information acquiring device, the yarn winding machine, and the textile machine system according to the present disclosure, the yarn information of a package the fully wound yarn length of which is very long as described above can be efficiently and appropriately acquired and managed.

[0060] For example, when the maximum value or the minimum value of optionally selected yarn information is to be acquired, the yarn information acquiring device such as the unit control device 3, the machine control device 4, or the management device that is a host control device of the yarn winding machine 1 may acquire the maximum value or the minimum value of the yarn information for each divided yarn length by temporarily storing a maximum value or a minimum value in the current divided yarn length segment from the time when the current divided yarn length segment starts while updating the maximum value or the minimum value as necessary, and determining the value at the time when the current divided yarn length segment ends. For example, when the cumulative value of optionally selected yarn information is to be acquired, the yarn information acquiring section may acquire the cumulative value of the yarn information for each divided yarn length by temporarily stores a cumulative value in the current divided yarn length segment from the time when the current divided yarn length segment starts while updating the cumulative value as necessary, and determining the value at the time when the current divided yarn length segment has ended. Acquiring the yarn information by such methods as described above eliminates the need of storing raw data, and thus the memory can be efficiently used. Alternatively, the yarn information acquiring section may continue to temporarily store pieces of raw data in a predetermined divided yarn length segment from when the divided yarn length segment starts to when the segment ends, may calculate the average value or the median value, for example, based on the pieces of raw data at the time when the predetermined divided yarn length segment has ended, and may discard the raw data after the calculation. By this method, the need of storing raw data that is relatively large data can be minimized, and an appropriate value can be obtained while the memory is being efficiently used.

[0061] At least some configurations of the embodiment described above may be optionally used in combination with at least some other configurations of the embodiment.

[0062] Based on the embodiment described above, a yarn information acquiring device, a yarn winding machine, and a textile machine system according to the present disclosure can be obtained as follows. Note that

at least some configurations of the yarn information acquiring device, the yarn winding machine, and the textile machine system according to the present disclosure described below may be optionally used in combination with at least some other configurations of the yarn information acquiring device, the yarn winding machine, and the textile machine system.

[0063] A yarn information acquiring device according to the present disclosure includes a yarn information acquiring section that, when yarn is wound to form a package in a yarn winding machine, acquires yarn information indicating a state of the yarn by the package.

[0064] With this yarn information acquiring device, the yarn information is acquired on a package-by-package basis, and thus if some event occurs in a package in a subsequent process after a process of forming the package, the cause of occurrence of the event can be easily identified.

[0065] The yarn information acquiring device according to the present disclosure may further include a yarn information storage section that stores the yarn information by the package. By this configuration, the cause of occurrence of an event that occurs in a package can be identified in the yarn information acquiring device.

[0066] In the yarn information acquiring device according to the present disclosure, the yarn information acquiring section may acquire the yarn information for each of yarn lengths into which the length of yarn that forms one package is divided. By this configuration, the cause of occurrence of an event that occurs in a package can be more accurately identified.

Claims

1. A yarn information acquiring device (4) comprising a yarn information acquiring section (41) that, when yarn is wound to form a package in a yarn winding machine (1), is configured to acquire yarn information indicating a state of the yarn, wherein the yarn information acquiring section (41) is configured to manage the yarn information by the package, and to acquire the yarn information for each of divided yarn lengths that are a plurality of lengths into which a fully wound yarn length in the package fully wound is divided.
2. The yarn information acquiring device (4) according to claim 1 further comprising a yarn information storage section (42) configured to store the yarn information by the package and for each divided yarn length.
3. The yarn information acquiring device (4) according to claim 1 or 2, wherein the divided yarn lengths are lengths into which the fully wound yarn length is divided by a value within a range equal to or larger than 10 and equal to or smaller than 1000.

4. The yarn information acquiring device (4) according to any one of claims 1 to 3, wherein the yarn information acquiring section (41) is configured to acquire first yarn information that is the yarn information for each of first yarn lengths that are the divided yarn lengths, and to acquire second yarn information that is the yarn information for each of second yarn lengths that are the divided yarn lengths. 5
5. The yarn information acquiring device (4) according to claim 4, wherein the second yarn lengths is longer than the first yarn lengths, the first yarn information is information indicating tension generated in the yarn when the yarn is wound, and the second yarn information is information indicating thickness of the yarn. 10
6. The yarn information acquiring device (4) according to any one of claims 1 to 5, wherein the yarn information acquiring section (41) is configured to acquire, for each divided yarn length, environmental information indicating at least one of temperature and humidity in an area where the yarn winding machine (1) is installed. 20 25
7. The yarn information acquiring device (4) according to any one of claims 1 to 6, wherein the yarn information acquiring section (41) is configured to acquire, for each divided yarn length, operating information indicating at least one of an operating condition and an operating state of the yarn winding machine (1). 30 35
8. The yarn information acquiring device (4) according to any one of claims 1 to 7, wherein when each package is formed with a plurality of yarn supplying bobbins, the yarn information acquiring section (41) is configured to acquire the yarn information by the yarn supplying bobbin. 40
9. The yarn information acquiring device (4) according to any one of claims 1 to 8, wherein when each package is formed with at least one can, the yarn information acquiring section (41) is configured to acquire the yarn information by the can. 45
10. The yarn information acquiring device (4) according to any one of claims 1 to 9, wherein the yarn information acquiring section (41) is configured to acquire event information indicating an event that occurs in the yarn together with time information when the yarn is wound to form the package in the yarn winding machine (1). 50 55
11. The yarn information acquiring device (4) according to claim 10, wherein the event information is infor-

mation indicating joining of the yarn.

12. A yarn winding machine (1) comprising:

a yarn supplying section (21) configured to supply yarn;
a winding section (26) configured to wind the yarn and to form a package; and
the yarn information acquiring device (4) according to any one of claims 1 to 11.

13. A textile machine system comprising:

a yarn winding machine (1) including a yarn supplying section (21) configured to supply yarn and a winding section (26) configured to wind the yarn and to form a package; and
the yarn information acquiring device (4) according to any one of claims 1 to 11.

Fig. 1

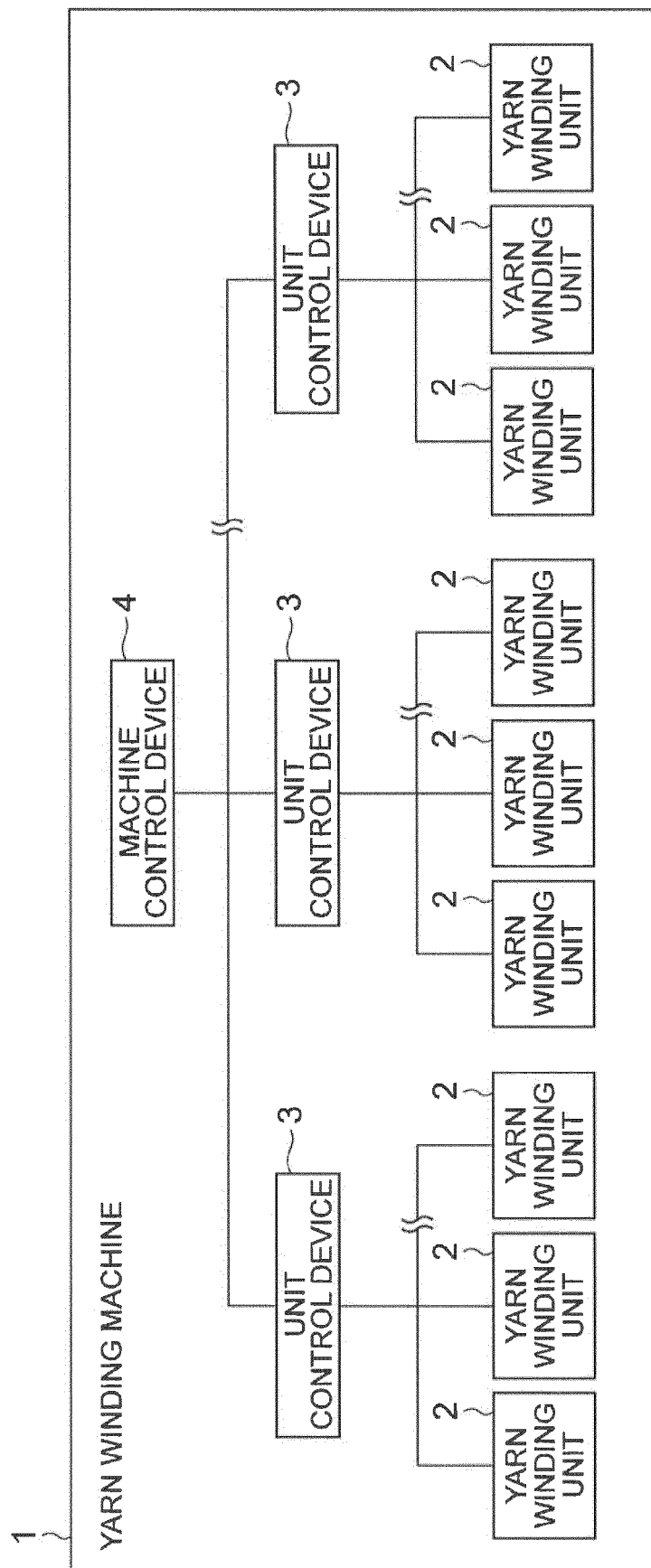


Fig.2

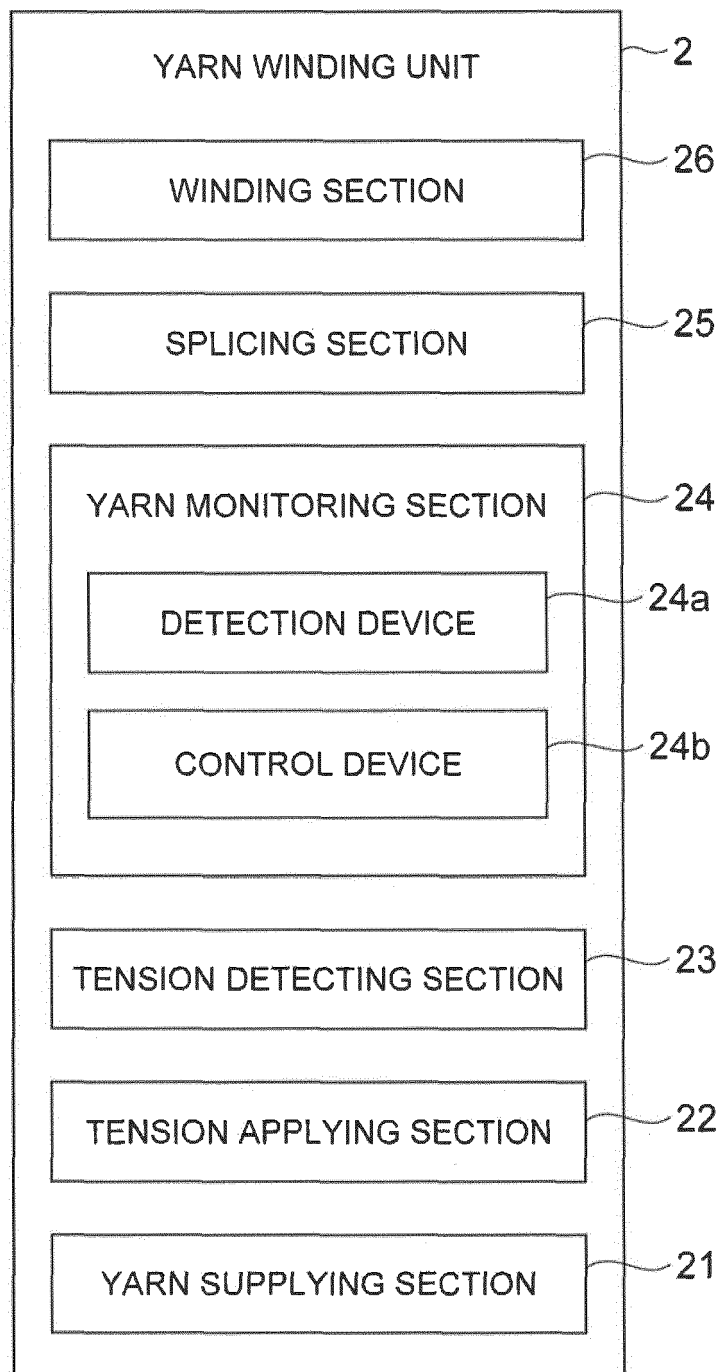


Fig.3

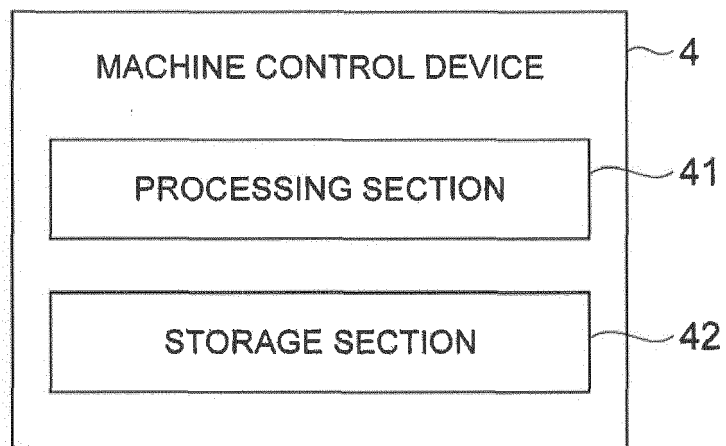


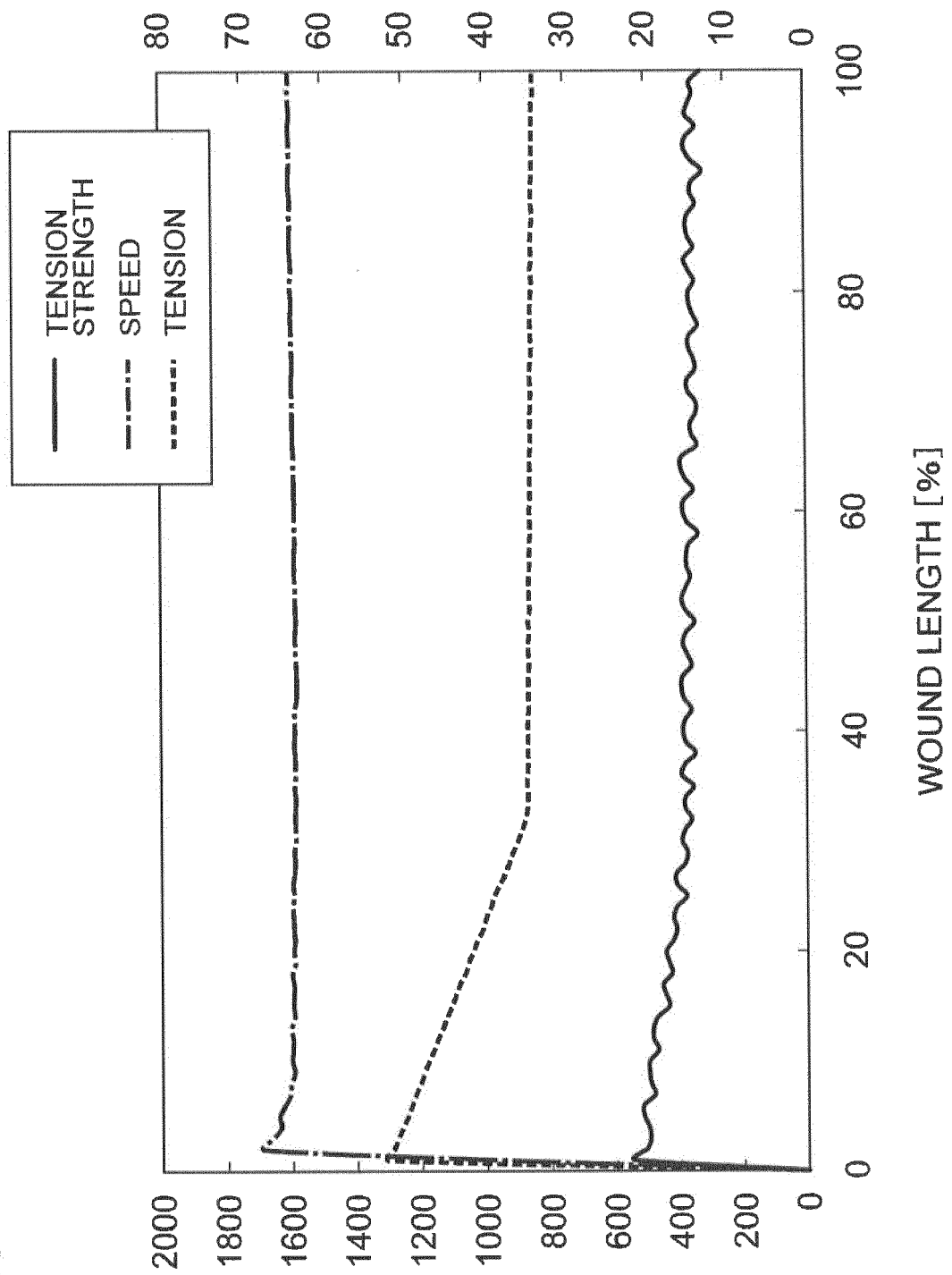
Fig.4

Fig. 5

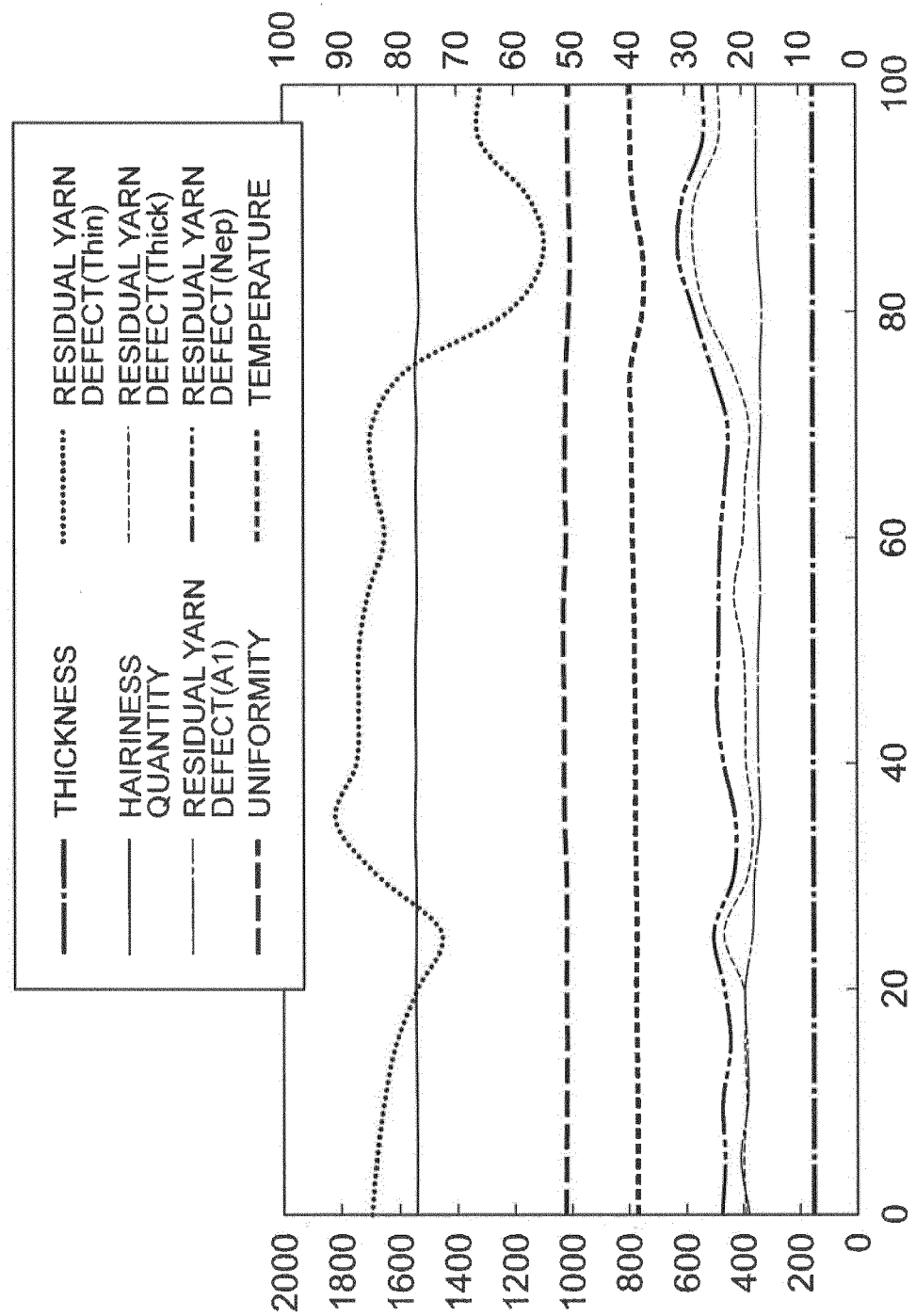
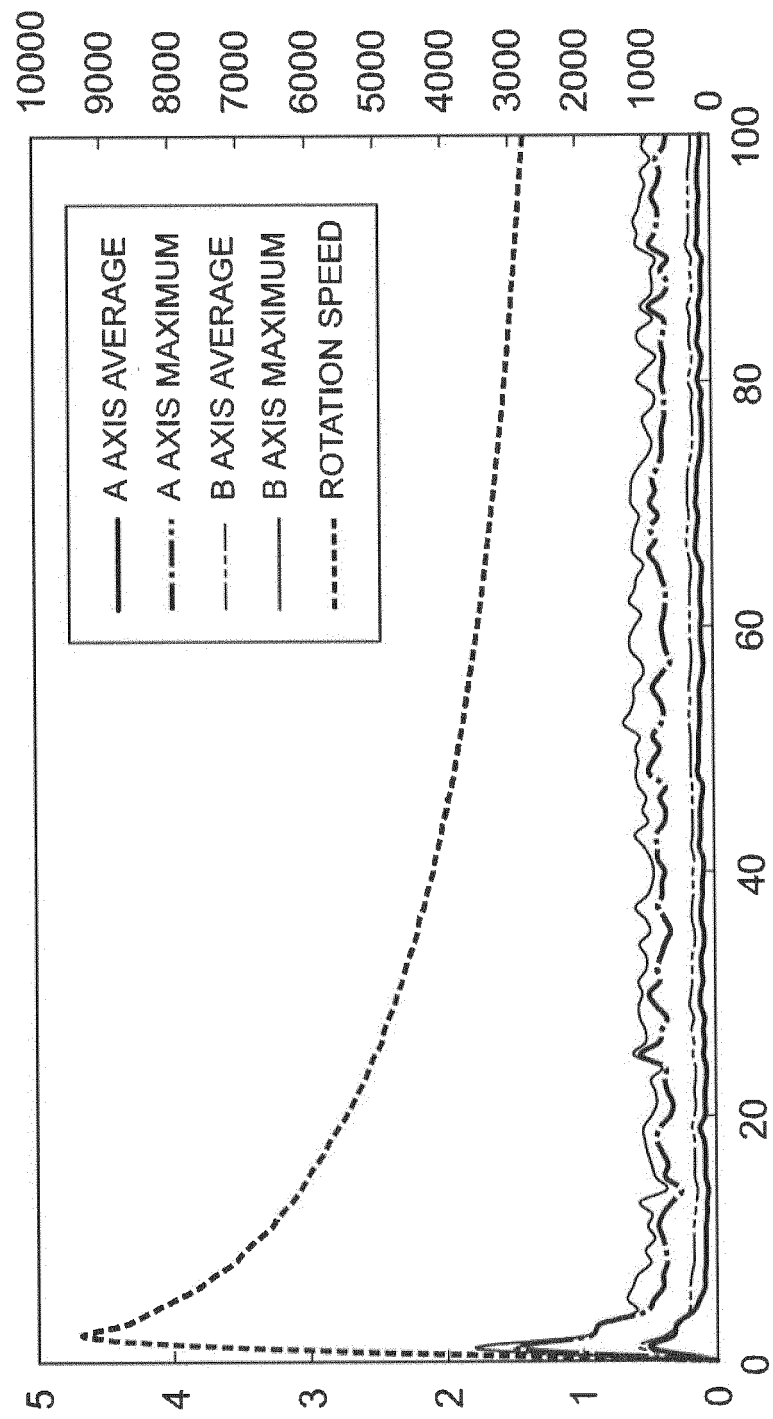


Fig.6





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