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(54) **TEXTILE MACHINE**

(57) An automatic winder (1) includes a yarn joining device (38), a first catching / guiding device (30) that guides a yarn (14) to the yarn joining device, an upper yarn sensor (60) that detects the yarn in a pipe member (32) of the first catching / guiding device, a yarn monitoring device (40) that detects the yarn traveling on a yarn path, and a unit controlling section (100) that determines success or failure in catching the yarn from a winding section (17) by the first catching / guiding device based on at least one of a detection result obtained in the upper yarn sensor and a detection result obtained in the yarn monitoring device, and that determines whether a defect has occurred in the yarn joining operation based on the detection results obtained in the upper yarn sensor and the yarn monitoring device.

FIG.2

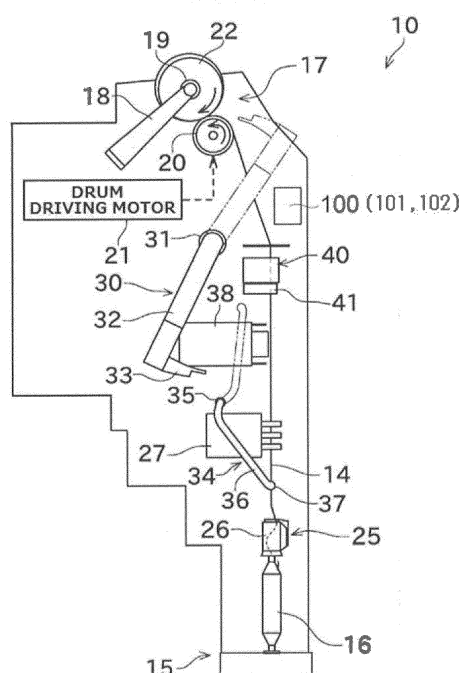
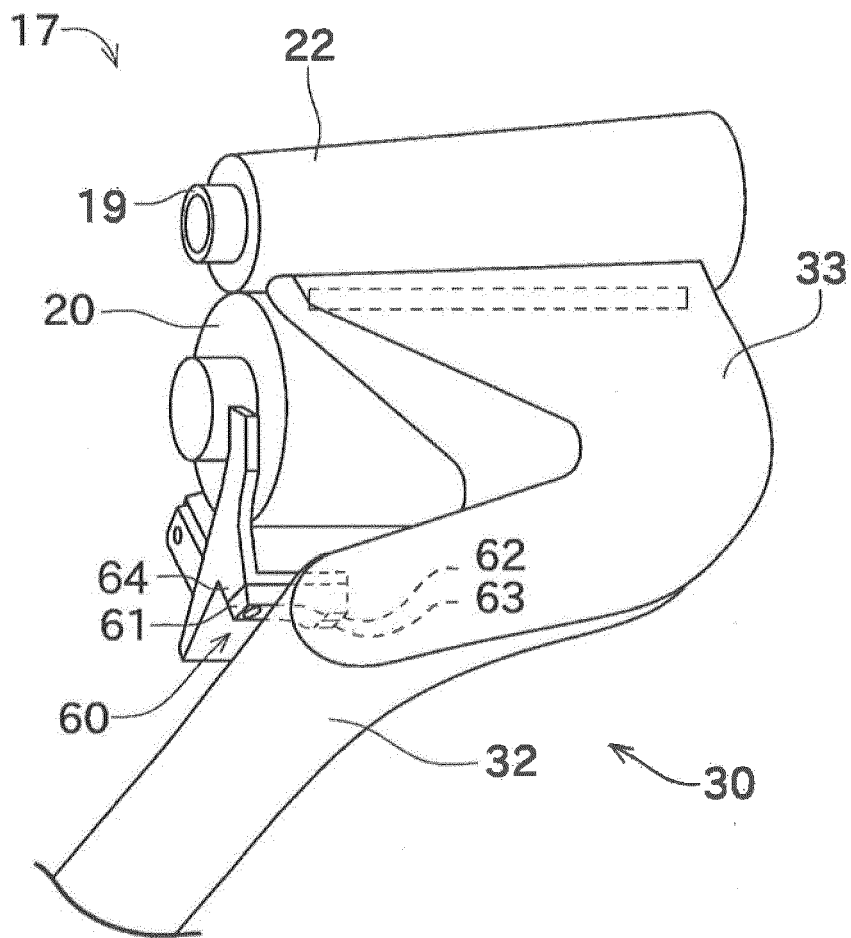


FIG.3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] For example, a machine disclosed in WO 2015/029275 is known as a conventional textile machine. The textile machine disclosed in WO 2015/029275 includes a winding yarn catching / guiding device, a detecting section, and a yarn joining device. The winding yarn catching / guiding device includes a movable catching member that, when a yarn becomes discontinuous, moves from a standby position to a catching position nearer to a winding section, and catches a winding yarn, which is a yarn from the winding section, by suction. The detecting section detects the winding yarn caught by the winding yarn catching / guiding device. The yarn joining device performs a yarn joining operation on the winding yarn and a yarn from a yarn supplying section from which the yarn is pulled.

SUMMARY OF THE INVENTION

[0003] In the conventional textile machine, the success or failure in catching the winding yarn in the winding yarn catching / guiding device is determined based on a detection by the detecting section of the presence / absence of the winding yarn inside the movable catching member. However, in the textile machine, even if the winding yarn has been caught successfully by the winding yarn catching / guiding device, the yarn joining operation of the yarns may not be performed normally in the yarn joining device due to some other issues.

[0004] From the viewpoint of the availability of the device, it is desirable that an operator knows at an earlier stage that a defect has occurred in the yarn joining operation.

[0005] One object of the present invention is to provide a textile machine that can appropriately detect the occurrence of a defect in the yarn joining operation.

[0006] A textile machine according to one aspect of the present invention includes a yarn supplying section from which a yarn is pulled; a winding section that winds the yarn pulled from the yarn supplying section and forms a package; a yarn joining device that performs yarn joining of the yarn from the yarn supplying section and the yarn from the winding section; a yarn catching / guiding device that sucks the yarn from the winding section in a tube member thereby catching the yarn and guides the caught yarn to the yarn joining device; a first detecting section that detects the yarn present in the tube member of the yarn catching / guiding device; a second detecting

section arranged on a yarn path between the yarn supplying section and the winding section and that detects the yarn traveling on the yarn path; a success / failure determining section that determines success or failure in catching the yarn from the winding section by the yarn catching / guiding device based on at least one of a detection result obtained in the first detecting section and a detection result obtained in the second detecting section; and a defect determining section that determines whether a defect has occurred in the yarn joining operation based on the detection results obtained in the first detecting section and the second detecting section.

[0007] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

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

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

FIG. 3 is a perspective view of a winding section and a first catching / guiding device.

FIG. 4 is a perspective view of a pipe member.

FIG. 5 is a cross-section of the pipe member.

DETAILED DESCRIPTION

[0009] Exemplary embodiments of the present invention are explained in detail with reference to the accompanying drawings. Identical elements or corresponding elements are indicated by the same reference symbols in the drawings and redundant explanation thereof is omitted.

[0010] As shown in FIG. 1, an automatic winder (textile machine) 1 includes a plurality of winding units 10 arranged in a row, a machine-frame controlling device 12, and a doffing device 13 as main structural sections.

[0011] The machine-frame controlling device 12 can communicate with each of the winding units 10. An operator of the automatic winder 1 can manage a plurality of the winding units 10 collectively by appropriately operating the machine-frame controlling device 12. The machine-frame controlling device 12 includes a display screen (displaying section) 12a and input keys 12b. The display screen 12a displays information and the like about setting contents and / or a state of the winding unit 10. The operator can perform working settings of the winding unit 10 by performing an appropriate operation by using the input keys 12b.

[0012] Each of the winding units 10, while unwinding a yarn 14 from a corresponding yarn supplying bobbin 16 and while traversing the yarn 14, winds the yarn 14

on a winding bobbin 19. With this operation, the winding unit 10 forms a package 22.

[0013] Each of the winding units 10 includes a unit controlling section 100 arranged on one side (right side in FIG. 1) of the yarn supplying bobbin 16, the package 22, and the like. The unit controlling section 100 includes, for example, a CPU (Central Processing Unit) and a ROM (Read Only Memory). A computer program to control the various structural sections of the winding unit 10 is stored in the ROM. The CPU executes the computer program stored in the ROM.

[0014] When the package 22 is fully wound (a predetermined amount of the yarn has been wound) in any winding unit 10, the doffing device 13 travels to a position of this winding unit 10, removes the fully-wound package therefrom and sets an empty winding bobbin 19 therein.

[0015] A configuration of the winding unit 10 is explained below while referring to FIG. 2. As shown in FIG. 2, the winding unit 10 includes a yarn supplying section 15 and a winding section 17.

[0016] The yarn supplying section 15 is a support mechanism that supports at a predetermined position the yarn supplying bobbin 16 placed on a not-shown conveying tray. Accordingly, the yarn 14 is unwound from the yarn supplying bobbin 16 and the yarn 14 is pulled from the yarn supplying bobbin 16. The yarn supplying section 15 is not limited to a conveying tray type but, for example, can be a magazine type.

[0017] The winding section 17 includes a cradle 18, the winding bobbin 19, and a winding drum 20 as main structural sections.

[0018] The cradle 18 includes a not-shown pair of rotation support members. The cradle 18 rotatably supports the winding bobbin 19 (or package 22) by holding the winding bobbin 19 between the rotary support members. The cradle 18 is pivotable between a contacting state in which the package 22 held thereby is in contact with the winding drum 20 and a separated state in which the package 22 is separated from the winding drum 20.

[0019] The winding drum 20 traverses the yarn 14 on the surface of the package 22 as well as rotates the package 22. The winding drum 20 is rotationally driven by a drum driving motor 21. By rotationally driving the winding drum 20 while the winding drum 20 is in contact with an outer peripheral surface of the package 22, the package 22 is rotationally driven. A spiral traversing groove (traversing mechanism) is formed in the outer peripheral surface of the winding drum 20. Because of the traversing groove, the yarn 14 unwound from the yarn supplying bobbin 16 is wound on the surface of the package 22 while being traversed for a certain width. As a result, the package 22 having a predetermined winding width can be formed.

[0020] In each of the winding units 10, on a yarn traveling path between the yarn supplying section 15 and the winding section 17, an unwinding assisting device 25, a tension applying device 27, a yarn joining device 38, and a yarn monitoring device (second detecting sec-

tion and yarn defect detecting device) 40 are sequentially arranged in this order from the yarn supplying section 15 side. A first catching / guiding device (yarn catching / guiding device) 30 and a second catching / guiding device 34 are arranged near the yarn joining device 38. In the below explanation, upstream and downstream with respect to the traveling direction of the yarn 14 may be simply called "upstream" and "downstream" respectively.

[0021] The unwinding assisting device 25 includes a regulating member 26 that can be put around a core tube of the yarn supplying bobbin 16. The regulating member 26 has a substantially cylindrical shape, and it is arranged so as to touch a balloon formed in a yarn layer upper part of the yarn 14, which is unwound from the yarn supplying bobbin 16, that swings around because of the centrifugal force. By causing the regulating member 26 to touch the balloon, the regulating member 26 touches the balloon part of the yarn 14 and prevents the yarn 14 from swinging around excessively. Accordingly, the yarn 14 can be appropriately unwound from the yarn supplying bobbin 16.

[0022] The tension applying device 27 applies a predetermined tension to the traveling yarn 14. In the present embodiment, the tension applying device 27 is a gate-type member having fixed comb teeth and movable comb teeth. The movable comb teeth are biased so as to engage with the fixed comb teeth. By passing the yarn 14 in a meandering state between the movable comb teeth and the fixed comb teeth that are in the engaged state, a suitable tension can be applied to the yarn 14, and the quality of the package 22 can be increased.

[0023] When the yarn 14 becomes discontinuous between the yarn supplying section 15 and the winding section 17 for some reason, the yarn joining device 38 performs yarn joining of the yarn 14 (lower yarn) from the yarn supplying section 15 and the yarn 14 (upper yarn) from the winding section 17. In the present embodiment, the yarn joining device 38 is a splicer device that twists yarn ends together by using a swirling air current generated by compressed air.

[0024] The first catching / guiding device 30 catches the upper yarn when the yarn 14 becomes discontinuous. The first catching / guiding device 30 includes a shaft 31, a pipe member (tube member) 32, and an upper yarn sucking / catching member 33. The pipe member 32 and the upper yarn sucking / catching member 33 are pivotable (movable) from a standby position (solid line in FIG. 2) on the yarn supplying section 15 side to a catching position (dotted line in FIG. 2) on the winding section 17 side about the shaft 31 as a center under the control of the unit controlling section 100. The first catching / guiding device 30 is connected to a not-shown negative pressure source, and a suction current can be generated in the upper yarn sucking / catching member 33 (specifically, in a suction port formed at a tip part thereof). With this arrangement, the upper yarn sucking / catching member 33 can catch the upper yarn at the catching position and guide the upper yarn to the yarn joining device 38 by

returning to the standby position.

[0025] As shown in FIG. 3, the first catching / guiding device 30 includes an upper yarn sensor (first detecting section) 60 for detecting the yarn 14 present inside the pipe member 32. The upper yarn sensor 60 includes a casing 61, a light emitting section 62, and a light receiving section 63.

[0026] The casing 61 is secured to the winding section 17 with a securing member 64. The casing 61 supports the light emitting section 62 and the light receiving section 63. The light emitting section 62 is constituted by a light emitting element such as a light emitting diode. The light emitting section 62 emits light on a later-explained light transmitting cover (light transmitting member) 50 arranged on the pipe member 32. When the yarn 14 is present inside the pipe member 32, the light emitted by the light emitting section 62 is reflected from the yarn 14.

[0027] The light receiving section 63 is constituted by a light receiving element such as a photodiode. The light receiving section 63 receives the light (reflected light) reflected from the yarn 14, and outputs an electric signal, in the form of an electric current or an electric voltage, corresponding to the amount of the received light. A not-shown arithmetic section is arranged inside the casing 61. The arithmetic section determines the success or failure to catch the yarn 14 from the winding section 17 by the first catching / guiding device 30 based on a detection result obtained in the light receiving section 63. Specifically, the arithmetic section analyzes the electric signal output by the light receiving section 63 and determines the presence / absence of the yarn 14 inside the pipe member 32. The arithmetic section outputs to the unit controlling section 100 a detection signal indicating a determination result (detection result) about the presence / absence of the yarn 14 inside the pipe member 32.

[0028] As explained above, as shown in FIG. 4, the pipe member 32 is provided with the light transmitting cover 50. The light transmitting cover 50 is formed of a member (such as acryl or polycarbonate) having translucency. The light transmitting cover 50 is a member for closing an opening 52 in the pipe member 32. The opening 52 is a through hole formed in a wall of the pipe member 32. The opening 52 is located on a tip end part side of the pipe member 32 (on upper yarn sucking / catching member 33 side). That is, the upper yarn sensor 60 detects the yarn 14 located on the tip end part side of the pipe member 32. The light transmitting cover 50 is attached to the pipe member 32 so as to be pivotable. By pivoting the light transmitting cover 50, the opening 52 can be opened or closed.

[0029] As shown in FIG. 5, the light emitting section 62 and the light receiving section 63 of the upper yarn sensor 60 are arranged at a location that is shifted on one side of a center (virtual line L1 in FIG. 5) of the pipe member 32 in a width direction of the package. Specifically, the light emitting section 62 and the light receiving section 63 are arranged such that an optical axis line L2 representing an optical axis of the light emitted from the light

emitting section 62 does not intersect with a center C of the pipe member 32.

[0030] The second catching / guiding device 34 includes, like the first catching / guiding device 30, a shaft 35, a pipe member 36, and a lower yarn sucking / catching member 37. The lower yarn sucking / catching member 37, like the upper yarn sucking / catching member 33, is pivotable about the shaft 35 as a center. Moreover, a suction current can be generated in the lower yarn sucking / catching member 37. With this arrangement, the second catching / guiding device 34 can catch the lower yarn and guide the lower yarn to the yarn joining device 38.

[0031] The yarn monitoring device 40 monitors a state of the yarn 14 traveling on a yarn path and detects the presence / absence of a yarn defect based on the information obtained in the monitoring. The yarn monitoring device 40 detects, for example, a thickness abnormality of the yarn 14 and / or a foreign substance contained in the yarn 14 as the yarn defect. Moreover, the yarn monitoring device 40 detects a yarn breakage, i.e., the presence / absence of the yarn 14 in the yarn path, and the like. The yarn monitoring device 40 has a slit for passing the yarn 14 traveling on the yarn path of the yarn 14, and monitors the yarn 14 passing through this slit with a not-shown optical sensor. Upon detecting a yarn defect, the yarn monitoring device 40 outputs a yarn defect signal to the unit controlling section 100. A cutter 41 for cutting the yarn 14 is arranged near the yarn monitoring device 40. The cutter 41 is operated by the yarn monitoring device 40.

[0032] In this manner, the winding unit 10 can form the package 22 by winding the yarn 14 on the winding bobbin 19. When performing the yarn joining operation in the yarn joining device 38, the yarn 14 from the winding section 17 is caught by the first catching / guiding device 30 and the yarn 14 from the yarn supplying section 15 is caught by the second catching / guiding device 34. The yarns 14 caught by the first catching / guiding device 30 and the second catching / guiding device 34 are guided to the yarn joining device 38. At this time, the yarns 14 are located in the slit of the yarn monitoring device 40. The yarn joining device 38 performs the yarn joining of the yarns 14 guided thereto.

[0033] An operation of the unit controlling section 100 is explained in detail below. The unit controlling section 100 functions as a success / failure determining section 101 that determines the success or failure to catch the yarn 14 from the winding section 17 by the first catching / guiding device 30 and as a defect determining section 102 that determines a defect in the automatic winder 1.

[0034] The unit controlling section (success / failure determining section and defect determining section) 100 determines the success or failure to catch the yarn 14 from the winding section 17 by the first catching / guiding device 30 and whether there is a defect in the yarn joining operation based on the detection signal output from the arithmetic section of the upper yarn sensor 60 and the

yarn defect signal output from the yarn monitoring device 40. When the yarn 14 is cut and the yarn joining operation is started, the unit controlling section 100 determines the success or failure to catch the yarn 14 from the winding section 17 by the first catching / guiding device 30 and whether there is a defect in the yarn joining operation.

[0035] When the detection signal indicates that the yarn 14 has been detected and the yarn defect signal indicates that the yarn 14 has been detected, the unit controlling section 100 determines that the yarn 14 has been successfully caught (yarn end finding) by the first catching / guiding device 30. Upon determining that the yarn 14 has been successfully caught by the first catching / guiding device 30, the unit controlling section 100 starts the yarn joining of the yarns 14 in the yarn joining device 38.

[0036] When the detection signal indicates that the yarn 14 has not been detected and the yarn defect signal indicates that the yarn 14 has not been detected, the unit controlling section 100 determines that there is a failure in the catching of the yarn 14 in the first catching / guiding device 30. Upon determining that there is a failure in the catching of the yarn 14 in the first catching / guiding device 30, the unit controlling section 100 causes the first catching / guiding device 30 to perform the catching of the yarn 14 again.

[0037] When the detection signal indicates that the yarn 14 has been detected and the yarn defect signal indicates that the yarn 14 has not been detected, the unit controlling section 100 determines that a first defect has occurred. The first defect includes yarn jamming in the slit of the yarn monitoring device 40 (defect in the yarn monitoring device 40), double yarn end finding, hooking of the yarn 14 in the first catching / guiding device 30 (defect in the yarn 14 caught by the first catching / guiding device 30), and the like.

[0038] The yarn jamming in the slit of the yarn monitoring device 40 means a defect in which yarn waste and the like of the cut yarn 14 clogs the slit, the yarn 14 in which sloughing has been produced clogs the slit, and the like. In the yarn monitoring device 40, a light is emitted from the light emitting section 62 on the yarn 14 passing through the slit, and the presence / absence of the yarn 14 is detected based on a change in the amount of light received in the light receiving section 63. No change occurs in the amount of light when the yarn 14 is jammed in the slit and the yarn 14 cannot be detected by the yarn monitoring device 40.

[0039] The double yarn end finding is a phenomenon in which a part in the middle of the yarn 14 is caught. The first catching / guiding device 30 usually catches an end of the yarn 14 wound on the package 22. When a part in the middle of the yarn 14 is caught, two yarns 14 may be pulled from the package 22. When this happens, a defect that the yarns 14 do not enter the slit of the yarn monitoring device 40 can occur.

[0040] The hooking of the yarn 14 in the first catching / guiding device 30 is a defect in which the yarn 14 is

hooked by the upper yarn sucking / catching member 33 so that the yarn 14 is continuously detected by the upper yarn sensor 60. When the yarn 14 caught by the first catching / guiding device 30 is guided to the yarn joining device 38, an unwanted piece of the yarn is cut off. This cut piece of the yarn is sucked by the first catching / guiding device 30 and collected. At this time, the cut piece of the yarn may be hooked by the suction port and the like of the upper yarn sucking / catching member 33. When this happens, because the cut piece of the yarn is detected by the upper yarn sensor 60, it may happen that the upper yarn sensor 60 continuously detects the yarn. Therefore, even if the yarn 14 is not actually being pulled from the package 22, the yarn 14 is detected by the upper yarn sensor 60. Upon determining that the first defect has occurred, the unit controlling section 100 causes the display screen 12a of the machine-frame controlling device 12 to display information that indicates that the first defect has occurred.

[0041] When the detection signal indicates that the yarn 14 has not been detected and the yarn defect signal indicates that the yarn 14 has been detected, the unit controlling section 100 determines that a second defect has occurred. The second defect includes malfunctioning of the upper yarn sensor 60 (defect in the upper yarn sensor 60) or occurrence of a stain on the light transmitting cover 50 provided on the pipe member 32. Upon determining that the second defect has occurred, the unit controlling section 100 causes the display screen 12a of the machine-frame controlling device 12 to display information that indicates that the second defect has occurred.

[0042] As explained above, in the automatic winder 1 according to the present embodiment, the unit controlling section 100 determines whether a defect has occurred in the yarn joining operation based on the detection results obtained in the yarn monitoring device 40 and the upper yarn sensor 60. As a result, not only the success or failure in the catching of the yarn 14 by the first catching / guiding device 30 but also whether a defect has occurred in the yarn joining operation can be determined in the automatic winder 1. Accordingly, in the automatic winder 1, the occurrence of a defect in the yarn joining operation can be appropriately detected. As a result, the operator of the automatic winder 1 can know that the defect has occurred in the yarn joining operation.

[0043] In the automatic winder 1 according to the present embodiment, the pipe member 32 of the first catching / guiding device 30 is provided with the light transmitting cover 50 having translucency. The upper yarn sensor 60 includes the light emitting section 62 and the light receiving section 63. In the upper yarn sensor 60, while the first catching / guiding device 30 is located at the catching position, as the light that is emitted by the light emitting section 62 and that has passed through the light transmitting cover 50 and reflected from the yarn 14 is received by the light receiving section 63, the yarn 14 present inside the pipe member 32 is detected. In this

arrangement, because the light emitting section 62 and the light receiving section 63 are not provided in or to the pipe member 32 of the first catching / guiding device 30, no movement occurs in the wiring of the light emitting section 62 and the light receiving section 63. Therefore, because the degradation of the electric wiring is suppressed, the occurrence of the defect in the upper yarn sensor 60 due to the degradation of the electric wiring can be suppressed.

[0044] In the automatic winder 1 according to the present embodiment, the unit controlling section 100 determines whether a defect has occurred in the yarn joining operation. That is, the unit controlling section 100 determines whether a defect in the upper yarn sensor 60, a defect in the yarn monitoring device 40, and a defect in the yarn 14 caught by the first catching / guiding device 30 have occurred. Whether a defect has occurred in the yarn joining operation can be detected by determining whether any of the above-mentioned defects has occurred.

[0045] In the automatic winder 1 according to the present embodiment, the machine-frame controlling device 12 includes the display screen 12a. Upon determining that the first defect or the second defect has occurred, the unit controlling section 100 causes the display screen 12a to display information that indicates that the first defect or the second defect has occurred. Accordingly, the operator can be appropriately alarmed when a defect has occurred in the automatic winder 1.

[0046] In the automatic winder 1 according to the present embodiment, the light emitting section 62 and the light receiving section 63 of the upper yarn sensor 60 are arranged such that the optical axis line L2 representing the optical axis of the light emitted from the light emitting section 62 does not intersect with the center C of the pipe member 32. With this arrangement, an angle between the light and the light transmitting cover 50 can be reduced. As a result, because the light reflected from the surface of the light transmitting cover 50 will be reflected in a direction other than the direction in which the light receiving section 63 is arranged, the accuracy of detection of the yarn 14 present inside the pipe member 32 can be increased.

[0047] The embodiments of the present invention are explained above; however, the present invention is not necessarily limited to these embodiments. The present invention can be implemented by making various changes in a range that do not deviate from the gist of the present invention.

[0048] In the above embodiment, when the detection signal indicates that the yarn 14 has been detected and the yarn defect signal indicates that the yarn 14 has been detected, the unit controlling section 100 determines that the yarn 14 has been successfully caught by the first catching / guiding device 30. However, a configuration is allowable in which the unit controlling section 100 determines that the yarn 14 has been successfully caught by the first catching / guiding device 30 even when at

least one of the detection signal and the yarn defect signal indicates that the yarn 14 has been detected.

[0049] In the above embodiment, a situation has been explained as an example in which when the unit controlling section 100 determines that the first defect or the second defect has occurred, the unit controlling section 100 causes the display screen 12a of the machine-frame controlling device 12 to display information that indicates that the first defect or the second defect has occurred. However, the method to report the occurrence of the first defect or the second defect is not limited to this method. The occurrence of the first defect or the second defect can be reported by using a lamp, a buzzer, and the like.

[0050] In the above embodiment, a situation has been explained as an example in which the upper yarn sensor 60 detects the yarn 14 on the tip end part side of the pipe member 32. However, a configuration is allowable in which the upper yarn sensor 60 detects the yarn 14 on a base end part side of the pipe member 32. The position where the upper yarn sensor 60 shall detect the yarn 14 present inside the pipe member 32 is not limited.

[0051] In the above embodiment, a situation has been explained as an example in which the upper yarn sensor 60 includes the light emitting section 62 and the light receiving section 63, and the light emitting section 62 and the light receiving section 63 are attached to the winding section 17. However, the light emitting section 62 and the light receiving section 63 can be attached to the pipe member 32.

[0052] In the above embodiment, a situation has been explained as an example in which the determination of the presence / absence of the yarn 14 is performed in the yarn monitoring device 40. However, the determination of the presence / absence of the yarn 14 in the yarn monitoring device 40 can be performed in the unit controlling section 100. In the configuration in which this determination is performed in the unit controlling section 100, the yarn monitoring device 40 outputs the signal indicating the result of detection obtained by the sensor to the unit controlling section 100. The unit controlling section 100 determines the presence / absence of the yarn 14 based on this signal.

[0053] In the above embodiment, a situation has been explained as an example in which the state of the yarn 14 is monitored by using the optical sensor arranged in the yarn monitoring device 40. However, the sensor of the yarn monitoring device 40 can be, for example, an electrostatic capacitive sensor. In the configuration in which the sensor is the electrostatic capacitive sensor, the yarn monitoring device 40 detects a yarn defect based on a change in the electrostatic capacitance.

[0054] In the above embodiment, a situation has been explained as an example in which the tension applying device 27 is a gate-type member. However, the tension applying device 27 can be, for example, a disk-type member.

[0055] In the above embodiment, a situation has been explained as an example in which the yarn joining device

38 is a splicer device. However, the yarn joining device 38 can be, for example, a mechanical knotter and the like.

[0056] In the above embodiment, a situation has been explained as an example in which the detecting section that detects the yarn 14 traveling on the yarn path is the yarn monitoring device 40 (clearer). However, the detecting section that detects the yarn 14 traveling on the yarn path is not limited to the yarn monitoring device 40. The detecting section can be arranged separately from the yarn monitoring device 40.

[0057] In the above embodiment, a situation has been explained as an example in which the display screen 12a and the input keys 12b are provided as separate units in the machine-frame controlling device 12. However, for example, in the machine-frame controlling device 12, a touch panel display device having the function of both the displaying section and the operating section can be used.

[0058] In the above embodiment, a situation has been explained as an example in which the traversing groove is formed in the winding drum 20 and the traversing of the yarn 14 is performed by using the traversing groove. However, the traversing of the yarn 14 can be performed by using an arm type, a belt type, or a rotary type traversing mechanism. In this case, a roller having no traversing groove formed therein can be used as an auxiliary roller.

[0059] In the above embodiment, a situation has been explained as an example in which the pipe member 32 of the first catching / guiding device 30 is provided with the pivotable light transmitting cover 50. However, as far as the light transmitting cover 50 is able to close the opening 52, the light transmitting cover 50 needs not be pivotable (open / close the opening 52).

[0060] In the above embodiment, a situation has been explained as an example in which the textile machine is the automatic winder 1. However, the textile machine can be an air spinning machine, an open-ended spinning machine, and the like. When the textile machine is the air spinning machine, the yarn supplying section from which the yarn is pulled is a spinning device that applies a twist to a fiber bundle to generate the yarn.

[0061] A textile machine according to one aspect of the present invention includes a yarn supplying section from which a yarn is pulled; a winding section that winds the yarn pulled from the yarn supplying section and forms a package; a yarn joining device that performs yarn joining of the yarn from the yarn supplying section and the yarn from the winding section; a yarn catching / guiding device that sucks the yarn from the winding section in a tube member thereby catching the yarn and guides the caught yarn to the yarn joining device; a first detecting section that detects the yarn present in the tube member of the yarn catching / guiding device; a second detecting section arranged on a yarn path between the yarn supplying section and the winding section and that detects the yarn traveling on the yarn path; a success / failure determining section that determines success or failure in

catching the yarn from the winding section by the yarn catching / guiding device based on at least one of a detection result obtained in the first detecting section and a detection result obtained in the second detecting section; and a defect determining section that determines whether a defect has occurred in the yarn joining operation based on the detection results obtained in the first detecting section and the second detecting section.

[0062] In the above textile machine, the defect determining section determines whether a defect has occurred in the yarn joining operation based on the detection results obtained in the first detecting section and the second detecting section. As a result, not only the success or failure in the catching of the yarn by the yarn catching / guiding device but also whether a defect has occurred in the yarn joining operation can be determined in the textile machine. Accordingly, in the textile machine, the occurrence of a defect in the yarn joining operation can be appropriately detected. As a result, the operator of the textile machine can know that the defect has occurred in the yarn joining operation.

[0063] According to another aspect of the present invention, the yarn supplying section can be a support mechanism that supports a yarn supplying bobbin on which the yarn has been wound. In this arrangement, the textile machine is an automatic winder. Accordingly, whether there is a defect in the yarn joining operation can be determined in the automatic winder.

[0064] According to still another aspect of the present invention, the yarn supplying section can be a spinning device that applies a twist to a fiber bundle to generate the yarn. In this arrangement, the textile machine is a spinning machine. Accordingly, whether there is a defect in the yarn joining operation can be determined in the spinning machine.

[0065] According to still another aspect of the present invention, the second detecting section can be a yarn monitoring device that monitors a state of the yarn traveling on the yarn path. The textile machine usually includes the yarn monitoring device. Accordingly, because the yarn monitoring device can function as the second detecting section, a yarn traveling on the yarn path can be detected even in the usual configuration. Therefore, whether there is a defect in the yarn joining operation can be determined without using any dedicated device.

[0066] According to still another aspect of the present invention, the yarn monitoring device can be a yarn defect detecting device that detects a defect in the yarn based on a change in a thickness of the yarn. With this arrangement, a state of the yarn can be appropriately monitored by detecting a defect based on a change in a thickness of the yarn.

[0067] According to still another aspect of the present invention, the tube member of the yarn catching / guiding device can be provided with a light transmitting member having translucency. The first detecting section can include a light emitting section and a light receiving section,

and while the yarn catching / guiding device is located at a catching position, can detect the yarn present inside the tube member by emitting a light from the light emitting section on the yarn via the light transmitting member and receiving a light reflected from the yarn in the light receiving section. In this arrangement, because the light emitting section and the light receiving section are not provided in or to the tube member of the yarn catching / guiding device, no movement occurs in the wiring of the light emitting section and the light receiving section. Therefore, because the degradation of the electric wiring is suppressed, the occurrence of the defect in the first detecting section due to the degradation of the electric wiring can be suppressed.

[0068] According to still another aspect of the present invention, the defect determining section can determine whether at least one defect has occurred as the defect in the yarn joining operation among a defect in the first detecting section, a defect in the second detecting section, and a defect in the yarn caught by the yarn catching / guiding device. Whether a defect has occurred in the yarn joining operation can be detected by determining whether any of the above-mentioned defects has occurred.

[0069] According to still another aspect of the present invention, the textile machine can include a displaying section for displaying information that indicates that the defect has occurred when the defect determining section determines that the defect has occurred. With this arrangement, the operator can be appropriately alarmed when a defect has occurred in the yarn joining operation.

[0070] According to the present invention, the occurrence of a defect in the yarn joining operation can be appropriately detected.

[0071] In the above explanation, the meaning of "a plurality of" also includes "a predetermined number of".

[0072] Although the invention has been explained with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the scope of the claims.

Claims

1. A textile machine (1) comprising:

a yarn supplying section (15) from which a yarn (14) is to be pulled;
a winding section (17) configured to wind the yarn (14) pulled from the yarn supplying section (15) and to form a package (22);
a yarn joining device (38) configured to perform yarn joining of the yarn (14) from the yarn supplying section (15) and the yarn (14) from the winding section (17);

a yarn catching/guiding device (30) configured to suck the yarn (14) from the winding section (17) in a tube member (32) thereby catching the yarn (14) and to guide the caught yarn (14) to the yarn joining device (38);

a first detecting section (60) configured to detect the yarn (14) present in the tube member (32) of the yarn catching/guiding device (30);

a second detecting section (40) arranged on a yarn path between the yarn supplying section (15) and the winding section (17) and configured to detect the yarn (14) traveling on the yarn path; a success/failure determining section (101) configured to determine success or failure in catching the yarn (14) from the winding section (17) by the yarn catching/guiding device (30) based on at least one of a detection result obtained in the first detecting section (60) and a detection result obtained in the second detecting section (40); and

a defect determining section (102) configured to determine whether a defect has occurred in the yarn joining operation based on the detection results obtained in the first detecting section (60) and the second detecting section (40).

2. The textile machine (1) as claimed in Claim 1, wherein the yarn supplying section (15) is a support mechanism configured to support a yarn supplying bobbin (16) on which the yarn (14) has been wound.

3. The textile machine (1) as claimed in Claim 1, wherein the yarn supplying section (15) is a spinning device configured to apply a twist to a fiber bundle to generate the yarn (14).

4. The textile machine (1) as claimed in any one of Claims 1 to 3, wherein the second detecting section (40) is a yarn monitoring device (40) configured to monitor a state of the yarn (14) traveling on the yarn path.

5. The textile machine (1) as claimed in Claim 4, wherein the yarn monitoring device (40) is a yarn defect detecting device (40) configured to detect a defect in the yarn (14) based on a change in a thickness of the yarn (14).

6. The textile machine (1) as claimed in any one of Claims 1 to 5, wherein the tube member (32) of the yarn catching/guiding device (30) is provided with a light transmitting member (50) having translucency, and the first detecting section (60) includes a light emitting section (62) and a light receiving section (63), and is configured to, while the yarn catching/guiding device (30) is located at a catching position, detect the yarn (14) present inside the tube member (32)

by emitting a light from the light emitting section (62) on the yarn (14) via the light transmitting member (50) and receiving a light reflected from the yarn (14) in the light receiving section (63).

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7. The textile machine (1) as claimed in any one of Claims 1 to 6, wherein the defect determining section (102) is configured to determine whether at least one defect has occurred as the defect in the yarn joining operation among
- a defect in the first detecting section (60),
- a defect in the second detecting section (40), and
- a defect in the yarn (14) caught by the yarn catching/guiding device (30).

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8. The textile machine (1) as claimed in any one of Claims 1 to 7, further comprising a displaying section (12a) configured to display information that indicates that the defect has occurred when the defect determining section (102) determines that the defect has occurred.

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FIG.1

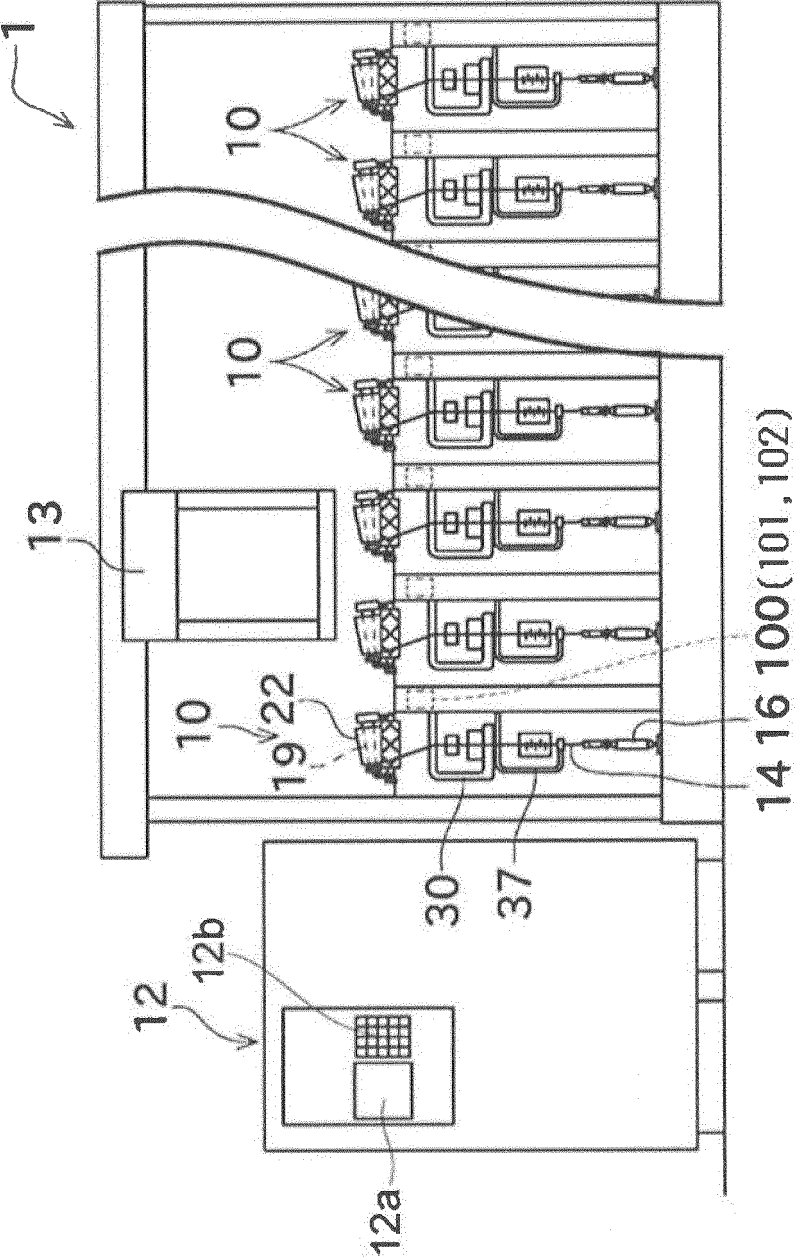


FIG.2

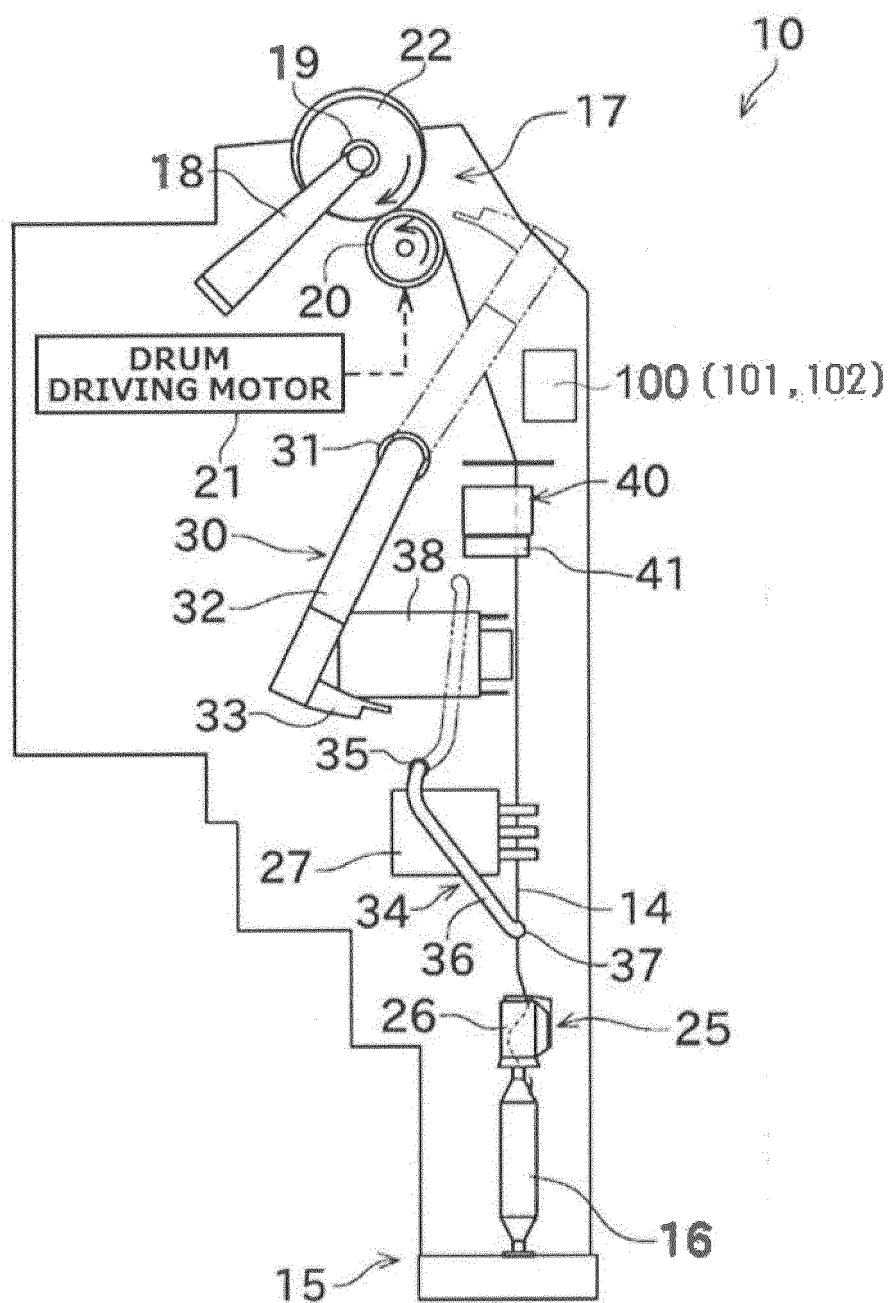


FIG.3

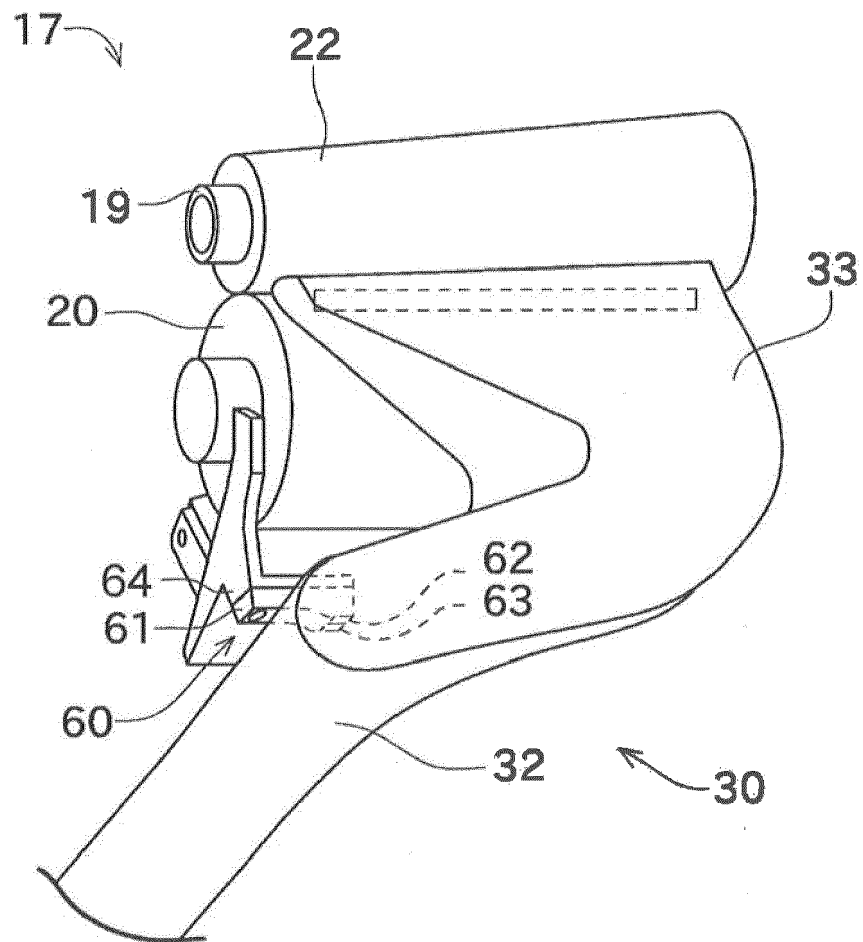


FIG.4

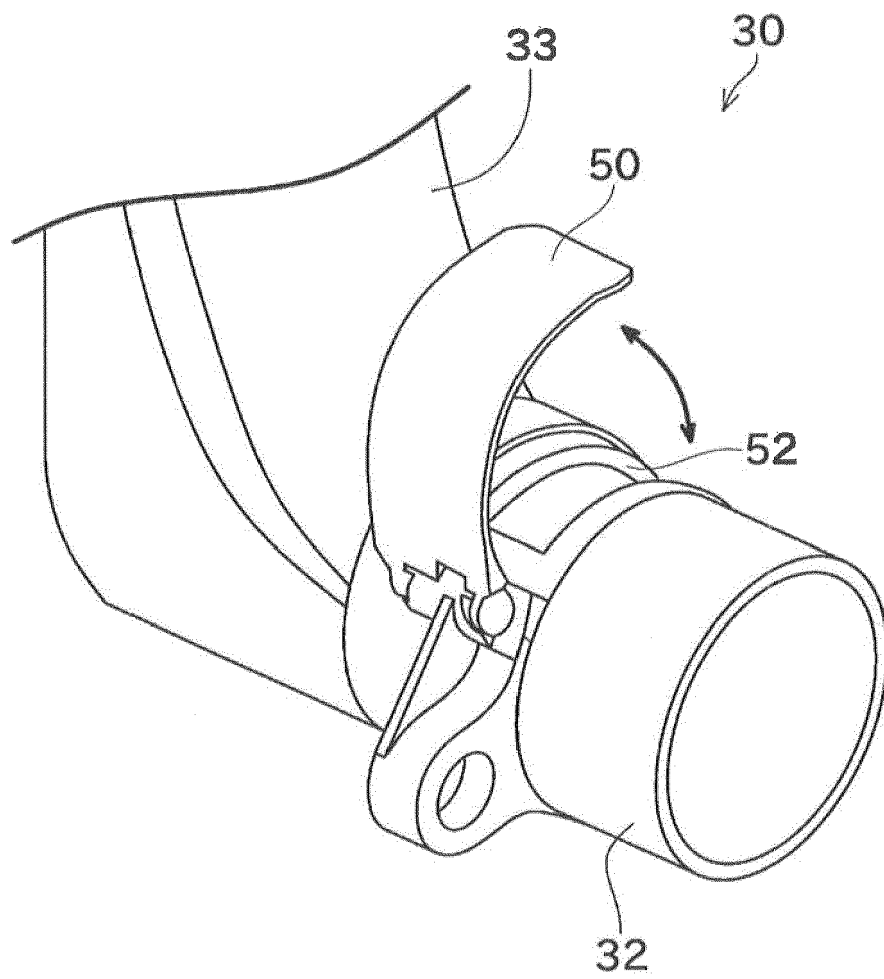
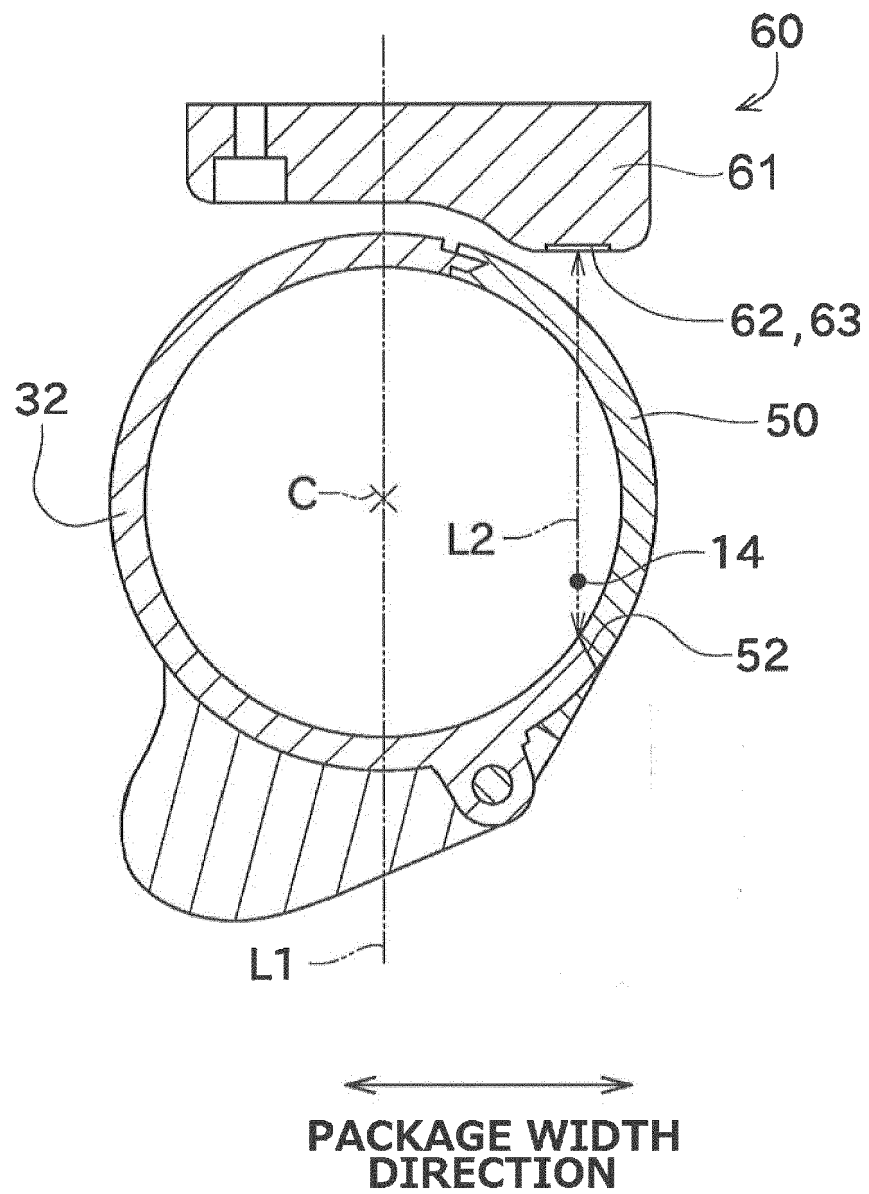


FIG.5





EUROPEAN SEARCH REPORT

Application Number
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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 2015/029275 A1 (MURATA MACHINERY LTD [JP]) 5 March 2015 (2015-03-05) * the whole document *	1-8	INV. B65H63/06 B65H67/08 B65H69/06
A	EP 2 998 257 A1 (MURATA MACHINERY LTD [JP]) 23 March 2016 (2016-03-23) * abstract * * paragraph [0027] * * paragraph [0029] * * paragraph [0041] - paragraph [0045] * * figures 2,4 *	1-8	
A	US 5 862 660 A (HAASEN ROLF [DE] ET AL) 26 January 1999 (1999-01-26) * column 6, line 53 - column 7, line 29 * * claim 1 * * figures 1,2 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 November 2017	Examiner Guisan, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 17 4517

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2015029275 A1	05-03-2015	CN 105473480 A	06-04-2016
		EP 3040299 A1	06-07-2016
		WO 2015029275 A1	05-03-2015
EP 2998257 A1	23-03-2016	CN 103569794 A	12-02-2014
		EP 2687469 A2	22-01-2014
		EP 2998257 A1	23-03-2016
		JP 2014019541 A	03-02-2014
US 5862660 A	26-01-1999	CN 1178188 A	08-04-1998
		DE 19640184 A1	02-04-1998
		IT MI971659 A1	11-01-1999
		JP 4436938 B2	24-03-2010
		JP H10109829 A	28-04-1998
		US 5862660 A	26-01-1999

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2015029275 A [0002]