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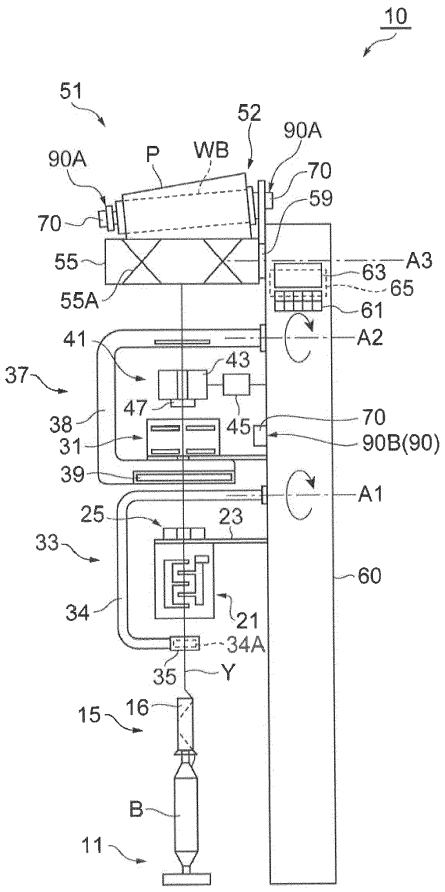
(54) TEXTILE MACHINE AND TEXTILE MACHINE SYSTEM

(57) A textile machine includes: a plurality of fiber processing units (10) that are arranged side by side; a shared device (8) that is commonly provided on the fiber processing units (10); a condition acquiring device (70) capable of acquiring information related to at least one of a condition of the fiber processing units (10) and a condition of the shared device (8) ; and attachment bases (90A, 90B) that are provided on a plurality of parts of the fiber processing units (10) and the shared device (8), and to which the condition acquiring device (70) is attached. The condition acquiring device (70) includes: a plurality of information acquiring units each of which acquires a different type of information related to the condition; a casing that houses the information acquiring units; and an attaching portion that is provided on the casing, and that is capable of being attached to the corresponding attachment base (90A, 90B) in a removable manner.

Fig.2



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a textile machine and a textile machine system.

BACKGROUND

[0002] Textile machines, also referred to as textile machinery, provided with a fiber processing unit performing some process to fibers are known. An automatic winder provided with a winder unit, and a spinning machine provided with a spinning unit both correspond to some examples of such a textile machine. For such a textile machine, there is a demand for a capability for determining whether there is any failure in the fiber processing unit during its operation, based on various types of information output from the fiber processing unit.

[0003] Japanese Unexamined Patent Publication No. H8-169641, for example, discloses a function diagnostic apparatus in which a pressure sensor, a static pressure sensor, a photoelectric sensor, a rotation sensor, and a displacement sensor are attached to respective parts to be monitored, and signals output from the respective sensors are input to a personal computer, for example, and the personal computer receiving the inputs of the signals is caused to analyze and to diagnose the conditions of such parts.

SUMMARY

[0004] An object of one embodiment of the present disclosure is, therefore, to provide a textile machine and a textile machine system capable of acquiring desired types of information from a desired part as required.

[0005] This object is achieved by a textile machine anda textile machine system as defined in the independent claims.

[0006] With the conventional apparatus mentioned above, the parts to be monitored need to be determined in advance, and sensors suitable for objectives need to be provided on the respective parts. Therefore, the apparatus is only capable of acquiring intended information from the predetermined parts, and is incapable of acquiring any information with different objectives, even when such parts are predetermined, for example.

[0007] A textile machine according to one aspect of the present disclosure includes: a plurality of fiber processing units that are arranged side by side; a shared device that is commonly provided on the fiber processing units; a condition acquiring device capable of acquiring information related to at least one of a condition of the fiber processing units and a condition of the shared device; and attachment bases that are provided on a plurality of parts of at least one of the fiber processing units and the shared device, and to which the condition acquiring device is attached, wherein the condition acquiring device includes: a plurality of information acquiring units each of which acquires a different type of information related to the condition; a casing that houses the information acquiring units; and an attaching portion that is provided on the casing, and that is capable of being attached to the corresponding attachment base in a removable manner.

[0008] In the textile machine having the configuration described above, the condition acquiring device is capable of acquiring a plurality of different types of information. Therefore, desired types of information can be acquired merely by attaching the condition acquiring device to a part from which the operator wants to acquire information. Furthermore, in the textile machine having such a configuration, the attachment bases are provided on at least one of the fiber processing units and the shared device, and the attaching portion is provided on the condition acquiring device. Therefore, the condition acquiring device can be easily attached to and removed from at least one of the fiber processing units and the shared device. As a result, desired types of information can be acquired as required from a desired part as required. It is not necessary to identify the parts to be monitored or types of information to be acquired in advance. Furthermore, the acquired information can be used for objectives such as anomaly diagnosis, predictive maintenance, and maintenance support (maintenance timing announcement).

[0009] The phrase "the attachment bases are provided on a plurality of parts of at least one of the fiber processing units and the shared device" herein means that the attachment bases are only needed to be provided in plurality across the entire textile machine. For example, only the total number of the attachment bases provided on the fiber processing units may be plural, or only the total number of the attachment bases provided on the shared device may be plural. It is also possible for the total numbers of the attachment bases provided on the fiber processing unit and to the shared device to be plural.

[0010] According to another aspect of the present disclosure, a plurality of attachment bases may be provided on one or more of the fiber processing units.

[0011] According to another aspect of the present disclosure, the condition acquiring device may acquire information related to a condition of an ambient environment around the fiber processing units or the shared device.

[0012] According to another aspect of the present disclosure, the textile machine may further include a machine frame that supports at least one of the fiber processing units and the shared device, and the machine frame may be provided with an attachment base.

[0013] In the textile machine described above, the attachment bases are also provided on the machine frame, and therefore the scope within which the condition acquiring device can be attached is increased, and the scope from which information is acquired can be increased.

[0014] According to another aspect of the present disclosure, only an information acquiring unit or information acquiring units set to be operated of the information acquiring units may acquire information.

[0015] In the textile machine having the configuration described above, it is possible to prepare only one type of condition acquiring devices (common components), and to cause only the information acquiring unit(s) that acquire desired types of information to operate, depending on an attached position indicating which one of the attachment bases has the attaching portion attached, or depending on an objective. In this manner, power can be saved, the amount of communication for output information can be reduced, and the capacity of the storage unit, if there is any, can be relatively reduced.

[0016] According to another aspect of the present disclosure, the condition acquiring device may further include a first setting unit configured to receive an instruction as to whether one or more of the information acquiring units is to be operated from the operator, and the first setting unit may designate which of the information acquiring units is to be operated based on the instruction received from the operator.

[0017] In the textile machine having the configuration described above, the condition acquiring device includes the first setting unit serving as an interface for receiving an instruction as to whether each of the information acquiring units is to be operated from the operator. Therefore, through an operation made by the operator, only the information acquiring unit or units that acquire desired types of information can be caused to operate, depending on the attached position or the objective. In this manner, power can be saved, the amount of communication of the output information can be reduced, and the capacity of the storage unit, if there is any, can be relatively reduced.

[0018] According to another aspect of the present disclosure, the condition acquiring device may further include an attached position identifying unit that identifies an attached position indicating which one of the attachment bases has the attaching portion attached, and the attached position identifying unit may designate which information acquiring unit is to be operated of the information acquiring units based on the attached position.

[0019] In the textile machine having the configuration described above, the condition acquiring device automatically designates the information acquiring units to be operated, and those not to be operated, depending on where the condition acquiring device is attached. Therefore, the operator can avoid a trouble of designating the information acquiring units that the operator wants to operate (those to be operated) manually and individually.

[0020] According to another aspect of the present disclosure, the condition acquiring device may further include a power source, and a storage unit in which the acquired information is stored.

[0021] In the textile machine having the configuration described above, the condition acquiring device does not require power supply from another apparatus. Therefore, the condition acquiring device can be attached to any desired part more easily. Furthermore, because the storage unit is provided, it is not necessary to output the information acquired by the information acquiring units on-line to another apparatus (e.g., personal computer). In such a configuration, another device can be connected to the condition acquiring device, and be caused to perform analysis or the like on the acquired information at any timing. In this manner, the operator can recognize the conditions of the fiber processing units more flexibly.

[0022] According to another aspect of the present disclosure, the condition acquiring device may further include a second setting unit having at least one of a first function and a second function. The first function may be a function enabling selection of the information acquiring units for which information is to be stored in the storage unit, and the second function may be a function enabling designation of at least one of time and a sampling cycle at which the information is stored in the storage unit.

[0023] In the textile machine having the configuration described above, even when a plurality of information acquiring units are configured to acquire information, the information therefrom can be selectively stored in the storage unit, or the time for storing the information acquired by the information acquiring units in the storage unit or the sampling cycle can be set. In this manner, only the necessary information can be stored in the storage unit. Furthermore, information can be stored in a manner suitable for the circumstance, e.g., storing long-term information by reducing the amount of information stored per unit time, or using a short-term storage time to increase the amount of information stored per unit time.

[0024] According to another aspect of the present disclosure, the attachment bases may be provided with marking. In the textile machine having the configuration described above, the operator can either easily check the position of the attachment base, or recognize the direction in which the condition acquiring device is to be attached (e.g., vertical directions). Therefore, a variation in the attached positions, that is, a variation in the information to be acquired can be reduced.

[0025] According to another aspect of the present disclosure, each of the attachment bases may be configured to engage with the attaching portion. In the textile machine having the configuration described above, the condition acquiring device can be easily attached to the corresponding attachment base.

[0026] According to another aspect of the present disclosure, the information acquiring units may acquire at least one of a sound, a vibration, an atmospheric pressure, a still image, a moving image, a current, an angular speed, a displacement, a temperature, and a humidity.

[0027] According to another aspect of the present disclosure, one or more of the attachment bases may be provided near a component as an article of consumption or near a device that requires adjustment. In the textile machine having the configuration described above, be-

cause the condition of the component as an article of consumption can be monitored, the part can be replaced at appropriate timing, for example. Furthermore, because the condition of the device that requires adjustments can be monitored, the device can be adjusted at appropriate timing.

[0028] According to another aspect of the present disclosure, one or more of the attachment bases may be provided near a cradle that supports a package, and one of the information acquiring units may be a vibration acquiring unit that acquires the vibration of the cradle.

[0029] The vibration generated by the cradle varies depending on the condition of the cradle. In the textile machine having the configuration described above, because the vibration generated by the cradle can be acquired, it is possible to diagnose whether there is any abnormality in the cradle based on at least one of the acquired vibration and a change in the vibration.

[0030] According to another aspect of the present disclosure, one or more of the attachment bases may be provided near a yarn jointing device that joins ends of yarn, and one of the information acquiring units may be a sound acquiring unit that acquires the sound generated by the yarn joining device.

[0031] The sound generated by the yarn joining device varies depending on the condition of the yarn joining device. In the textile machine having the configuration described above, because the sound generated by the yarn joining device can be acquired, it is possible to diagnose whether there is any abnormality in the yarn joining device based on at least one of the acquired sound and a change in the sound.

[0032] According to another aspect of the present disclosure, the condition acquiring device may further include an output unit that outputs the information acquired by the information acquiring units to an external part of the condition acquiring device.

[0033] In the textile machine having the configuration described above, the information acquired by the condition acquiring device can be checked on a device that is external to the condition acquiring device. Furthermore, in the textile machine having the configuration described above, analyses such as abnormality diagnosis using the information acquired by the condition acquiring device can be carried out on a device that is external to the condition acquiring device.

[0034] A textile machine system according to another aspect of the present disclosure includes : the above-described textile machine that is provided in plurality; a unit controller that is provided on each of the fiber processing units; a machine managing unit that is provided on each unit of the textile machine, and manages the fiber processing units provided on the corresponding unit of textile machine; a host managing unit that is deployed at a location away from the textile machine, and manages at least one unit of the textile machine; and a terminal device that is capable of communicating with at least one of the unit controller, the machine managing unit, the host managing unit, and the condition acquiring device, wherein the condition acquiring device outputs the information to at least one of the unit controller, the machine managing unit, the host managing unit, and the terminal device.

[0035] In the textile machine system described above, the operator can check the information acquired by the condition acquiring device on any one of the unit controller, the machine managing unit, the host managing unit, and the terminal device. Furthermore, in the textile machine system described above, analyses such as abnormality diagnosis using the information acquired by the condition acquiring device can be carried out on any one of the unit controller, the machine managing unit, the host managing unit, and the terminal device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

FIG. 1 is a schematic of an automatic winder according to one embodiment of the present disclosure;
FIG. 2 is a schematic illustrating a general configuration of the winder unit illustrated in FIG. 1;
FIG. 3 is a perspective view of a condition acquiring device according to the embodiment;
FIG. 4 is a block diagram of the automatic winder illustrated in FIG. 1;
FIG. 5A is a plan view of the condition acquiring device seen from one side of the condition acquiring device;
FIG. 5B is a front view of attachment bases seen from the front side;
FIG. 6 is a general view of an automatic winder system according to another embodiment of the present disclosure;
FIG. 7 is a block diagram of an automatic winder or an automatic winder system according to a modification;
FIG. 8 is a perspective view of a condition acquiring device according to the modification; and
FIG. 9 is a schematic illustrating a general structure of a winder unit according to the modification.

DETAILED DESCRIPTION

[0037] Some embodiments of the present disclosure will now be explained with reference to some drawings. In explaining the drawings, the same elements will be assigned with the same reference numerals, and redundant explanations thereof will be omitted.

First Embodiment

[0038] An overall configuration of an automatic winder (textilemachine or textile machinery) 1 provided with a plurality of winder units (fiber processing units) 10 will now be explained with reference to FIGS. 1 and 2. Here-

inafter, the terms "upstream" and "downstream" represent the upstream and the downstream in the running direction of yarn being wound, respectively.

[0039] As illustrated in FIGS. 1 and 2, the automatic winder 1 includes, as its main components, a plurality of winder units 10 that are arranged in one direction, an automatic doffing device (shared device) 8, a machine managing unit 9, a condition acquiring device 70, a machine frame 1A, and attachment bases 90 (90A, 90B, and 90C) . A winder unit 10 is a device that traverses and winds the yarn Y unwound from a yarn feed bobbin B around a winding bobbin WB (see FIG. 2), to manufacture a package P.

[0040] The automatic doffing device 8 runs to the position of a winder unit 10 when the package P at the winder unit 10 becomes fully wound, causes the winder unit 10 to eject the fully wound package P, and supplies an empty winding bobbin WB to the winder unit 10.

[0041] The machine managing unit 9 includes, as its main components, a setting managing unit 9A and a display unit 9B. The setting managing unit 9A manages the settings of the winder units 10 by allowing an operator to enter predetermined setting values, and to select an appropriate control method, for example. The display unit 9B is enabled to display the condition of the wound yarn Y, the specifics of a trouble having occurred, and the like in each of the winder units 10 The display unit 9B may be provided as a touch panel, and the setting managing unit 9A may be included in the display unit 9B.

[0042] A structure of the winder unit 10 will now be explained specifically. As illustrated in FIG. 2, each of the winder units 10 includes, as its main components, a unit main body 60, a bobbin support (yarn feeding unit) 11, a yarn unwinding assisting device 15, a yarn tension applying device 21, a tension sensor 25, a yarn joining device 31, a lower yarn capturing unit 33, an upper yarn capturing unit 37, a yarn monitoring device 41, a winding unit 51, and a unit controller 65.

[0043] The unit main body 60 supports the devices included in the winder unit 10, that is, the yarn unwinding assisting device 15, the yarn tension applying device 21, the tension sensor 25, the yarn joining device 31, the lower yarn capturing unit 33, the upper yarn capturing unit 37, the yarn monitoring device 41, and the winding unit 51. The unit controller 65, the details of which will be described later, is internalized in the unit main body 60.

[0044] The unit main body 60 is provided with a setting input unit 61 and a display unit 63. The setting input unit 61 performs settings to the winder unit 10 by allowing the operator to enter some setting values and to select an appropriate control method. The display unit 63 displays the condition of the wound yarn Y, the specifics of a trouble having occurred, and the like in the winder unit 10. The display unit 63 may be provided as a touch panel, and the setting input unit 61 may be included in the display unit 63.

[0045] The bobbin support 11 holds the yarn feed bobbin B having been carried by a bobbin conveying system, not illustrated, at a predetermined position.

[0046] The yarn unwinding assisting device 15 assists unwinding of the yarn Y from the yarn feed bobbin B by bringing a restricting member 16 hanging over the core of the yarn feed bobbin B down in a synchronized manner as unwinding of the yarn Y from the yarn feed bobbin B. The restricting member 16 is then brought into contact with the balloon of the yarn Y formed on top of the yarn feed bobbin B, being formed by the rotation and the centrifugal force of the yarn Y unwound from the yarn feed bobbin B, and controls the balloon of the yarn Y to an appropriate size. Provided near the restricting member 16 is a sensor not illustrated for detecting the chase portion of the yarn feed bobbin B. When this sensor detects a descent of the chase portion, the yarn unwinding assisting device 15 causes the restricting member 16 to descend as well using an air cylinder (not illustrated), for example, in a manner following the descent of the chase portion.

[0047] The yarn tension applying device 21 applies a predetermined tension to the running yarn Y. A gate tension device that positions a movable comb with respect to a stationary comb may be used as the yarn tension applying device 21, for example. The movable comb may be rotated using a rotary solenoid in such a manner that the movable comb becomes engaged with and released from the stationary comb. It is also possible to use a disk tension device as the yarn tension applying device 21, for example, instead of the gate tension device.

[0048] The tension sensor 25 is disposed between the yarn tension applying device 21 and the yarn joining device 31, and is placed on the top surface of a guide plate 23. The tension sensor 25 measures the tension of the running yarn Y, and transmits a tension measurement signal to the unit controller 65.

[0049] The yarn joining device 31 joins the lower yarn extending from the yarn feed bobbin B and the upper yarn extending from the package P, when the yarn is cut off in response to a detection of a defect in the yarn by the yarn monitoring device 41, as well as when yarn unwound from the yarn feed bobbin B is out. As the yarn joining device 31 for joining the upper yarn and the lower yarn, a device (splicer) using a fluid such as compressed air is used. The yarn joining device 31 may also be a knotter that mechanically makes a knot.

[0050] The lower yarn capturing unit 33 is provided below the yarn joining device 31, and captures the end of the lower yarn and guides the end to the yarn joining device 31. The lower yarn capturing unit 33 has a lower yarn pipe arm 34, and a lower yarn suction port 34A provided on one end of the lower yarn pipe arm 34.

[0051] The lower yarn pipe arm 34 is supported rotatably about an axis A1 by the unit main body 60. An appropriate negative pressure source is connected to each lower yarn pipe arm 34. The lower yarn pipe arm 34 suctions and captures the end of the lower yarn by generating a suction flow in the lower yarn suction port 34A.

[0052] The upper yarn capturing unit 37 for capturing

the end of the upper yarn and guiding the yarn joining device 31 is provided above the yarn joining device 31. The upper yarn capturing unit 37 is provided with an upper yarn pipe arm 38, and an upper yarn suction port 39 provided on one end of the upper yarn pipe arm 38. The upper yarn pipe arm 38 is supported rotatably about an axis A2 by the unit main body 60. An appropriate negative pressure source is connected to each upper yarn pipe arm 38. The upper yarn pipe arm 38 suctions and captures the end of the upper yarn by generating a suction flow in the upper yarn suction port 39.

[0053] The yarn monitoring device 41 includes a head 43 on which a sensor not illustrated for detecting the thickness of the yarn Y is provided, and an analyzer 45 that processes a yarn thickness signal output from this sensor. The yarn monitoring device 41 detects a defect such as a slub in the yarn, by monitoring the yarn thickness signal output from the sensor. A cutting device 47 for cutting off the yarn Y immediately upon detection of a yarn defect by the yarn monitoring device 41 is provided near the head 43.

[0054] When the cutting device 47 cuts off the yarn Y, the upper yarn suction port 39 on the upper yarn capturing unit 37 is rotated downwardly, with the upper yarn that is the yarn end on the package P suctioned thereto, so that the end of the upper yarn is passed to the yarn joining device 31. The lower yarn suction port 34A on the lower yarn capturing unit 33 is rotated upwardly, with the lower yarn that is the yarn end on the yarn feed bobbin B suctioned thereto, so that the end of the lower yarn is passed to the yarn joining device 31. In this manner, the upper yarn is joined with the lower yarn in the yarn joining device 31.

[0055] The winding unit 51 includes a traverse drum 55 on which a drum groove 55A is provided, and a cradle 52 that supports the winding bobbin WB rotatably and removably. The cradle 52 brings the surface of the yarn Y wound around the winding bobbin WB (in other words, the surface of the package P) into contact with the surface of the traverse drum 55 at an appropriate pressure. The winding unit 51 causes the yarn Y to traverse at a predetermine width, and winds the yarn Y around the winding bobbin WB, by driving the traverse drum 55 in rotation with the driving force of a traverse drum driving motor 59, and causing the winding bobbin WB to be driven in rotation.

[0056] The unit controller 65 illustrated in FIG. 2 includes a central processing unit (CPU), a random access memory (RAM), a read-only memory (ROM), an input/output (I/O) port, and a communication port, for example. A computer program for controlling the components of the winder unit 10 is recorded in the ROM. The components of the winder unit 10 and the machine managing unit 9 are connected to the I/O port and the communication port, and are enabled to exchange information such as control information. For example, the unit controller 65 feedback-controls the yarn tension applying device 21 in such a manner that an optimal tension not breaking the yarn is applied to the yarn, based on the tension value input from the tension sensor 25.

[0057] The condition acquiring device 70 to be attached to any one of the attachment bases 90 (90A, 90B) on the winder unit 10, and the attachment base 90 (90C) on the machine frame 1A will now be explained. The condition acquiring device 70 acquires information (such as sound, vibration, and temperature) related to the condition of the winder unit 10. As illustrated in FIGS. 3 and 4, the condition acquiring device 70 includes a casing 71, attaching portions 73, and a sound acquiring unit 77, a vibration acquiring unit 78, and a temperature acquiring unit 79 that are information acquiring units that acquire different types of information emitted from the operating automatic winder 1, a setting unit (first setting unit) 81, a battery (power source) 87, a storage unit 89, and an output unit 83.

[0058] The casing 71 is made of resin or metal, and houses the sound acquiring unit 77, the vibration acquiring unit 78, the temperature acquiring unit 79, the battery 87, the storage unit 89, and the output unit 83, The resin may be either non-conductive resin or conductive resin. The setting unit 81 is disposed on one surface 71a of the casing 71. The casing 71 has a rectangular shape (oblong shape) in a view from the one surface 71a, as illustrated in FIGS. 3 and 5A, for example, and it is preferable for the casing 71 to have one side with a length equal to or more than 10 millimeters and equal to or less than 80 millimeters, and a thickness equal to or greater than 5 millimeters and equal to or less than 20 millimeters. The casing 71 has a prism-like shape that is rectangular in the view from the one surface 71a, for example, and it is more preferable for a first side to have a length equal to or greater than 20 millimeters and equal to or less than 36 millimeters, a second side to have a length equal to or greater than 40 millimeters and equal to or less than 60 millimeters, and a third side (thickness) to have a length equal to or greater than 5 millimeters and equal to or less than 15 millimeters.

[0059] The casing 71 may also be circular in the view from the one surface 71a, as illustrated in FIG. 8, for example. The casing 71 may also be a container having a space for housing all of the sound acquiring unit 77, the vibration acquiring unit 78, the temperature acquiring unit 79, the output unit 83, the battery 87, and the storage unit 89. The casing 71 may also be a casing that is the integration of a plurality of casings each of which has a space for housing the sound acquiring unit 77, the vibration acquiring unit 78, the temperature acquiring unit 79, the output unit 83, the battery 87, and the storage unit 89, respectively. The casing 71 may also be a casing that is the integration of a casing for housing one of the component (such as the sound acquiring unit 77 or the battery 87), and another casing for housing a plurality of components (such as the vibration acquiring unit 78 and the temperature acquiring unit 79).

[0060] As illustrated in FIG. 5A, the attaching portions 73 are provided on the other surface 71b of the casing

71. The attaching portions 73 are provided as holes 73a intowhichprotrusions 91 provided on the attachment base 90 (see FIG. 5B) can be inserted, for example. In the first embodiment, four holes 73a are provided. The number of the holes 73a is, however, not limited to four.

[0061] The sound acquiring unit 77 acquires sound (information). The sound acquiring unit 77 is a microphone, for example. The setting unit 81 switches the sound acquiring unit 77 to operate or not to operate. In other words, the sound acquiring unit 77 is capable of acquiring sound only when the setting unit 81 switches the sound acquiring unit 77 to operate. The sound data acquired by the sound acquiring unit 77 is sent to the storage unit 89.

[0062] The vibration acquiring unit 78 acquires vibration (information). The vibration acquiring unit 78 is an acceleration sensor, for example. The setting unit 81 switches the vibration acquiring unit 78 to operate or not to operate. In other words, the vibration acquiring unit 78 is capable of acquiring vibration only when the setting unit 81 switches the vibration acquiring unit 78 to operate. The vibration data acquired by the vibration acquiring unit 78 is sent to the storage unit 89.

[0063] The temperature acquiring unit 79 acquires temperature (information). The temperature acquiring unit 79 is a temperature sensor, for example. The setting unit 81 switches the temperature acquiring unit 79 to operate or not to operate. In other words, the temperature acquiring unit 79 is capable of acquiring temperature only when the setting unit 81 switches the temperature acquiring unit 79 to operate. The temperature data acquired by the temperature acquiring unit 79 is sent to the storage unit 89.

[0064] The battery 87 supplies power to the sound acquiring unit 77, the vibration acquiring unit 78, the temperature acquiring unit 79, the setting unit 81, and the output unit 83.

[0065] The storage unit 89 stores therein the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively. Specifically, the storage unit 89 stores therein the pieces of data transmitted from the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively. In other words, the storage unit 89 stores (records) the sound data transmitted from the sound acquiring unit 77, stores the vibration data transmitted from the vibration acquiring unit 78, and stores the temperature data transmitted from the temperature acquiring unit 79. When the storage capacity of the storage unit 89 has reached its upper limit, it is preferable for the pieces of data in the storage unit 8 9 to be automatically overwritten sequentially from the oldest one.

[0066] The setting unit 81 switches each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate. The setting unit 81 includes switches, for example, for switching the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate and not to operate, respectively, and a circuit for controlling the operations of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79.

[0067] The output unit 83 outputs the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively, to the external of the condition acquiring device 70. In the first embodiment, the output unit 83 is an interface such as a local area network (LAN) port or a universal serial bus (USB) that outputs the sound data, the vibration data, and the temperature data stored in the storage unit 89 to a terminal device. The output unit 83 may be an antenna when used is a wireless LAN, or a transceiver when used is a near field communication such as infrared communication.

[0068] The attachment base 90 with which the condition acquiring device 70 is attached in the winder unit 10 will now be explained. As illustrated in FIG. 2, the automatic winder 1 according to the first embodiment includes the attachment bases 90A provided on the cradle 52, the attachment base 90B provided on the unit main body 60 near the yarn joining device 31, and the attachment base 90C provided on the machine frame 1A above the winder unit 10.

[0069] As illustrated in FIG. 5B, each of the attachment bases 90 (90A, 90B, 90C) has a plate 93, a marking 95, and protrusions 91. The plate 93 is a plate-shaped member, and is a main body of the attachment base 90. The marking 95 is marking provided in a manner surrounding the plate 93. The marking 95 is provided in a manner surrounding the condition acquiring device 70 with the condition acquiring device 70 attached to the attachment bases 90. The marking 95 can be formed by incision or coloring, or as a seal. The marking 95 is enabled to indicate the operator with the direction in which the condition acquiring device 70 is attached (e.g., the vertical directions). The protrusions 91 are members protruding from the plate 93. Each of the protrusions 91 has a shape enabled to engage with the corresponding attaching portion 73 having a recessed shape and provided on the other surface 71b of the condition acquiring device 70. The protrusions 91, too, are enabled to indicate the direction in which the condition acquiring device 70 is attached to the operator, in the same manner as the marking 95. When the protrusions 91 can sufficiently serve as the marking, the marking 95 may be omitted.

[0070] A way in which the information (sound, vibration, or temperature) is acquired using the condition acquiring device 70 will now be explained. The operator attaches the condition acquiring device 70 near the device from which the operator wants to acquire information. When the operator wants to monitor the presence of any abnormality in the cradle 52, the presence of any abnormality in the yarn joining device 31, and the temperature near the automatic winder 1, for example, the operator attaches the condition acquiring device 70 to

each of the attachment bases 90A provided near the cradle 52, the attachment base 90B near the yarn joining device 31, and the attachment base 90C on the machine frame 1A, respectively.

[0071] Before or after attaching the condition acquiring device 70 to each of these portions, the operator switches each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate. The operator switches each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate by operating the switches that are a part of the setting unit 81.

[0072] The operator attaches the condition acquiring device 70 in which only the vibration acquiring unit 78 is caused to operate to the attachment base 90A provided near the cradle 52. In this manner, the condition acquiring device 70 is caused to store therein the vibration data generated as the traverse drum driving motor 59 drives the traverse drum 55. The operator also attaches another condition acquiring device 70 in which only the sound acquiring unit 77 is caused to operate to the attachment base 90B near the yarn joining device 31. In this manner, the condition acquiring device 70 is caused to store therein the sound generated as the yarn joining device 31 operates. The operator also attaches another condition acquiring device 70 in which only the temperature acquiring unit 79 is caused to operate to the attachment base 90C on the machine frame 1A. In this manner, the condition acquiring device 70 is caused to store therein the temperature data acquired near the automatic winder 1 (around the automatic winder 1). In other words, these condition acquiring devices 70 can store therein the environment in which the automatic winder 1 is deployed.

[0073] The operator connects a terminal device 7 (see FIG. 4) to the output unit 83 of each of the condition acquiring devices 70 at given timing or on a regular basis. In this manner, the data stored in the storage unit 89 in each of the condition acquiring device 70 can be transferred (output) to the terminal device 7. Examples of the terminal device 7 include a laptop personal computer, a smartphone, and a tablet.

[0074] The terminal device 7 determines whether there is any abnormality in the cradle 52, the yarn joining device 31, and the automatic winder 1, using the data transferred from the condition acquiring device 70. Specifically, the terminal device 7 diagnoses whether there is any abnormality in the cradle 52 based on the vibration data generated as the traverse drum driving motor 5 9 drives the traverse drum 55, and displays the result of the diagnosis on a display unit, for example. The operator can determine whether there is any abnormality in the cradle 52 by examining the diagnosis result displayed on the display unit or the like of the terminal device 7. The terminal device 7 also diagnoses whether there is any abnormality in the yarn joining device 31 based on the sound generated as the yarn joining device 31 operates, and displays the diagnosis result on the display unit, for example. The operator can determine whether there is any abnormality in the yarn joining device 31 by examining the diagnosis result displayed on the display unit or the like in the terminal device 7.

[0075] The terminal device 7 also determines, for example, whether machine operation temperature (installation environmental requirement) is satisfied based on the temperature near the automatic winder 1, that is, the temperature around the automatic winder 1, and displays at least one of the determination result and the detection result on the display unit, for example. The operator can manage the installation environmental requirement by examining at least one of the determination result and the detection result displayed on the display unit or the like of the terminal device 7.

[0076] The operational advantages achieved by the automatic winder 1 according to the first embodiment will now be explained. In the automatic winder 1 according to the first embodiment, because the condition acquiring device 70 is enabled to acquire a plurality of types of information (sound, vibration, and temperature) that are different from one another, desired types of information can be acquired merely by attaching the condition acquiring device 70 to a desired part from which the information is to be acquired. Furthermore, in the automatic winder 1 according to the first embodiment, the attachment bases 90 (90A, 90B) are provided on the winder unit 10, and the attachment base 90 (90C) is provided on the machine frame 1A. The attaching portions 73 are provided on the condition acquiring device 70. Therefore, the condition acquiring device 70 can be easily attached to and removed from the winder unit 10. As a result, desired types of information can be acquired from a desired part as required, without identifying the parts to be monitored or identifying the types of information to be acquired in the winder unit 10 in advance. The acquired information may then be used in abnormality diagnosis, predictive maintenance, maintenance support (maintenance timing announcement), and the like.

[0077] The automatic winder 1 according to the first embodiment includes an interface serving as a part of the setting unit 81 and receiving an instruction as to whether each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 is to be operated, and a circuit that controls the operations of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79. With this configuration, the operator can switch the operations of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 in such a manner that only those from which the operator wants to acquire information are operated. In this manner, power can be saved, and the capacity of the storage unit 89 can be relatively reduced.

[0078] Because the automatic winder 1 according to the first embodiment does not require any power supply from another apparatus, the automatic winder 1 may be attached to a desired part more easily. Furthermore, be-

cause the automatic winder 1 according to the first embodiment is provided with the storage unit 89, the automatic winder 1 does not require the terminal device 7 for performing analysis and the like of the information acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to be always connected, and the terminal device 7 can be connected and caused to analyze the information stored in the storage unit 89, as required. In this manner, the conditions of the winder unit 10 can be recognized more flexibly.

[0079] In the automatic winder 1 according to the first embodiment, because the vibration generated by the cradle 52 can be acquired, the terminal device 7 can diagnose whether there is any abnormality in the cradle 52 based on at least one of the acquired vibration and a change in the vibration. In the automatic winder 1 according to the first embodiment, because the sound generated by the yarn joining device 31 can be acquired, the terminal device 7 can diagnose whether there is any abnormality of the yarn joining device 31 based on at least one of the acquired sound and a change in the sound.

[0080] The automatic winder 1 according to the first embodiment is provided with the output unit 83 outputting the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively, to the external of to the condition acquiring device 70. The sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 can therefore be output to the external terminal device 7 that is separate from the condition acquiring device 70. The external terminal device 7 that is separate from the condition acquiring device 70 can then make analyses such as abnormality diagnosis using the sound, the vibration, and the temperature acquired by condition acquiring device 70.

[0081] In the automatic winder 1 according to the first embodiment, for example, the attachment bases 90A are provided near components as articles of consumption (the bearings on a bearing center that is a package support that supports the package at both ends). In this manner, because the package support can be monitored, consumables in the package support can be replaced at appropriate timing, for example.

Second Embodiment

[0082] An automatic winder system (textile machine system or textile machinery system) 5 according to a second embodiment of the present disclosure will now be explained mainly with reference to FIG. 6. This automatic winder system 5 includes the automatic winder (textile machine or textile machinery) 1 provided in plurality, the machine managing units 9 that are provided on the respective automatic winders 1, and each of which manages the winder units (fiber processing units) 10, the unit controllers 65 that control the respective winder units, a host managing unit 3 that is deployed at a position away from the automatic winders 1, and that manages the automatic winders 1, and the terminal device 7 that is connectable to the machine managing units 9. The automatic winder 1 and the winder units 10 are the same as those according to the first embodiment, and therefore, detailed explanations thereof are omitted herein.

[0083] The host managing unit 3 is a terminal device connected to the automatic winders 1. The host managing unit 3 is configured as a computer system including a CPU, a main storage such as a RAM and a ROM, an auxiliary storage unit an example of which includes a solid state drive (SSD) that is based on the mini-Serial AT attachment (mSATA) standard, an input unit such as a keyboard and a mouse, and an output unit such as a display screen. A hard disk, a flash memory, or the like may also be used as the auxiliary storage unit.

[0084] As illustrated in FIG. 6, the host managing unit 3 and each of the machine managing unit 9 are configured to be accessible to each other over a network. Examples of the network include an Internet circuit, a dedicated circuit, and a virtual private network (VPN) circuit. The network may be a wired or a wireless network.

[0085] The terminal device 7 is a small, portable terminal device. The terminal device 7 is a computer system including a CPU, a main storage such as a RAM and a ROM, an auxiliary storage unit examples of which include a hard disk and a flash memory, an input unit such as a touch panel screen, and an output unit. The terminal device 7 can connect to the machine managing unit 9 via a cable, a wireless LAN, a near field communication, or the like.

[0086] The condition acquiring device 70 used in this automatic winder system 5 is the same as that to be provided on the automatic winder 1 according to the first embodiment illustrated in FIG. 3. The condition acquiring device 70 outputs the sound data acquired by the sound acquiring unit 77, the vibration data acquired by the vibration acquiring unit 78, and the temperature data acquired by the temperature acquiring unit 79 to at least one of the corresponding unit controller 65, the corresponding machine managing unit 9, the host managing unit 3, and the terminal device 7.

[0087] When the sound data, the vibration data, and the temperature data acquired by the condition acquiring devices 70 are output to the corresponding machine managing unit 9, for example, the machine managing unit 9 can make analyses such as abnormality diagnosis based on the received information (the sound data, the vibration data, and the temperature data). It is also possible for the machine managing unit 9 to be only responsible for storing the information (the sound data, the vibration data, and the temperature data) received from the condition acquiring device 70, and to enable the host managing unit 3 connecting via a cable, a wireless LAN, a near field communication, or the like to perform analyses such as abnormality diagnosis based on the infor-

mation. In such a configuration, it is possible to determine whether any of the winder units 10 included in the corresponding automatic winder 1 has any abnormality.

[0088] When the sound data, the vibration data, and the temperature data acquired by the condition acquiring devices 70 are output to the host managing unit 3, for example, the host managing unit 3 can make analyses such as abnormality diagnosis based on the received information (the sound data, the vibration data, and the temperature data). In such a configuration, it is possible to determine whether any of the automatic winders 1 included in the automatic winder 1, and any of the winder units 10 included in each of the automatic winders 1 has any abnormality, in a centralizedmanner.

[0089] The operational advantages achieved by the automatic winder system 5 according to the second embodiment will now be explained. In the automatic winder system 5 according to the second embodiment, because the condition acquiring device 70 is enabled to acquire a plurality of different types of information (the sound, the vibration, and the temperature), desired types of information can be acquired merely by attaching the condition acquiring device 70 to any desired part from which information is to be acquired. Furthermore, in the automatic winder system 5 according to the second embodiment, the attachment bases 90 (90A, 90B) are provided on the winder unit 10, and the attachment bases 90 (90C) is provided on the machine frame 1A. The attaching portions 73 are provided on the condition acquiring device 70. Therefore, the condition acquiring device 70 can be easily attached to and removed from the winder unit 10. As a result, desired types of information can be acquired from a desired part of the winder unit 10 as required. The acquired information can then be used in abnormality diagnosis, predictive maintenance, maintenance support (maintenance timing announcement), and the like.

[0090] In the automatic winder system 5 according to the second embodiment, the unit controller 65, the machine managing unit 9, the host managing unit 3, or the terminal device 7 can perform analyses such as abnormality diagnosis using the sound, the vibration, and the temperature acquired by condition acquiring device 70. Because the function of performing the analyses such as abnormality diagnosis can be executed externally to the condition acquiring device 70, the size of the condition acquiring device 70 canbe reduced. Furthermore, in the automatic winder system 5 according to the second embodiment, such a diagnosis can be made using the integration of the information acquired by the condition acquiring device 70, and the information retained by the unit controller 65, the machine managing unit 9, and the host managing unit 3.

[0091] Some embodiments of the present disclosure are explained above, but the present disclosure is not limited thereto.

First Modification

[0092] In the embodiments described above, used is an example in which the condition acquiring device 70 includes the setting unit 81 that switches each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate. The condition acquiring device 70 may, however, also include a setting unit (second setting unit) 281 capable of executing at least one of a first function that enables a user to select the information acquiring units (the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79) for storing the information in the storage unit 89 and a second function that enables a user to set at least one of the time and a sampling cycle at which the information is stored in the storage unit 89, as illustrated in FIG. 7, for example, in replacement of the setting unit 81. The setting unit 281 is a circuit making at least one of the first function and the second function executable. The first function enables the user to select the information acquiring units (the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79) for which the information is to be stored in the storage unit 89, and the second function enables a user to designate at least one of the time and a sampling cycle at which the information is stored in the storage unit 89.

[0093] In the automatic winder 1 or the automatic winder system 5 according to the first modification, even in a configuration in which all of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 included in the condition acquiring device 70 are configured to keep acquiring information constantly, the information may be stored selectively in the storage unit 89, or the time and the sampling cycle at which the information acquired by each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 is stored in the storage unit 89 can be designated. Therefore, only the necessary information can be selectively stored.

[0094] With the setting unit 281, separate information sampling cycle and measurement time can be designated for each type of the information. For example, possible settings are causing the temperature acquiring unit 79 to make measurements at a longer cycle for 1 week, and causing the sound acquiring unit 77 to make measurements at a medium cycle for 10 minutes, and causing the vibration acquiring unit 78 to make measurement at a shorter cycle for 5 minutes.

[0095] The setting unit 281 can cause the acquisition (measurement) of the information to be started automatically. For example, when the operator wants to acquire the sound of the splicer, by causing the unit controller 65 to transmit some information related to the timing of a splicer operation (e.g., the timing at which air supply is started) to the condition acquiring device 70 before the air supply is started, the setting unit 281 can cause the soundacquiring unit 77 to start measuring the sound us-

ing the reception of the information as a trigger. In other words, the condition acquiring device 70 is caused to operate in a manner directly associated with the unit controller 65, through the communication with the unit controller 65. Alternatively, the condition acquiring device 70 may detect the start of the operation of the driving unit for ejecting air, based on a detection signal output from an operation detection sensor that is separately provided, for example, so that the sound acquiring unit 77 can start measuring the sound using the detection as a trigger. In other words, the condition acquiring device 70 is caused to operate in a manner indirectly associated with the unit controller 65, by detecting the operation of the driving unit for ejecting air.

Second Modification

[0096] The condition acquiring device 70 according to the embodiment is explained to include the battery 87 and the storage unit 89, as an example, but the condition acquiring device 70 may be configured to receive power supply from the external, without including the internal battery 87. The condition acquiring device 70 may include an informing unit capable of informing (displaying) information acquired from the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, for example, without including the storage unit 89. It is also possible for the condition acquiring device 70 to be provided with a CPU, and an analysis program stored in the storage unit 89, for example, and to make diagnoses based on the information acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, and to notify the diagnosis result.

[0097] The internal storage unit 89 may be rendered unnecessary in a configuration in which the information acquired from each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 is output to the external of the condition acquiring device 70, as in the automatic winder system 5 according to the second embodiment.

Third Modification

[0098] Used in explaining the condition acquiring device 70 included in the automatic winder 1 or the automatic winder system 5 according to any of the embodiments and the modifications described above is an example in which an operator makes an operation on (or via) the setting unit (first setting unit) 81 or the setting unit (second setting unit) 281 to designate whether to cause each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate, but the present disclosure is not limited to such an example.

[0099] For example, as illustrated in FIG. 7, the condition acquiring device 70 may include a control unit (attached position identifying unit) 181 for identifying to which attachment bases 90 the attaching portions 73 are attached, instead of the setting unit 81 or the setting unit 281, and the control unit 181 may automatically designate which information acquiring unit is to be operated, among those provided in plurality (the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79), based on the attached position identified by the control unit 181. The control unit 181 is a circuit that automatically designates an information acquiring unit that is tobe operated, among those provided in plurality (the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79), based on the identified attached position.

[0100] To use an example of the embodiment described above, for example, when the attaching portions 73 of the condition acquiring device 70 are attached to the attachment base 90A provided on the cradle 52, the control unit 181 automatically identifies that the condition acquiring device 70 is attached to the attachment base 90A provided on the cradle 52. Based on the recognition that the condition acquiring device 70 is attached to the attachment base 90A, the control unit 181 establishes a setting for enabling only the vibration acquiring unit 78 to operate, among the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79.

[0101] To the four protrusions 91 provided on each of the attachment bases 90A, 90B, and 90C, metal pieces are selectively attached. For example, a metal piece is attached to a predetermined one of the protrusions 91 on the attachment base 90A. Metal pieces are attached to predetermined two of the protrusions 91 of the attachment base 90B, and are attached to predetermined three of the protrusions 91 on the attachment base 90C. The holes 73a forming the attaching portions 73 are then enabled to detect the metal when the protrusions 91 on the attachment bases 90 are engaged with the respective attaching portions 73, and detection information is transmitted to the control unit 181. The control unit 181 then identifies to which one of the attachment bases 90A, 90B, and 90C the condition acquiring device 70 (the attaching portions 73) is attached, using the detection information. The control unit 181 then establishes a setting as to each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 is to be operated based on the identified attachment base 90A, 90B, or 90C. The control unit 181 is an electric circuit including a CPU, a RAM, and a ROM, for example. Recorded in the ROM is a computer program for controlling to cause each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate.

[0102] The way in which the positions of the attachment bases 90A, 90B, and 90C are identified is not limited to that explained above. For example, the condition acquiring device 70 may be provided with, for example, a reader of the one dimensional or two dimensional barcode, or an IC chip disposed in each of the attachment

bases 90A, 90B, and 90C. The condition acquiring device 70 may also be provided with a barometric sensor to acquire the height information of the attached position, so that the positions of the attachment bases 90A, 90B, and 90C are identified based on the height information.

Fourth Modification

[0103] Used in explaining the embodiments and the modification described above is an example in which the winder unit 10 has the winding unit 51 having what is called a driven-rotation configuration in which the package P is driven by the rotation of the traverse drum 55, but the winder unit 10 may also be a winder unit 210 having what is called a directly rotating configuration in which the motor shaft of a package driving motor 259 is connected to the winding bobbin WB in a such manner that the relative rotation of the motor shaft with respect to the winding bobbin WB is disabled, as illustrated in FIG. 9.

[0104] Specifically, the winding unit 251 includes a cradle 252, a contact roller 253, a traverse device 255, and a guide plate 256, and the winding unit 251 is supported by the unit main body 60. The cradle 252 supports the winding bobbin WB in a removable manner. The contact roller 253 is kept in contact with the circumferential surface of the winding bobbin WB or to the circumferential surface of the package P, and is rotatably provided. The traverse device 255 causes the yarn Y to traverse. An example of the traverse device 255 is an arm traverse device. The guide plate 256 guides the yarn Y on the upstream side to the traverse portion. A traverse fulcrum 257 made of ceramic is disposed on the upstream side of the guide plate 256. The traverse device 255 causes the yarn Y to traverse in the direction of the arrows in FIG. 9, using the traverse fulcrum 257 as a fulcrum.

[0105] The cradle 252 is supported rotatably by the unit main body 60 about a rotation axis A3. The cradle 252 absorbs an increase in the yarn layer diameter of the package P, resultant of the yarn Y being wound around the winding bobbin WB, by causing the cradle 252 to rotate.

[0106] The package driving motor 259 provided as a servo motor is mounted on the cradle 252. The package driving motor 259 winds the yarn Y around the winding bobbin WB by driving the winding bobbin WB in rotation. The motor shaft of the package driving motor 259 is connected in such a manner that the relative rotation thereof with respect to the winding bobbin WB is disabled, with the winding bobbin WB supported on the cradle 252.

[0107] Explained now is the attachment base 90 attached with the condition acquiring device 70 in the winder unit 210 having such a configuration. As illustrated in FIG. 9, the winder unit 210 according to the second embodiment includes the attachment base 90A provided on the cradle 252, and the attachment base 90B provided on the unit main body 60 near the yarn joining device 31.

[0108] Even in the automatic winder 1 including the winder unit 210 having such a configuration, the vibration generated by the cradle 252 can be acquired, so that the terminal device 7 or the like can diagnose whether there is any abnormality in the cradle 252 based on at least one of the acquired vibration and a change in the vibration. In the same manner, in the automatic winder 1 including the winder unit 210, the sound generated by the yarn joining device 31 can be acquired, so that the terminal device 7 or the like can diagnose whether there is any abnormality of the yarn joining device 31 based on at least one of the acquired sound and a change in the sound.

Other Modifications

[0109] Used in the embodiments and the modifications described above is an example in which the attachment bases 90A and 90B are provided on two respective parts of each of the winder units 10, and the attachment base 90C is provided on a part of the machine frame 1A, but the present disclosure is not limited to such an example. According to one aspect of the present disclosure, the attachment bases may be provided on any plurality of parts across the entire automatic winder.

[0110] For example, each of the winder units 10 may have one part provided with the attachment base, the automatic doffing device 8 may have one or more parts to be provided with the attachment base, and the machine frame 1A may have no parts provided with the attachment base, or one or more parts to be provided with the attachment base. As another example, no attachment bases may be provided on any of the winder units 10, and each type of shared device (e.g., the automatic doffing device 8 and a yarn feed bobbin supplying device (not illustrated) may have one or more parts provided with the attachment bases, and the machine frame 1A may have no part or one or more parts provided with the attachment bases. As another example, the attachment bases may be provided on a part (but a plurality) of the entire winder units 10. As another example, the winder units each having a different number of parts provided with attachment bases with respect to the others may be mixed within one automatic winder (for example, an automatic winder may include a winder unit having a plurality of parts provided with the attachment bases, another winder unit having one part provided with the attachment base, and still another winder unit having no part provided with the attachment base) .

[0111] In any of the embodiments and the modifications described above, the automatic doffing device 8 is used as an example of the shared device commonly provided on a plurality of fiber processing units, but the present disclosure is not limited to such an example. For example, assuming an automatic winder having a plurality of winder units, the automatic winder may be provided with an automatic yarn feed bobbin supplying device, in replacement of or in addition to the automatic doffing device.

[0112] Used in explaining the embodiments and the modifications described above is an example in which the terminal device 7, the machine managing unit 9, the unit controller 65, the host managing unit 3, or the condition acquiring device 70 executes the abnormality diagnosis and the like based on the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively, but the present disclosure is not limited to such an example. For example, the terminal device 7, the machine managing unit 9, the unit controller 65, the host managing unit 3, or the condition acquiring device 70 may display the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 as they are, or display the sound, the vibration, and the temperature that are partially analyzed, on the display unit, for example. The operator may then make the abnormality diagnosis of the winder units 10 and the like by examining the information displayed on the display unit.

[0113] Used in explaining the embodiments and the modifications described above is an example in which switching of each of the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 to operate or not to operate is established via settings, or an example in which the sound, the vibration, and then temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79, respectively, are selectively stored, but the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 may be all caused to operate, and all of the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 may be stored in the storage unit 89.

[0114] Used in explaining the embodiments and the modifications described above is an example in which the condition acquiring device 70 is provided with the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 that acquire sound, vibration, and temperature, respectively, as the information acquiring units, but the present disclosure is not limited to such an example. For example, the condition acquiring device 70 may be a condition acquiring device 70 including two or more of a microphone capable of acquiring sound information, an acceleration sensor capable of acquiring vibration information, a barometric sensor capable of acquiring atmospheric pressure information, a camera capable of acquiring a still image or a moving image, a geomagnetic sensor capable of acquiring a current, a temperature sensor capable of acquiring temperature information, a gyro sensor capable of acquiring angular speed information, a displacement sensor capable of acquiring displacement information, and a humidity sensor capable of acquiring humidity information, for example, as the information acquiring units.

[0115] A part of the sound, the vibration, and the temperature acquired by the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79 (e. g. , only the temperature) may be transmitted to the machine managing unit 9, the unit controller 65, or the host managing unit 3 so that the information is analyzed immediately, for example, and the remaining information (the sound and the vibration) may be stored in the storage unit 89, so that abnormality diagnosis, predictive maintenance, or maintenance support (maintenance timing announcement) may be performed at predetermined timing, for example.

[0116] The attachment base 90 maybe provided with one boss having a screw hole, for example, instead of the protrusions 91, and a screw may be provided on the attaching portion 73, instead of the holes 73a. By screwing the screw into the boss, the condition acquiring device 70 can be easily attached to the attachment base 90. Instead of allowing the attaching portion 73 and the attachment base 90 to be engaged with each other, an adhesive member such as a double-sided tape or a magnet may be provided as the attaching portions 73. In such a configuration as well, the condition acquiring device 70 can be easily attached to the attachment bases 90 via the adhesion of the adhesive member, or a magnetic force of the magnet. In such a case, it is preferable for the attachment base 90 to be a flat member having some area. In a configuration in which a magnet is used, the attachment base 90 is a member that can be fixed with the magnetic force. The attachment base 90 may also serve as marking indicating the operator with the direction in which the condition acquiring device 70 is attached (e.g., vertical directions).

[0117] Used in explaining the embodiments and the modifications described above is an example in which the terminal device 7 determines whether the machine operation temperature (installation environmental requirement) is satisfied based on the ambient temperature near the automatic winder 1 acquired by the condition acquiring device 70 attached to the attachment base 90C. It is however still possible to detect abnormal heating of the motor based on the temperature acquired by the condition acquiring device 70 attached to the attachment base provided near the motor, or to detect wearing of a bush in the cradle based on the temperature acquired by the condition acquiring device 70 attached to the attachment base provided near the cradle, for example. The operator can then recognize the condition of the motor or the cradle by examining the detection result displayed on the display unit or the like of the terminal device 7.

[0118] Used in explaining the embodiments and the modifications described above is an example of the textile machine including the condition acquiring device 70 that is attached to the attachment base 90 (90A, 90B, 90C), but a configuration without any condition acquiring device 70 is still possible. Even in such a configuration, desired types of information can be acquired merely by

performing a simple operation of attaching the condition acquiring device 70 to the attachment base corresponding to the part from which the operator wants to acquire information. As a result, desired types of information can be acquired from a desired part as required without identifying the part to be monitored or the type of information to be acquired in advance.

[0119] The condition acquiring device 70 included in the automatic winder 1 or the automatic winder system 5 according to any of the embodiments and the modifications described above is explained to use the control unit 181 to automatically designate the information acquiring units to be operated, among the information acquiring units provided in plurality (the sound acquiring unit 77, the vibration acquiring unit 78, and the temperature acquiring unit 79), instead of using manual settings via the setting unit (first setting unit) 81 or the setting unit (second setting unit) 281, as an example, but the present disclosure is not limited to such an example. For example, the automatic setting via the control unit 181 may be used in addition to the manual setting via the setting unit 81 or the setting unit 281. In such a configuration, complications in the settings can be avoided by giving priorities to the manual settings performed via the setting unit 81 or the setting unit 281, and the automatic settings performed via the control unit 181.

[0120] Used in explaining the embodiments and the modifications described above is an example in which the textile machine is the automatic winder 1 provided with a plurality of winder units 10, but the textile machine may also be a spinning machine provided with a plurality of spinning units, as another example. Such a spinning unit at least includes a spinning device (yarn feeding unit) that supplies yarn, and a winding unit for winding the yarn supplied from the spinning device into a package, as a fiber processing section. An example of the shared device is a yarn joining carriage, in this example. The yarn joining carriage is enabled to run in the direction along which the spinning units are arranged, and runs to the spinning unit at which the yarn is cut, and joins the yarn in the spinning unit. By attaching the condition acquiring device 70 capable of acquiring temperature information to the spinningmachine, the quality of the yarn spun thereby can be managed using the information.

[0121] At least some parts of the embodiments and the modifications described above may be combined in any way.

[0122] The textile machine according to one aspect of the present disclosure is attachable with a condition acquiring device including: a plurality of information acquiring units each of which acquires a different type of information related to a condition of at least one of a plurality of fiber processing units that are arranged side by side and a shared device that is commonly provided on the fiber processing units; a casing that houses the information acquiring units; and an attaching portion that is provided on the casing, wherein the condition acquiring device is capable of acquiring at least one of a condition of the fiber processing units and a condition of the shared device, and the textile machine includes the fiber processing units, the shared device, and an attachment base that is provided on a plurality of parts of at least one of the fiber processing units and the shared device, and to which the attaching portion provided on the condition acquiring device is attachable in a removable manner.

[0123] The textile machine having the configuration described above includes an attachment base configured to be attached with the condition acquiring device capable of acquiring a plurality of different types of information. Therefore, desired types of information can be acquired merely by a simple operation of attaching the condition acquiring device to the attachment base corresponding to the part from which the operator wants to acquire information. As a result, desired types of information can be acquired from a desired part as required, without identifying the part to be monitored or the type of information to be acquired in advance.

[0124] A condition acquiring device according to another aspect of the present disclosure is configured to be removably attachable to textile machine that includes: a plurality of fiber processing units that are arranged side by side; a shared device that is commonly provided on the fiber processing units; and an attachment base that is provided on a plurality of parts of at least one of the fiber processing units and the shared device, and the condition acquiring device includes: a plurality of information acquiring units each of which acquires a different type of information related to a condition of at least one of the fiber processing units and the shared device; a casing that houses the information acquiring units; and an attaching portion that is provided on the casing, and that is removably attachable to the attachment base.

[0125] Because the condition acquiring device having the configuration described above is enabled to acquire a plurality of different types of information, desired types of information can be acquired merely by attaching the condition acquiring device to the part from which the operator wants to acquire information. Furthermore, in the textile machine having such a configuration, because an attachment base is provided on at least one of the fiber processing units and the shared device, and the attaching portion is provided on the condition acquiring device, the condition acquiring unit can be easily attached to and removed from the fiber processing unit or the shared device. As a result, desired types of information can be acquired from a desired part as required, without identifying the portions to be monitored or the type of information to be acquired in advance.

[0126] A fiber processing unit according to another aspect of the present disclosure at least includes: a yarn feeding unit that supplies yarn, and a winding unit that winds the yarn supplied form the yarn feeding unit into a package, as a fiber processing section; a condition acquiring device capable of acquiring conditions of the fiber processing section; and a plurality of attachment bases configured to be attached with the condition acquiring

device, wherein the condition acquiring device includes: a plurality of information acquiring units each of which acquires a different type of information related to a condition of the fiber processing unit; a casing that houses the information acquiring units; and an attaching portion that is provided on the casing, and is removably attachable to the attachment bases.

[0127] In the fiber processing unit having the configuration described above, because the condition acquiring device is enabled to acquire a plurality of different types of information, desired types of information can be acquired merely by attaching the condition acquiring device to the part from which the operator wants to acquire information. Furthermore, in the fiber processing unit having such a configuration, the attachment bases are provided on the fiber processing unit, and the attaching portion is provided on the condition acquiring device. Therefore, the condition acquiring device can be easily attached to and removed from the fiber processing unit. As a result, desired types of information can be acquired from a desired part as required.

Claims

1. A textile machine (1) comprising:

a plurality of fiber processing units (10) that are arranged side by side;
a shared device (8) that is commonly provided for the plurality of fiber processing units (10);
a condition acquiring device (70) configured to acquire information related to at least one of a condition of a fiber processing unit (10) and a condition of the shared device (8); and
a plurality of attachment bases (90A, 90B, 90C) provided on a plurality of parts of at least one of the fiber processing units (10) and the shared device (8), wherein the condition acquiring device (70) is attached to one of the attachment bases (90A, 90B, 90C), wherein
the condition acquiring device (70) includes:

a plurality of information acquiring units (77, 78, 79) each of which is configured to acquire a different type of information related to the condition;
a casing (71) that houses the information acquiring units (77, 78, 79); and
an attaching portion (73) provided on the casing (71) and configured to be attached to an attachment base (90A, 90B, 90C) in a removable manner.

2. The textile machine (1) according to claim 1, wherein a plurality of attachment bases (90A, 90B) is provided on one or more of the fiber processing units (10).

3. The textile machine (1) according to claim 1 or 2, wherein the condition acquiring device (70) is configured to acquire information related to a condition of an ambient environment around the fiber processing units (10) or the shared device (8).

4. The textile machine (1) according to any one of claims 1 to 3, further comprising a machine frame (1A) that supports at least one of the fiber processing units (10) and the shared device (8), wherein an attachment base (90C) is provided on the machine frame (1A).

5. The textile machine (1) according to any one of claims 1 to 4, wherein the plurality of information acquiring units (77, 78, 79) are configured to be set to be operated so that only an information acquiring unit or information acquiring units set to be operated acquires information.

6. The textile machine (1) according to any one of claims 1 to 5, wherein the condition acquiring device (70) further includes a first setting unit (81) configured to receive from an operator an instruction as to whether one or more of the information acquiring units (77, 78, 79) is to be operated , wherein
the first setting unit (81) is configured to designate which of the information acquiring units (77, 78, 79) is to be operated based on the instruction received from the operator.

7. The textile machine (1) according to any one of claims 1 to 6, wherein the condition acquiring device (70) further includes an attached position identifying unit (181) configured to identify a position at which one of the attachment bases (90A, 90B, 90C) an attaching portion (73) of a condition acquiring device (70) is attached, wherein
the attached position identifying unit (181) is configured to designate which of the information acquiring units (77, 78, 79) is to be operated based on the attached position.

8. The textile machine (1) according to any one of claims 1 to 7, wherein the condition acquiring device (70) further includes a power source (87), and a storage unit (89) configured to store the acquired information.

9. The textile machine (1) according to claim 8, wherein the condition acquiring device (70) further includes a second setting unit (281) having at least one of a first function and a second function,
the first function is a function enabling a selection of the information acquiring units (77, 78, 79) for which information is to be stored in the storage unit (89), and
the second function is a function enabling a desig-

nation of at least one of time and a sampling cycle at which the information is stored in the storage unit (89).

10. The textile machine (1) according to any one of claims 1 to 9, wherein the attachment bases (90A, 90B, 90C) are provided with a marking (95).

11. The textile machine (1) according to any one of claims 1 to 10, wherein each of the attachment bases (90A, 90B, 90C) is configured to engage with the attaching portion (73).

12. The textile machine (1) according to any one of claims 1 to 11, wherein the information acquiring units (77, 78, 79) are configured to acquire at least one of a sound, a vibration, an atmospheric pressure, a still image, a moving image, a current, an angular speed, a displacement, a temperature, and a humidity.

13. The textile machine (1) according to any one of claims 1 to 12, wherein one or more of the attachment bases (90A, 90B, 90C) is provided near a component comprising an article of consumption or near a device that requires adjustment.

14. The textile machine (1) according to any one of claims 1 to 13, wherein one or more of the attachment bases (90A, 90B, 90C) is provided near a cradle (52) that supports a package (P), and
one of the information acquiring units (77, 78, 79) is a vibration acquiring unit (78) configured to acquire the vibration of the cradle (52).

15. The textile machine (1) according to any one of claims 1 to 14, wherein one or more of the attachment bases (90A, 90B, 90C) is provided near a yarn joining device (31) that joins ends of yarn, and
one of the information acquiring units (77, 78, 79) is a sound acquiring unit (77) configured to acquire the sound generated by the yarn joining device (31).

16. The textile machine (1) according to any one of claims 1 to 15, wherein the condition acquiring device (70) further includes an output unit (83) configured to output the information acquired by the information acquiring units (77, 78, 79) to an external part of the condition acquiring device (70).

17. A textile machinery system (5) comprising:

a plurality of the textile machines (1) according to any one of claims 1 to 16;
a unit controller (65) provided for each of the fiber processing units (10);
a machine managing unit (9) provided for each of the textile machines (1), and configured to manage the fiber processing units (10) provided in the corresponding textile machine (1);
a host managing unit (3) deployed at a location away from the textile machines (1), and configured tomanage at least one the textile machines (1); and
a terminal device (7) configured to communicate with at least one of the unit controller (65), the machine managing unit (9), the host managing unit (3), and the condition acquiring device (70), wherein
the condition acquiring device (70) is configured to output the information to at least one of the unit controller (65), the machine managing unit (9), the host managing unit (3), and the terminal device (7).

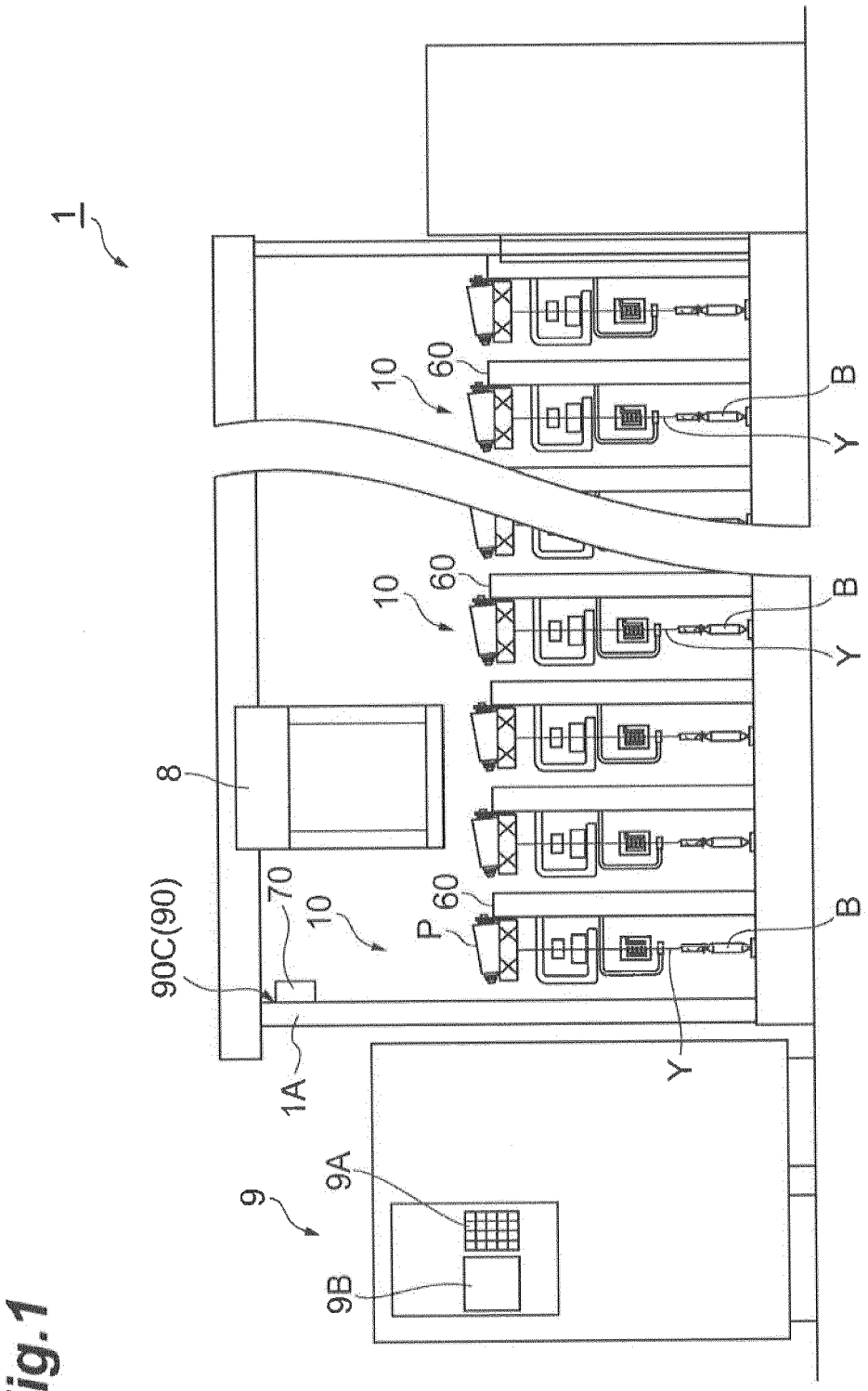
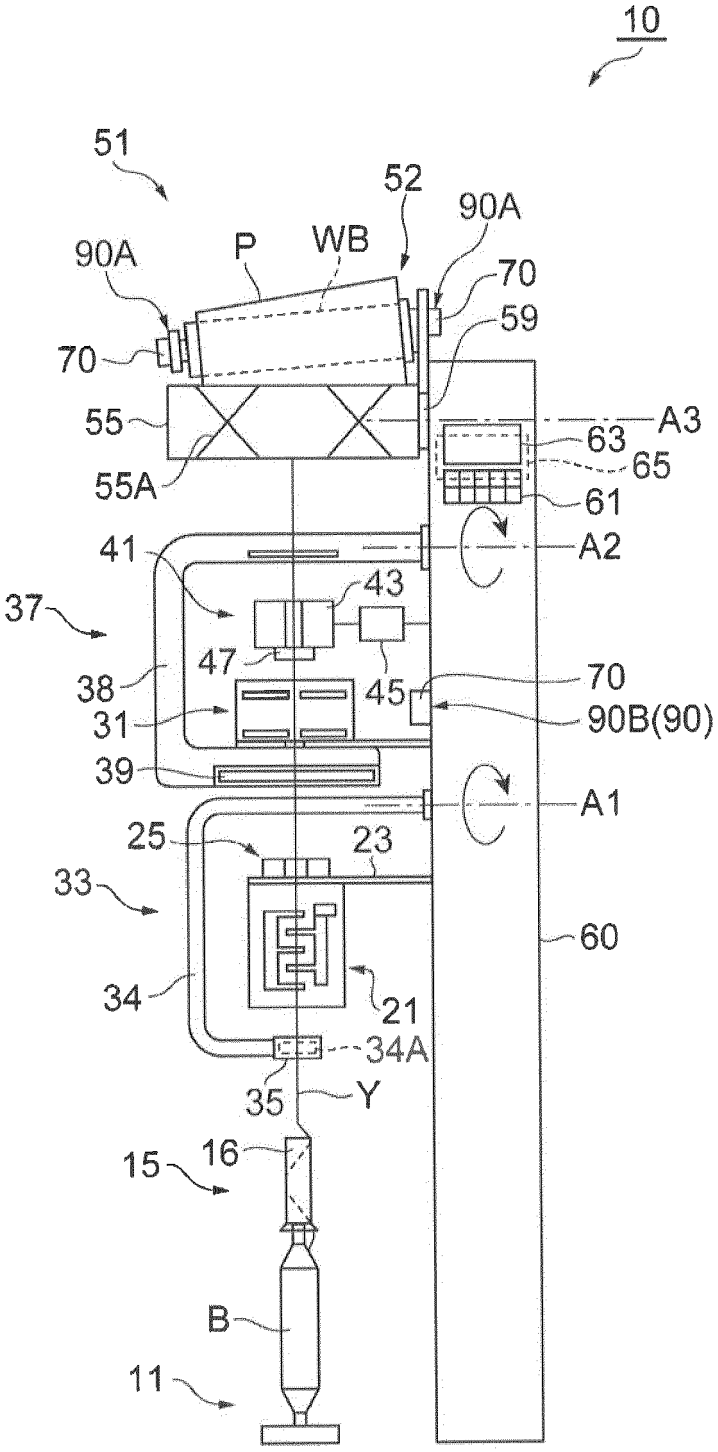


Fig.1

Fig.2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A2
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47
38
45
70
31
90B(90)
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60
34
21
34A
35
Y
15
16
B
11

Fig.3

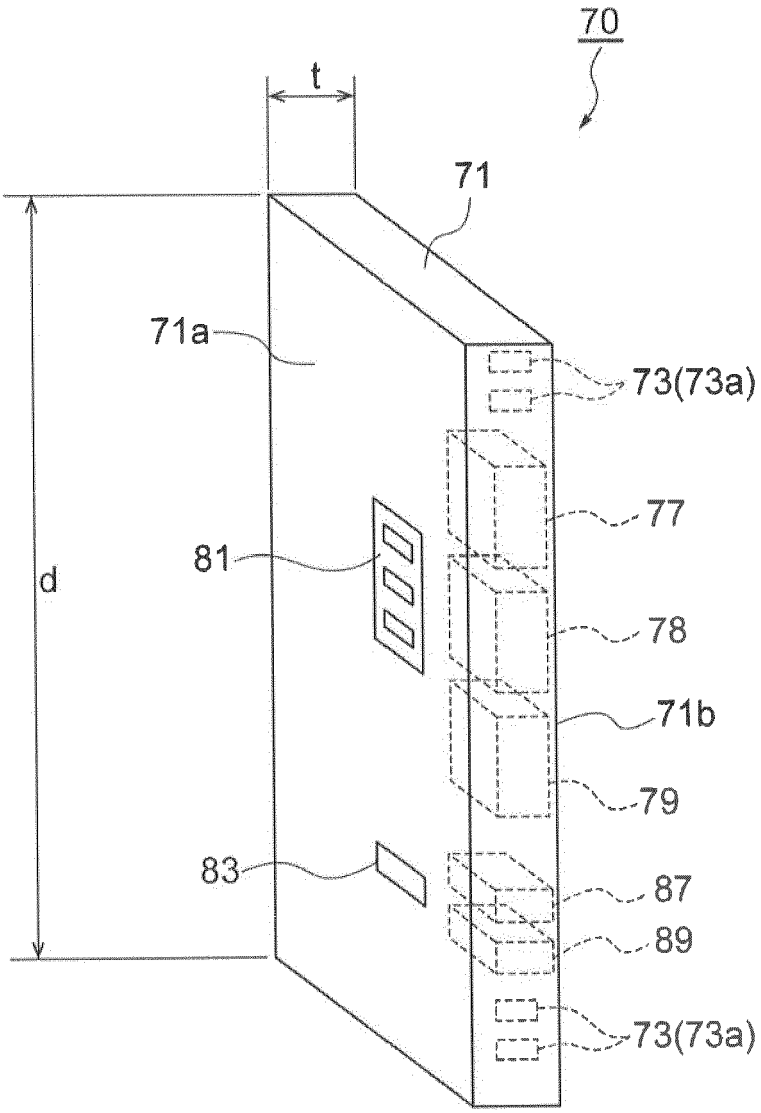


Fig.4

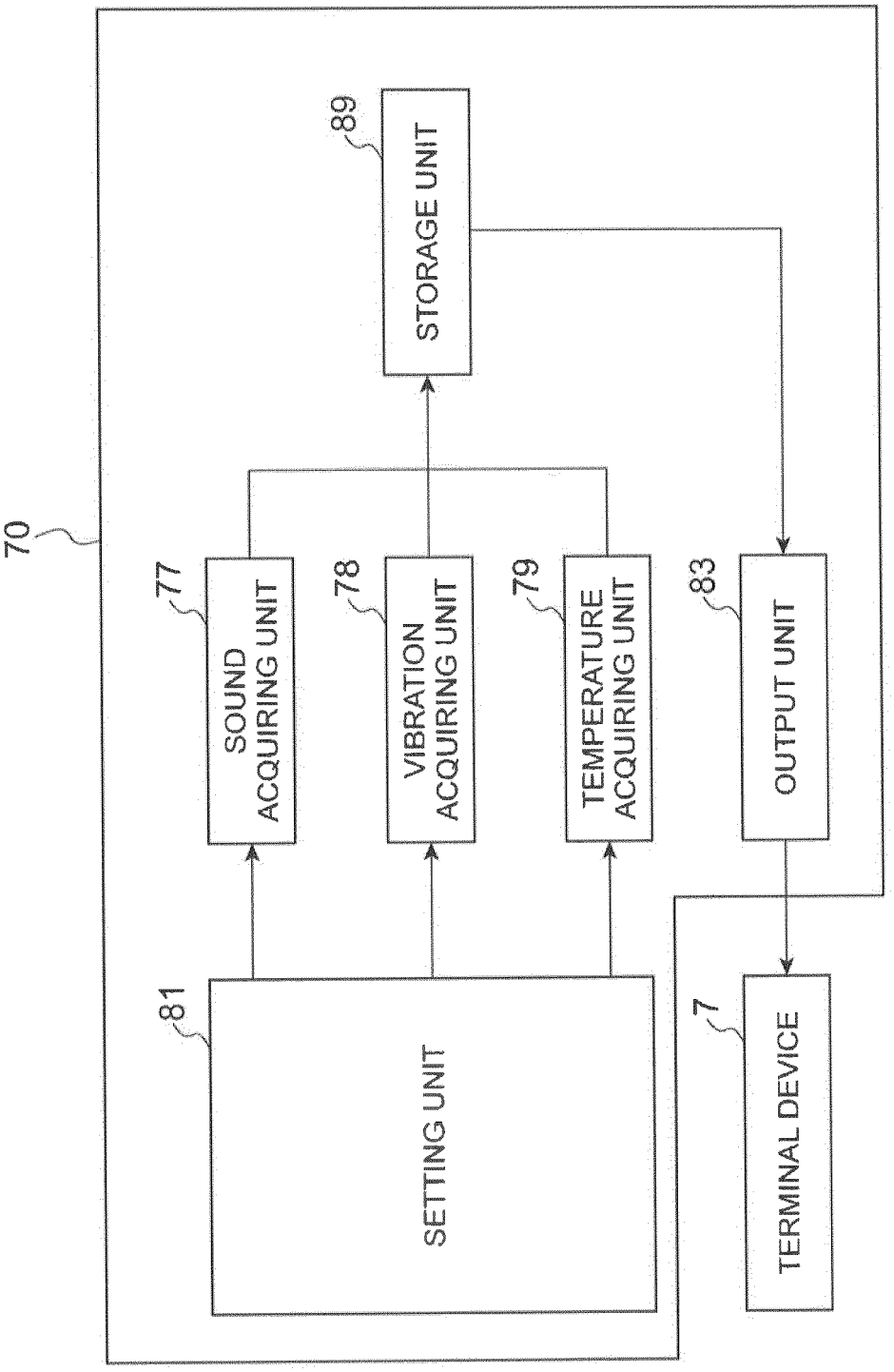

70
89
STORAGE UNIT
77
SOUND ACQUIRING UNIT
78
VIBRATION ACQUIRING UNIT
79
TEMPERATURE ACQUIRING UNIT
83
OUTPUT UNIT
81
SETTING UNIT
7
TERMINAL DEVICE

Fig.5A

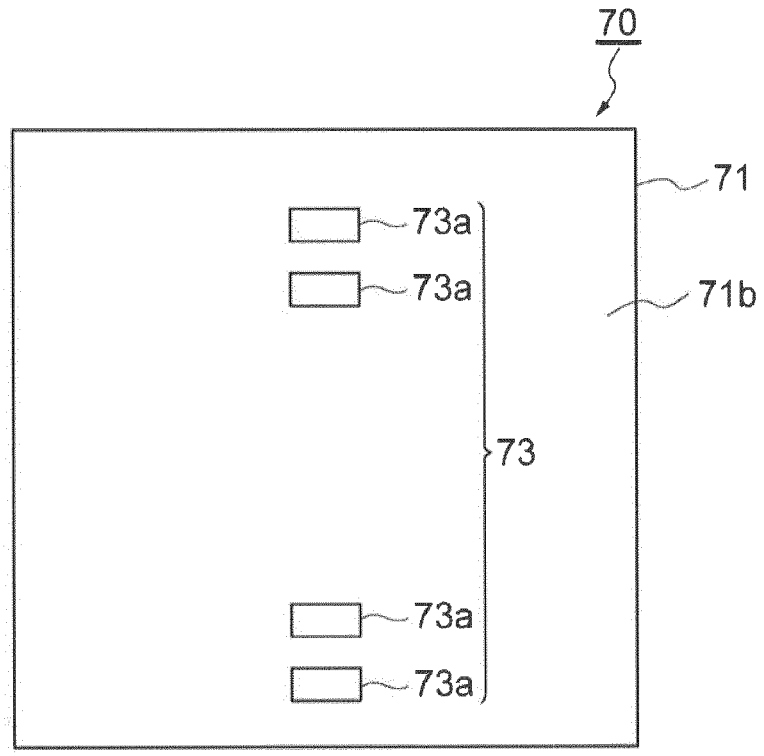


Fig.5B

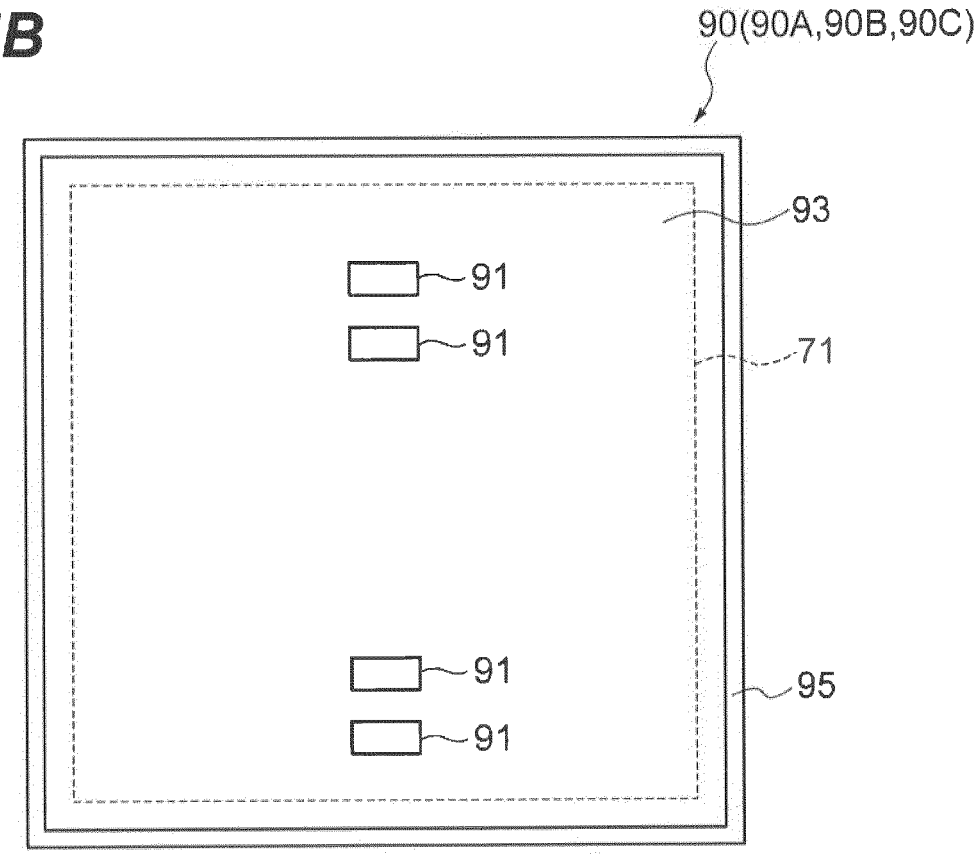
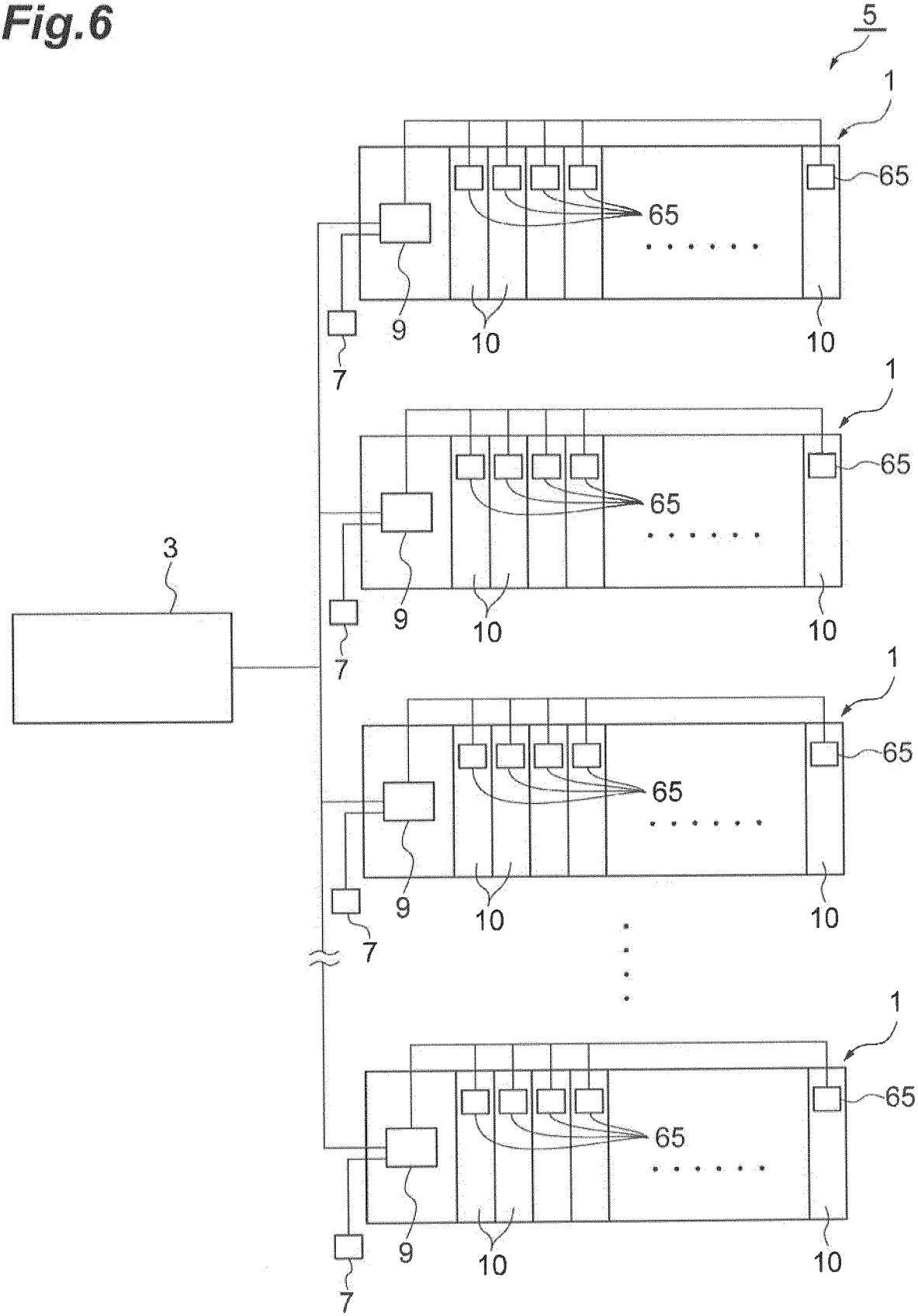
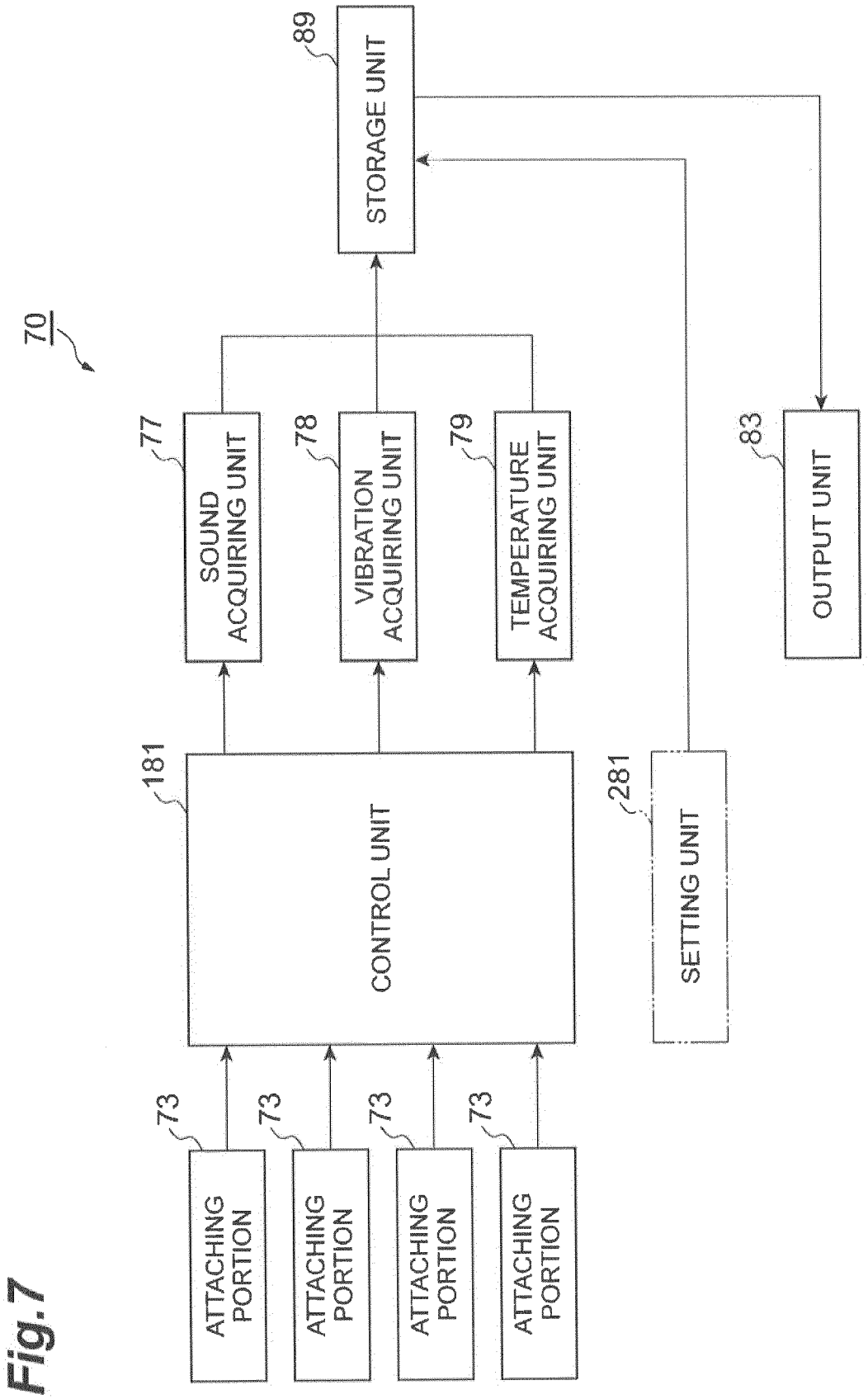


Fig.6

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SOUND ACQUIRING UNIT
78
VIBRATION ACQUIRING UNIT
79
TEMPERATURE ACQUIRING UNIT
83
OUTPUT UNIT
181
CONTROL UNIT
281
SETTING UNIT
73
ATTACHING PORTION
73
ATTACHING PORTION
73
ATTACHING PORTION
73
ATTACHING PORTION

Fig.7

Fig.8

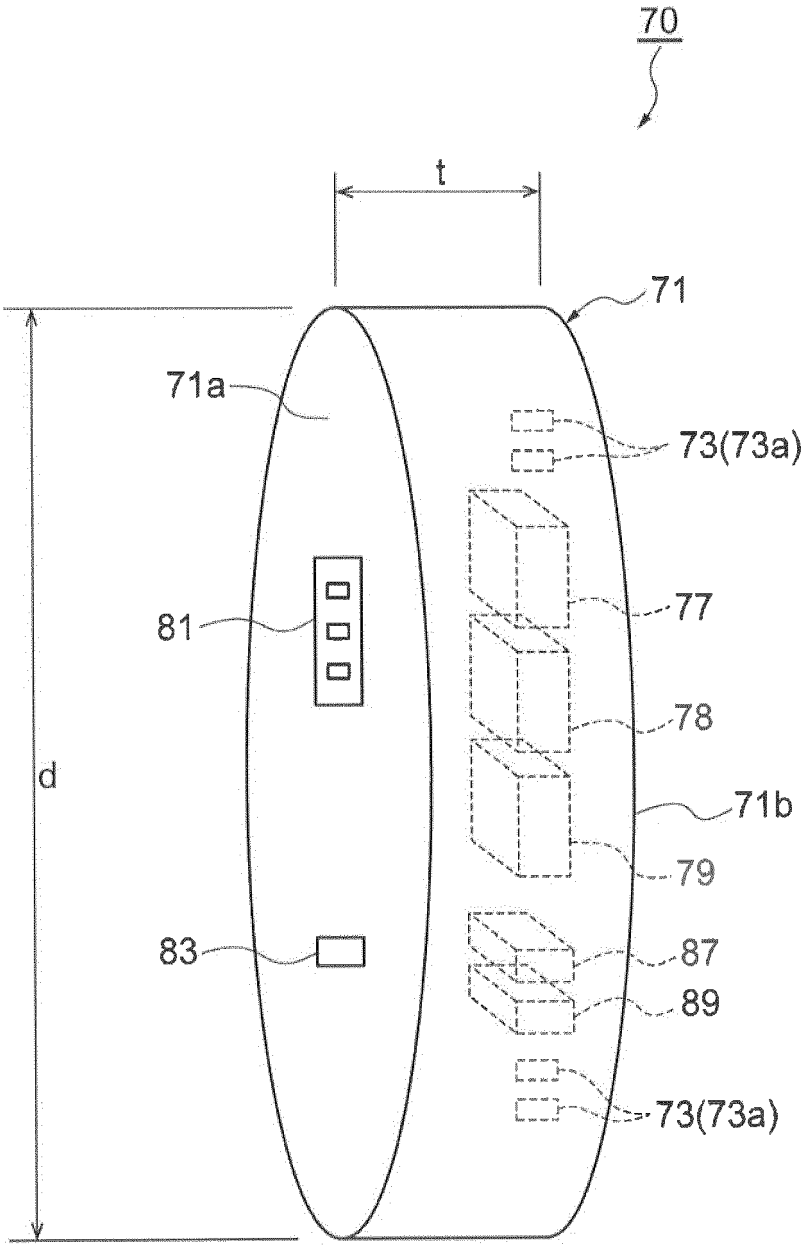
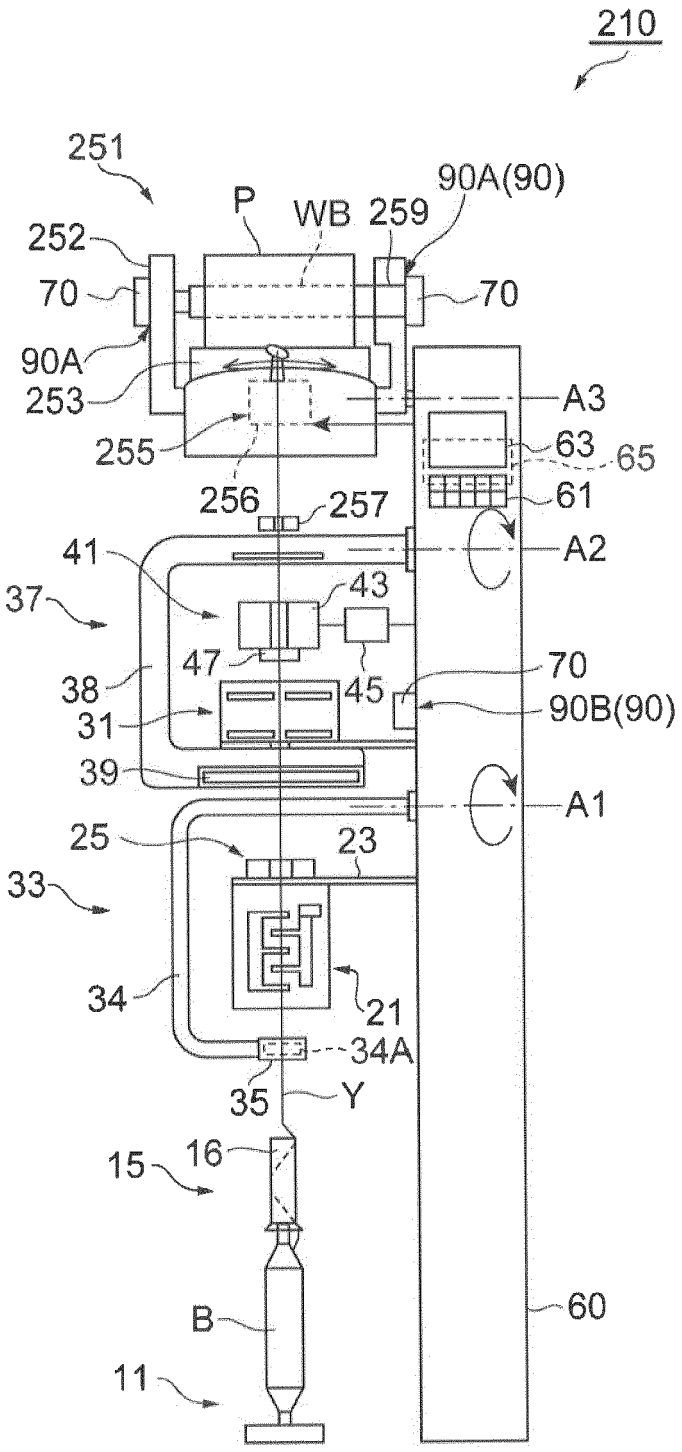


Fig.9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B
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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 1223

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	EP 1 939 123 A1 (MURATA MACHINERY LTD [JP]) 2 July 2008 (2008-07-02) * paragraphs [0040] - [0042], [0048] - [0050], [0054], [0055], [0060] - [0063]; figures 1,2 * -----	1-17	INV. B65H54/26 B65H54/72 B65H63/00 D01H13/14

TECHNICAL FIELDS SEARCHED (IPC)

B65H
D01H
D03D
D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 February 2017	Pussemier, Bart

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14-02-2017

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