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(72) Inventor: **Tanigawa, Yasunobu**  
**Kyoto, 612-8686 (JP)**

(74) Representative: **HOFFMANN EITLE**  
**Patent- und Rechtsanwälte**  
**Arabellastrasse 4**  
**81925 München (DE)**

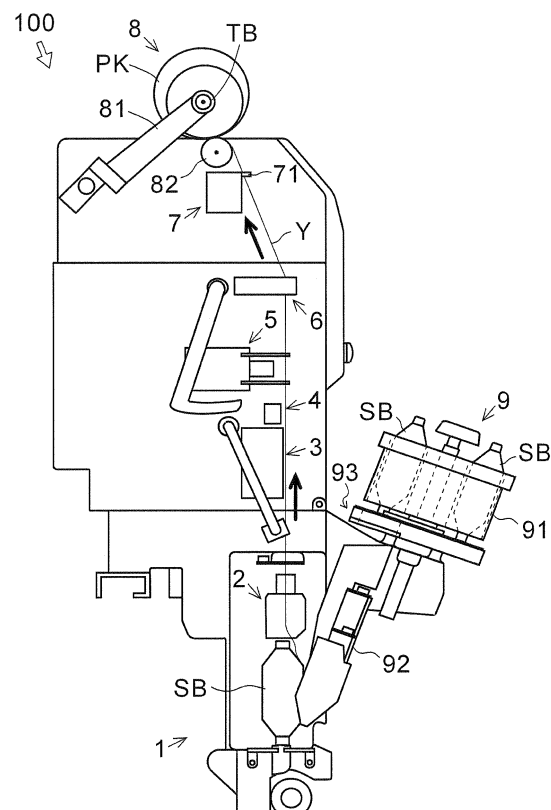
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(71) Applicant: **Murata Machinery, Ltd.**  
**Minami-ku**  
**Kyoto-shi**  
**Kyoto 601-8326 (JP)**

(54) **Winding device**

(57) A bobbin supplying section (9) includes a magazine (91) provided with a plurality of through-holes (91H) in a circumferential direction, a guiding passage (92) arranged towards a part of the plurality of through-holes (91H), a plate member (931) arranged on one side of the through-holes (91H) excluding the through-hole (91H) to which the guiding passage (92) is directed to support the yarn supplying bobbins (SB) inserted to the through-holes (91H) excluding the through-hole (91H) to which the guiding passage (92) is directed, and an open/close mechanism (93) for communicating or blocking the guiding passage (92) and the through-hole (91H) in which the plate member (931) is not arranged, the open/close mechanism (93) being movable by a driving device (94) adapted to rotate the magazine (91).

FIG. 1



## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

**[0001]** The present invention relates to a technique of a winding device adapted to wind a spun yarn to form a package.

#### 2. Description of the Related Art

**[0002]** Conventionally, there is known a winding device adapted to wind a spun yarn unwound from a yarn supplying bobbin to form a package (see e.g., Japanese Unexamined Patent Publication No. 2011-6179). The winding device includes a bobbin supporting section for supporting the yarn supplying bobbin. There also exists a winding device adapted to supply the yarn supplying bobbin from a bobbin supplying section to the bobbin supporting section.

**[0003]** The bobbin supplying section is mainly configured by a magazine and a guiding passage. The magazine is provided with a plurality of through-holes in a circumferential direction, so that the yarn supplying bobbins can be accommodated in the through-holes. The guiding passage guides the yarn supplying bobbin accommodated in the through-hole to the bobbin supporting section. Specifically, the magazine can intermittently rotate so that the through-hole stops at a predetermined position. The yarn supplying bobbin accommodated in the through-hole is dropped by force of gravity when the through-hole stops at the predetermined position. The guiding passage can guide the dropped yarn supplying bobbin to the bobbin supporting section.

**[0004]** Therefore, the yarn supplying bobbin cannot be inserted to one of the plurality of through-holes formed in the magazine. That is, since the one through-hole is communicated with the bobbin supporting section via the guiding passage, if the yarn supplying bobbin is inserted to such a through-hole, the yarn supplying bobbin may be unintentionally supplied to the bobbin supporting section.

**[0005]** Thus, if the magazine provided with nine through-holes is arranged, for example, the yarn supplying bobbin is allowed to be inserted to only eight through-holes. However, if an operator mistakenly inserts the yarn supplying bobbin, problems have occurred in which the yarn supplying bobbin may be supplied to the bobbin supporting section that is not in a state of supporting the yarn supplying bobbin, or the yarn supplying bobbin may be further supplied to the bobbin supporting section that is already supporting the yarn supplying bobbin.

### BRIEF SUMMARY OF THE INVENTION

**[0006]** The present invention has been made to solve

the above problems, and an object thereof is to provide a winding device including a bobbin supplying section in which a yarn supplying bobbin can be inserted to all the through-holes.

**[0007]** The present invention provides a winding device including a winding section adapted to wind a spun yarn wound around a yarn supplying bobbin to form a package, a bobbin supporting section adapted to support the yarn supplying bobbin, and a bobbin supplying section adapted to supply the yarn supplying bobbin to the bobbin supporting section, wherein the bobbin supplying section includes a magazine provided with a plurality of through-holes in a circumferential direction, a guiding passage arranged towards a part of the plurality of through-holes, a plate member arranged on one side of the through-holes excluding the through-hole to which the guiding passage is directed to hold the yarn supplying bobbins inserted to the through-holes excluding the through-hole to which the guiding passage is directed, and an open/close mechanism for communicating or blocking the guiding passage and the through-hole on which the plate member is not arranged, and the open/close mechanism is movable by a driving device adapted to rotate the magazine.

**[0008]** In the present invention, the open/close mechanism further includes an open/close member, the open/close member being a shutter member that moves parallel to the plate member.

**[0009]** In the present invention, the driving device includes a magazine gear adapted to rotate integrally with the magazine, a feeding claw adapted to rotate the magazine gear in one direction, and a feeding lever adapted to push the feeding claw, the through-hole in which the plate member is not arranged is opened or closed by the shutter member when the feeding lever is swung in one direction, the through-hole in which the plate member is not arranged is closed or opened by the shutter member when the feeding lever is swung to the other direction, and the feeding claw rotates the magazine together with the magazine gear.

**[0010]** In the present invention, the shutter member is attached to the feeding lever, and the feeding lever is swung by a dedicated power source for driving the bobbin supplying section.

**[0011]** In the present invention, the feeding lever is swung using a power of a stepping motor.

**[0012]** In the present invention, the open/close mechanism includes a detection device adapted to detect whether or not the shutter member is supporting the yarn supplying bobbin.

**[0013]** The present invention relates to an automatic winder including a plurality of the winding devices according to the present invention.

**[0014]** The present invention has the following effects.

**[0015]** According to the present invention, since the winding device includes the open/close mechanism for communicating or blocking the guiding passage and the through-hole on which the plate member is not arranged,

the yarn supplying bobbin can be inserted to all the through-holes. The inserting operation of the yarn supplying bobbin by an operator is thus simplified. The frequency of the inserting operation can also be reduced. Furthermore, since the open/close mechanism is configured by the open/close member for opening or closing the through-hole in which the plate member is not arranged and is movable by the driving device adapted to rotate the magazine, the operation of the magazine and the operation of the open/close mechanism can be performed in conjunction with each other.

**[0016]** According to the present invention, since the shutter member moves parallel to the plate member, the miniaturization of the open/close mechanism can be achieved.

**[0017]** According to the present invention, since the shutter member is movable by the driving device adapted to rotate the magazine, the operation of the magazine and the operation of the open/close mechanism can be easily performed in conjunction with each other.

**[0018]** According to the present invention, since the feeding lever is swung by the dedicated power source for driving the bobbin supplying section, bobbin replacement of high degree of freedom that is not influenced by the operation of other main body mechanisms can be realized.

**[0019]** According to the present invention, since the feeding lever is swung by using the power of the stepping motor, the failure of the open/close mechanism and the driving device can be prevented even when the yarn supplying bobbin is stuck between the shutter member and the plate member, and the like.

**[0020]** According to the present invention, since whether or not the shutter member is supporting the yarn supplying bobbin can be detected, stopping of the operation of the winding device that occurs when the yarn supplying bobbin is not inserted to the magazine can be prevented.

**[0021]** According to the present invention, the effect that the inserting operation of the yarn supplying bobbin by the operator can be simplified is enhanced by arranging a plurality of winding devices. The effect of reducing the frequency of the inserting operation is also enhanced.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0022]** FIG. 1 is a view illustrating an overall structure of a winding device 100;

**[0023]** FIG. 2 is a view illustrating a bobbin supplying section 9;

**[0024]** FIG. 3 is a view of the bobbin supplying section 9 seen from a direction of an arrow X;

**[0025]** FIG. 4 is a view illustrating a structure of an open/close mechanism 93 and a driving device 94;

**[0026]** FIGS. 5A to 5C are views illustrating an operation mode of the open/close mechanism 93 and the driving device 94; and

**[0027]** FIG. 6 is a view illustrating a state in which a

shutter member 932 is supporting a yarn supplying bobbin SB.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0028]** First, a winding device 100 according to one embodiment of the present invention will be described.

**[0029]** FIG. 1 is a view illustrating an overall structure of the winding device 100. An arrow in the figure indicates a feeding direction of a spun yarn Y.

**[0030]** The winding device 100 includes a bobbin supporting section 1. A yarn supplying bobbin SB, around which the spun yarn Y is wound, is mounted to the bobbin supporting section 1. The winding device 100 includes a yarn unwinding assisting section 2, a tension applying section 3, a tension detecting section 4, a yarn joining section 5, a yarn detecting section 6, a traversing section 7, and a winding section 8 along the feeding direction of the spun yarn Y unwound from the yarn supplying bobbin SB. The winding device 100 also includes a bobbin supplying section 9.

**[0031]** The yarn unwinding assisting section 2 assists the unwinding of the spun yarn Y wound around the yarn supplying bobbin SB. The yarn unwinding assisting section 2 restricts the spun yarn Y unwound from the yarn supplying bobbin SB from spreading by centrifugal force.

**[0032]** The tension applying section 3 applies a predetermined tension on the spun yarn Y unwound from the yarn supplying bobbin SB. The tension applying section 3 enables high-speed winding of the spun yarn Y by applying a predetermined tension on the spun yarn Y. As the tension applying section 3, a disc type tensor, and the like may also be employed in addition to a gate type tensor that applies the tension on the spun yarn Y by comb teeth.

**[0033]** The tension detecting section 4 detects the tension applied on the spun yarn Y. The tension detecting section 4 can detect the tension applied on the spun yarn Y based on a voltage value that changes according to the tension of the spun yarn Y. Specifically, a control section analyzes a detection signal from the tension detecting section 4 to grasp the tension applied on the spun yarn Y.

**[0034]** The yarn joining section 5 joins ends of the spun yarn Y to each other. When the spun yarn Y is broken, for example, the yarn joining section 5 joins the ends of the disconnected spun yarn Y to each other. As the yarn joining section 5, a mechanical splicer and the like may be employed in addition to an air splicer that joins the ends of the spun yarn Y by a whirling airflow.

**[0035]** The yarn detecting section 6 detects a defective part of the spun yarn Y. The yarn detecting section 6 detects yarn breakage of the spun yarn Y. The yarn detecting section 6 irradiates the spun yarn Y with a light emitting diode as a light source, and detects the defective part of the spun yarn Y and the yarn breakage of the spun yarn Y based on a reflected light quantity from the spun

yarn Y. Specifically, the control section analyzes a detection signal from the yarn detecting section 6 to determine presence or absence of the defective part and presence or absence of the yarn breakage. As the yarn detecting section 6, a capacitance sensor and the like may be employed in addition to an optical sensor described above.

**[0036]** The traversing section 7 traverses the spun yarn Y guided to a package PK. The traversing section 7 mainly includes a traverse guide 71 and a traverse guide driving unit. The traverse guide 71 reciprocates in a rotation axis direction of a bobbin TB with the spun yarn Y hooked to a hook portion to traverse the spun yarn Y. The traverse guide driving unit drives the traverse guide 71 by using power of a servo motor. The traversing section 7 thus configures a so-called arm-type traverse device adapted to traverse the spun yarn Y by the reciprocating traverse guide 71. However, a belt-type traverse device, a blade traverse device, and the like can be used in addition to the arm-type traverse device. The winding device 100 may employ a traverse drum method, i.e., a structure in which a drum that rotates while making contact with the package PK is arranged to traverse the spun yarn Y by a guiding groove formed on a surface of the drum.

**[0037]** The winding section 8 winds the spun yarn Y by rotating the bobbin TB. The winding section 8 mainly includes a bobbin holding unit 81, a contact roller 82, and a package driving unit. The bobbin holding unit 81 includes a bearing for removably clamping the bobbin TB, and rotatably holds the bobbin TB. The contact roller 82 adjusts the shape of the package PK by pressing the surface of the package PK. The package driving unit rotates the bobbin TB and the package PK formed on the bobbin TB by using the power of the servo motor. The winding section 8 is configured such that the package PK is rotated by the package driving unit, and the contact roller 82 is rotated accompanying the rotation of the package PK. However, the contact roller 82 may be rotated by the package driving unit, and the package PK may be rotated accompanying the rotation of the contact roller 82.

**[0038]** The bobbin supplying section 9 supplies the yarn supplying bobbin SB to the bobbin supporting section 1. The bobbin supplying section 9 is mainly configured by a magazine 91, a guiding passage 92, and an open/close mechanism 93. A structure of the bobbin supplying section 9 will be described in detail below.

**[0039]** FIG. 2 is a view illustrating the bobbin supplying section 9. FIG. 3 is a view of the bobbin supplying section 9 seen from the direction of an arrow X. The arrows in the figures indicate a rotating direction of the magazine 91 (see FIG. 3) and a guiding direction of the yarn supplying bobbin SB (see FIG. 2).

**[0040]** The magazine 91 is provided with a plurality of through-holes 91H in a circumferential direction with a rotation axis A of the magazine 91 as a center. Therefore, the magazine 91 can accommodate the yarn supplying bobbin SB in each through-hole 91H. More specifically,

the yarn supplying bobbin SB inserted to each through-hole 91H is supported by the open/close mechanism 93, and held inside the through-hole 91H. The magazine 91 can intermittently rotate so that the through-hole 91H stops at a predetermined position. The predetermined position is a position where the through-hole 91H overlaps a cutout portion 931L. The cutout portion 931L refers to an empty portion where a plate member 931 is not arranged.

**[0041]** The guiding passage 92 is formed to extend one through-hole 91H to the bobbin supporting section 1. Therefore, the guiding passage 92 can guide the yarn supplying bobbin SB accommodated in the through-hole 91H to the bobbin supporting section 1. More specifically, the yarn supplying bobbin SB accommodated in the through-hole 91H is guided by the guiding passage 92 when dropped from the through-hole 91H, and then guided to the bobbin supporting section 1. The yarn supplying bobbin SB is supported by inserting a peg 11 to the yarn supplying bobbin SB.

**[0042]** The open/close mechanism 93 is configured by the plate member 931 arranged to block a lower opening of the through-hole 91H and an open/close member 932. In the present embodiment, the open/close member 932 is a shutter member (hereinafter indicated as the shutter member 932). The plate member 931 is provided with the cutout portion 931L that communicates one of the through-holes 91H with the guiding passage 92. The shutter member 932 can open or close the cutout portion 931L by moving in parallel to the plate member 931. Therefore, the plate member 931 can support the yarn supplying bobbin SB inserted to the through-hole 91H. The shutter member 932 can support the yarn supplying bobbin SB inserted to the through-hole 91H when closing the cutout portion 931L. The shutter member 932 can drop the yarn supplying bobbin SB accommodated in the through-hole 91H by opening the cutout portion 931L. More specifically, the plate member 931 can support the yarn supplying bobbins SB inserted to the other through-holes 91H excluding the through-hole 91H that stopped above the cutout portion 931L. The shutter member 932 can support the yarn supplying bobbin SB inserted to the through-hole 91H that stopped above the cutout portion 931L when closing the cutout portion 931L. The shutter member 932 can drop the yarn supplying bobbin SB accommodated in the through-hole 91H that stopped above the cutout portion 931L by opening the cutout portion 931L.

**[0043]** As described above, since the bobbin supplying section 9 of the winding device 100 includes the open/close mechanism 93 for communicating or blocking the guiding passage 92 and the through-hole 91H on which the plate member 931 is not arranged, the yarn supplying bobbins SB can be inserted to all the through-holes 91H. That is, the yarn supplying bobbin SB can be inserted to all the through-holes 91H by closing the cutout portion 931L with the shutter member 932. The inserting operation of the yarn supplying bobbin SB by an operator

is thus simplified. The frequency of the inserting operation can also be reduced.

**[0044]** As described above, the open/close mechanism 93 is configured by the plate member 931, which is provided with the cutout portion 931L for communicating one of the through-holes 91H and the guiding passage 92, and the shutter member 932 for opening or closing the cutout portion 931L. The open/close mechanism 93 can be moved by a driving device 94 adapted to rotate the magazine 91 (see FIGS. 4 and 5).

**[0045]** The open/close mechanism 93 is thus configured by the plate member 931 provided with the cutout portion 931L and the shutter member 932 for opening or closing the cutout portion 931L, and is movable by the driving device 94 adapted to rotate the magazine 91. Therefore, the operation of the magazine 91 and the operation of the open/close mechanism 93 can be performed in conjunction with each other.

**[0046]** Furthermore, the shutter member 932 is configured to move parallel to the plate member 931, as described above.

**[0047]** Since the shutter member 932 moves parallel to the plate member 931, the open/close mechanism 93 can be miniaturized. That is, since the shutter member 932 moves parallel to the plate member 931, a movable region of the shutter member 932 is small and the open/close mechanism 93 can be miniaturized. Therefore, the miniaturization of the bobbin supplying section 9 can be realized, and furthermore, the miniaturization of the winding device 100 can be achieved.

**[0048]** The open/close mechanism 93 is movable by the driving device 94 adapted to rotate the magazine 91, as described above. The driving device 94 is mainly configured by a magazine gear 941, a feeding lever 942, a feeding claw 943, and a stop latch 944 (see FIG. 4). A structure in which the open/close mechanism 93 is movable by the driving device 94 will be hereinafter described in detail.

**[0049]** FIG. 4 is a view illustrating a structure of the open/close mechanism 93 and the driving device 94. FIGS. 5A to 5C are views illustrating an operation mode of the open/close mechanism 93 and the driving device 94. The arrows in the figure indicate the operating direction of each component constituting the open/close mechanism 93 and the driving device 94.

**[0050]** The magazine gear 941 rotates the magazine 91. The magazine gear 941 is provided with a feeding gear Ga, to which the feeding claw 943 is hooked, and a stop gear Gb, to which the stop latch 944 is hooked. The feeding gear Ga has nine gear teeth in which the distance from the rotation axis A to the outer circumferential surface gradually becomes smaller with change in an angular phase in the rotating direction. The stop gear Gb has nine gear teeth in which the distance from the rotation axis A to the outer circumferential surface gradually becomes larger with change in the angular phase in the rotating direction. The feeding gear Ga and the stop gear Gb each have nine gear teeth because nine

through-holes 91H are formed in the magazine 91.

**[0051]** The feeding lever 942 is swingably attached with the rotation axis A as the center. The feeding lever 942 is provided with a supporting shaft SH1 for swingably supporting the feeding claw 943, and a pin P for pushing a roller arm 945. Furthermore, the shutter member 932 is attached to the feeding lever 942 so that the shutter member 932 can be moved (turned). In the present embodiment, the shutter member 932 opens the cutout portion 931L when the feeding lever 942 is swung to one side (see FIG. 5A). However, the shutter member 932 closes the cutout portion 931L when the feeding lever 942 is swung to the other side (see FIGS. 5B and 5C).

**[0052]** The feeding claw 943 rotates the magazine gear 941 to one side by the swinging of the feeding lever 942. The feeding claw 943 is provided with a claw portion that is hooked to the feeding gear Ga. When the feeding lever 942 is swung to one side (counterclockwise direction in FIG. 4), the feeding claw 943 does not rotate the magazine gear 941 since the claw portion is not hooked to the feeding gear Ga (see FIG. 5A). However, when the feeding lever 942 is swung to the other side (clockwise direction in FIG. 4), the feeding claw 943 rotates the magazine gear 941 since the claw portion is hooked to the feeding gear Ga (see FIGS. 5B, 5C).

**[0053]** The stop latch 944 causes the magazine gear 941 to be freely rotatable or non-rotatable by the swinging of the feeding lever 942. The stop latch 944 is provided with a claw portion that is hooked to the stop gear Gb. The stop latch 944 is swingably supported with a supporting shaft SH2 provided in the roller arm 945 as a center. The roller arm 945 and the stop latch 944 are configured to be swingable with each other within a prescribed opening angle. When the feeding lever 942 is swung to one side, the stop latch 944 causes the magazine gear 941 to be non-rotatable since the roller arm 945 is swung when the pin P pushes the roller arm 945 so that the claw portion is not detached from the stop gear Gb (see FIG. 5A). However, when the feeding lever 942 is swung to other side, the stop latch 944 causes the magazine gear 941 to be freely rotatable since the claw portion is detached from the stop gear Gb when the pin P pushes the roller arm 945 (see FIG. 5B). When the feeding lever 942 is further swung, the stop latch 944 causes the magazine gear 941 to be non-rotatable since the claw portion is hooked to the stop gear Gb when the pin P separates from the roller arm 945 (see FIG. 5C).

**[0054]** The operation mode of the open/close mechanism 93 and the driving device 94 will be described along the time series. This is the operation carried out when supplying the yarn supplying bobbin SB to the bobbin supporting section 1.

**[0055]** First, as illustrated in FIG. 5A, the feeding lever 942 is swung to one side. In this case, the pin P swings the roller arm 945 towards the stop latch 944, but the stop latch 944 causes the magazine gear 941 to be non-rotatable since the claw portion is not detached from the stop gear Gb. The feeding claw 943 cannot rotate

the magazine gear 941 because it is swung in a direction in which the claw portion is not hooked to the feeding gear Ga. Therefore, the claw portion of the feeding claw 943 slides on the outer peripheral surface of the gear tooth and moves to the adjacent gear tooth. The shutter member 932 moves (turns) by the swinging of the feeding lever 942, and opens the cutout portion 931L. The yarn supplying bobbin SB supported by the shutter member 932 thus can be dropped.

[0056] Then, the feeding lever 942 is swung to the other side, as illustrated in FIG. 5B. In this case, the pin P swings the roller arm 945 to the opposite side of the stop latch 944, so that the stop latch 944 causes the magazine gear 941 to freely rotate since the stop latch 944 swings along with the roller arm 945 and the claw portion is detached from the stop gear Gb. The feeding claw 943 can rotate the magazine gear 941 since the claw portion is hooked to the feeding gear Ga. Therefore, the magazine 91 rotates integrally with the magazine gear 941. The shutter member 932 moves (turns) along with the feeding lever 942, and closes the cutout portion 931L.

[0057] Next, the feeding lever 942 is further swung, as illustrated in FIG. 5C. In this case, the stop latch 944 causes the magazine gear 941 to freely rotate since the claw portion is detached from the stop gear Gb. Therefore, the claw portion of the stop latch 944 slides on the outer peripheral surface of the gear tooth and moves to the adjacent gear tooth. The feeding claw 943 further rotates the magazine gear 941 since the claw portion is hooked to the feeding gear Ga. Therefore, the magazine 91 further rotates integrally with the magazine gear 941, and the adjacent through-hole 91H stops above the cutout portion 931L. The yarn supplying bobbin SB accommodated in the adjacent through-hole 91H is thereby supported by the shutter member 932.

[0058] Therefore, since the shutter member 932 of the open/close mechanism 93 is movable by the driving device 94 that rotates the magazine 91, the bobbin supplying section 9 of the winding device 100 can easily perform the operation of the magazine 91 and the operation of the open/close mechanism 93 in conjunction with each other.

[0059] The feeding lever 942 is swung by using power of a stepping motor (not illustrated) arranged in the driving device 94.

[0060] Thus, since the feeding lever 942 is swung by using the power of the stepping motor, the bobbin supplying section 9 can prevent failure of the open/close mechanism 93 and the driving device 94 even when the yarn supplying bobbin SB is stuck between the shutter member 932 and the plate member 931, and the like. This is because even if the yarn supplying bobbin SB is stuck or the spun yarn Y wound around the yarn supplying bobbin SB gets entangled, for example, and a strong load is applied on the open/close mechanism 93 and the driving device 94, the load can be released by shifting the phase of the rotor (step out phenomenon).

[0061] The feeding lever 942 may be swung by a ded-

icated power source for driving the bobbin supplying section 9. That is, the bobbin supplying section 9 may include a dedicated power source adapted to rotate the magazine 91, and the feeding lever 942 may be swung by the relevant power source.

[0062] When configured in such a manner, the feeding lever 942 is swung by the dedicated power source for driving the bobbin supplying section 9, and thus bobbin replacement of high degree of freedom that is not influenced by the operation of other main body mechanisms can be realized.

[0063] The bobbin supplying section 9 of the winding device 100 has a **characteristic in that** it can detect whether or not the shutter member 932 is supporting the yarn supplying bobbin SB. A structure for detecting whether or not the shutter member 932 is supporting the yarn supplying bobbin SB will be hereinafter described in detail.

[0064] FIG. 6 is a view illustrating a state in which the shutter member 932 is supporting the yarn supplying bobbin SB. The arrow in the figure indicates a pushing direction of the shutter member 932 by the yarn supplying bobbin SB.

[0065] The open/close mechanism 93 includes a detection device 933 in proximity to the shutter member 932. The detection device 933 is a magnetic force sensor (Hall IC) adapted to detect magnetic force of a magnet M attached to the shutter member 932. The detection device 933 converts an output voltage according to the change in a magnetic flux density, and detects the position of the magnet M from the value of the output voltage.

[0066] The shutter member 932 is attached to the feeding lever 942 by way of an urging member such as a coil spring. The shutter member 932 is thus pushed by the yarn supplying bobbin SB when the yarn supplying bobbin SB is inserted. The control section thus can grasp whether or not the shutter member 932 is being pushed based on a detection signal from the detection device 933.

[0067] Since the open/close mechanism 93 can detect whether or not the shutter member 932 is supporting the yarn supplying bobbin SB, the stopping of the operation of the winding device 100 that occurs when the yarn supplying bobbin SB is not inserted to the magazine 91 can be prevented.

[0068] As described above, the winding device 100 has an effect of simplifying the inserting operation of the yarn supplying bobbin SB and reducing the frequency of the inserting operation. Such an effect can be enhanced by configuring an automatic winder that includes a plurality of the winding devices 100.

[0069] In other words, the effect of simplifying the inserting operation of the yarn supplying bobbin SB by the operator can be enhanced by arranging a plurality of the winding devices 100. The effect of reducing the frequency of the inserting operation is also enhanced.

## Claims

1. A winding device (100) **characterized by** comprising:

a winding section (8) adapted to wind a spun yarn wound around a yarn supplying bobbin (SB) to form a package;  
a bobbin supporting section (1) adapted to support the yarn supplying bobbin (SB); and  
a bobbin supplying section (9) adapted to supply the yarn supplying bobbin (SB) to the bobbin supporting section (1), wherein the bobbin supplying section (9) includes:

a magazine (91) provided with a plurality of through-holes (91H) in a circumferential direction,

a guiding passage (92) arranged towards a part of the plurality of through-holes (91H),  
a plate member (931) arranged on one side of the through-holes (91H) excluding the through-hole (91H) to which the guiding passage (92) is directed to hold the yarn supplying bobbins (SB) inserted to the through-holes (91H) excluding the through-hole (91H) to which the guiding passage (92) is directed, and

an open/close mechanism (93) for communicating or blocking the guiding passage (92) and the through-hole (91H) in which the plate member (931) is not arranged, and

the open/close mechanism (93) is movable by a driving device (94) adapted to rotate the magazine (91).

2. The winding device (100) according to claim 1, **characterized in that** the open/close mechanism (93) further includes an open/close member (932), the open/close member (932) being a shutter member (932) that moves parallel to the plate member (931).

3. The winding device (100) according to claim 2, **characterized in that** the driving device (94) includes:

a magazine gear (941) adapted to rotate integrally with the magazine (91),  
a feeding claw (943) adapted to rotate the magazine gear (941) in one direction, and  
a feeding lever (942) adapted to push the feeding claw (943),  
the through-hole (91H) in which the plate member (931) is not arranged is opened or closed by the shutter member (932) when the feeding lever (942) is swung in one direction,  
the through-hole (91H) in which the plate mem-

ber (931) is not arranged is closed or opened by the shutter member (932) when the feeding lever (942) is swung to the other direction, and the feeding claw (943) rotates the magazine (91) together with the magazine gear (941).

4. The winding device (100) according to claim 3, **characterized in that** the shutter member (932) is attached to the feeding lever (942), and the feeding lever (942) is swung by a dedicated power source for driving the bobbin supplying section (9).
5. The winding device (100) according to claim 3 or 4, **characterized in that** the feeding lever (942) is swung by using power of a stepping motor.
6. The winding device (100) according to any one of claims 1 to 5, **characterized in that** the open/close mechanism (93) includes a detection device (933) adapted to detect whether or not the shutter member (932) is supporting the yarn supplying bobbin (SB).
7. An automatic winder comprising a plurality of the winding devices (100) according to any one of claims 1 to 6.

FIG. 1

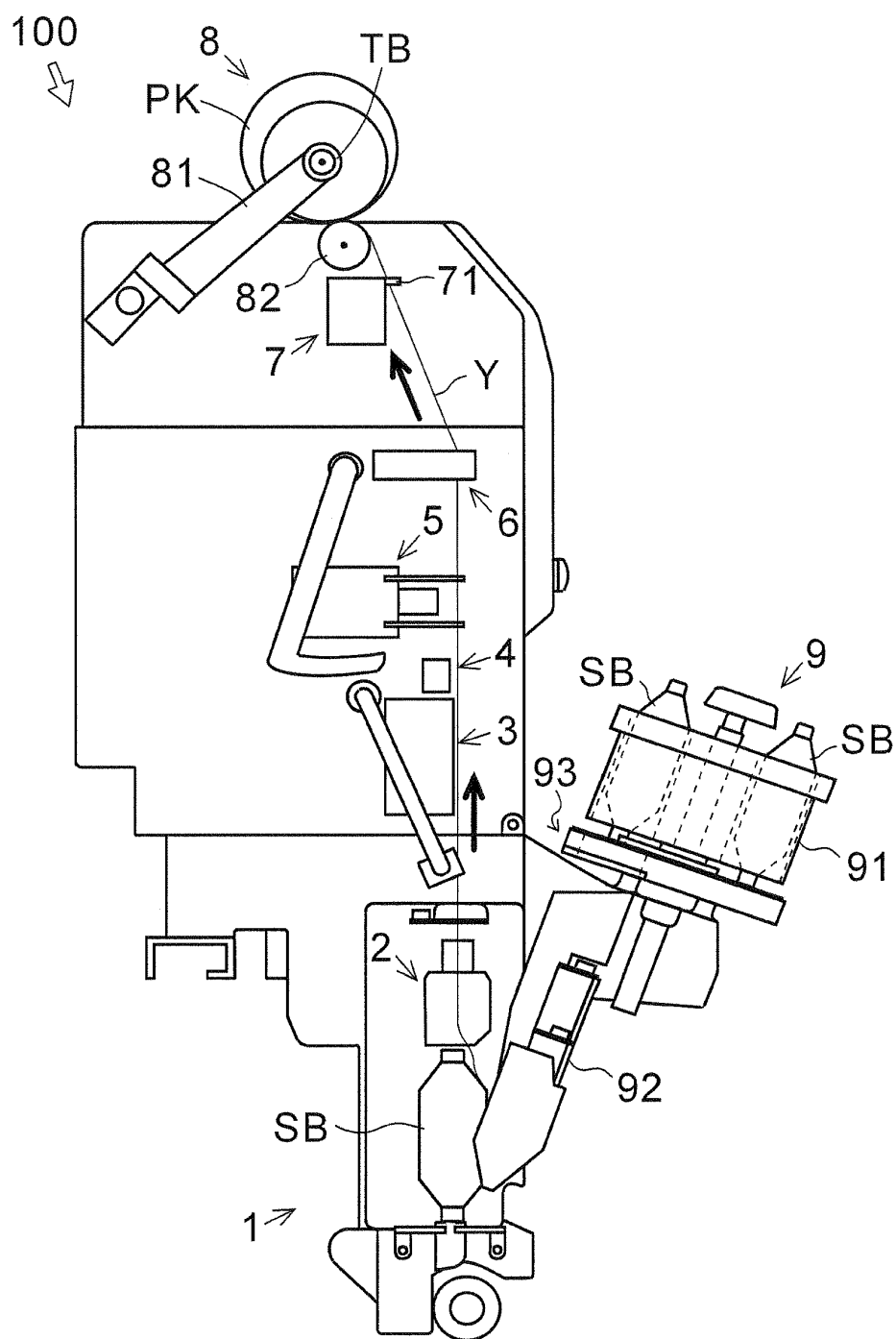


FIG. 2

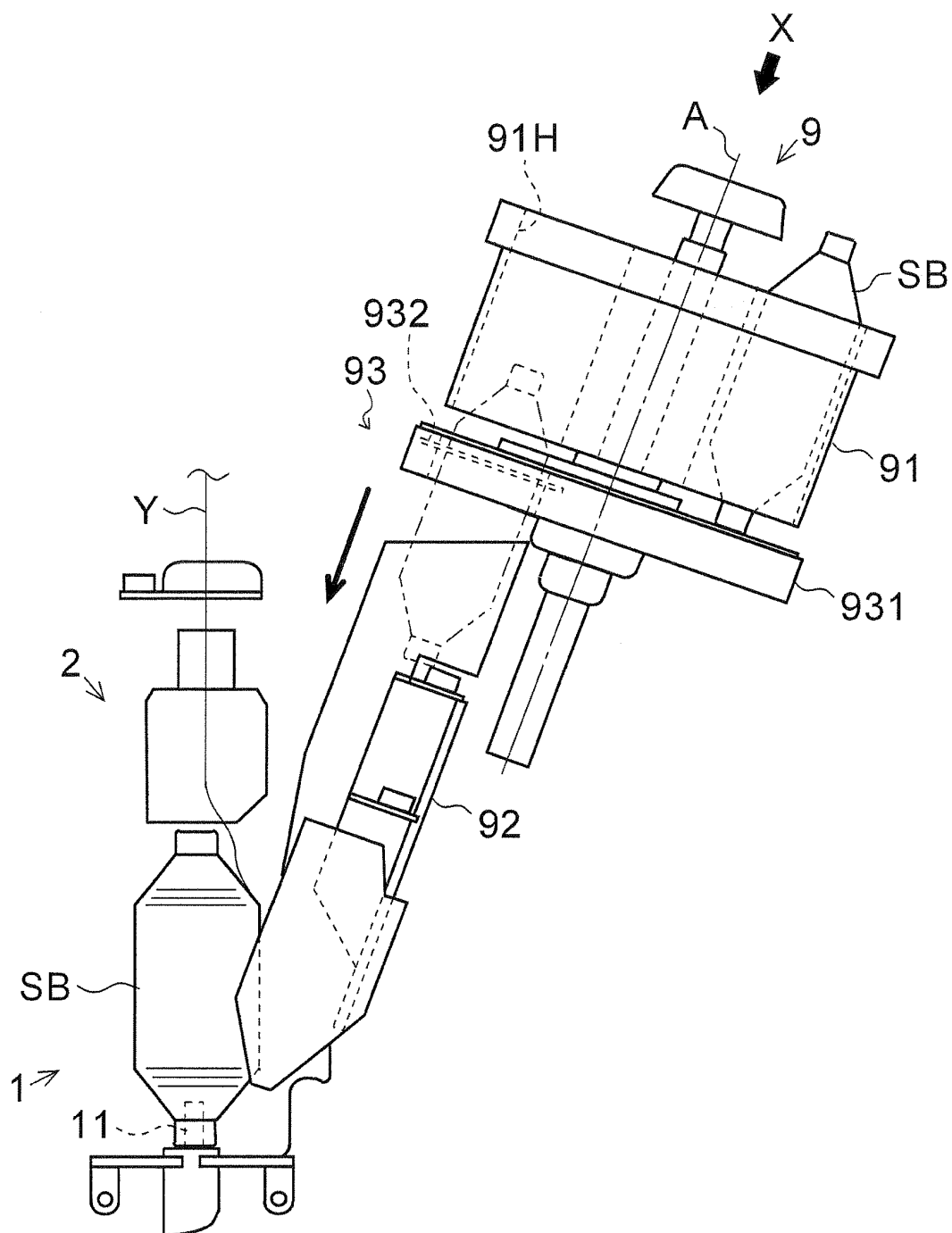


FIG. 3

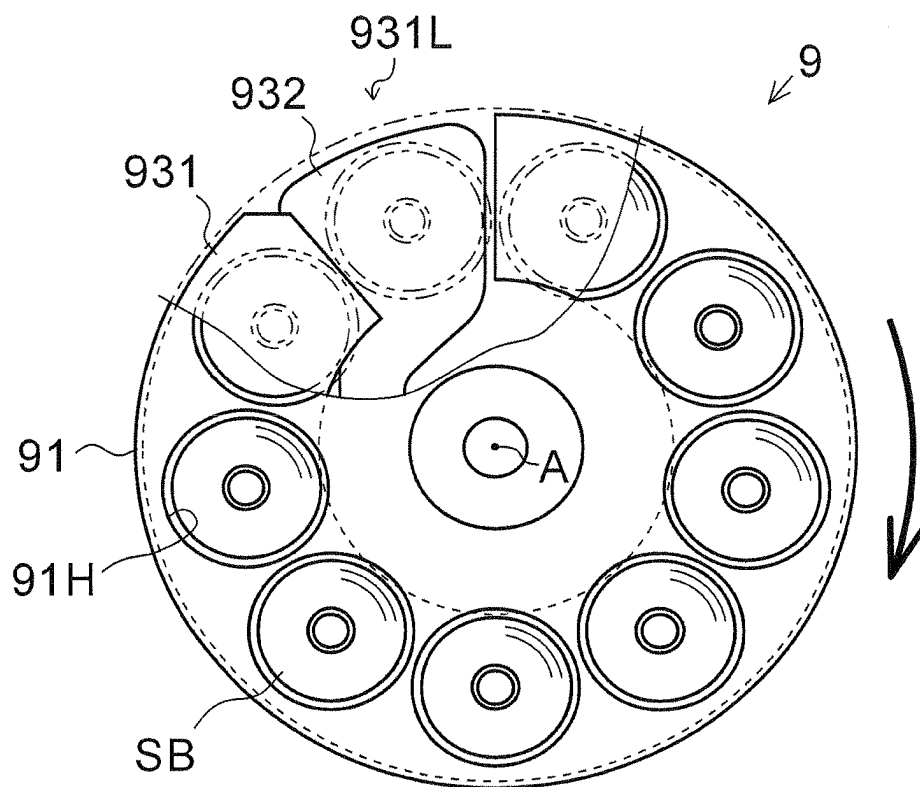


FIG. 4

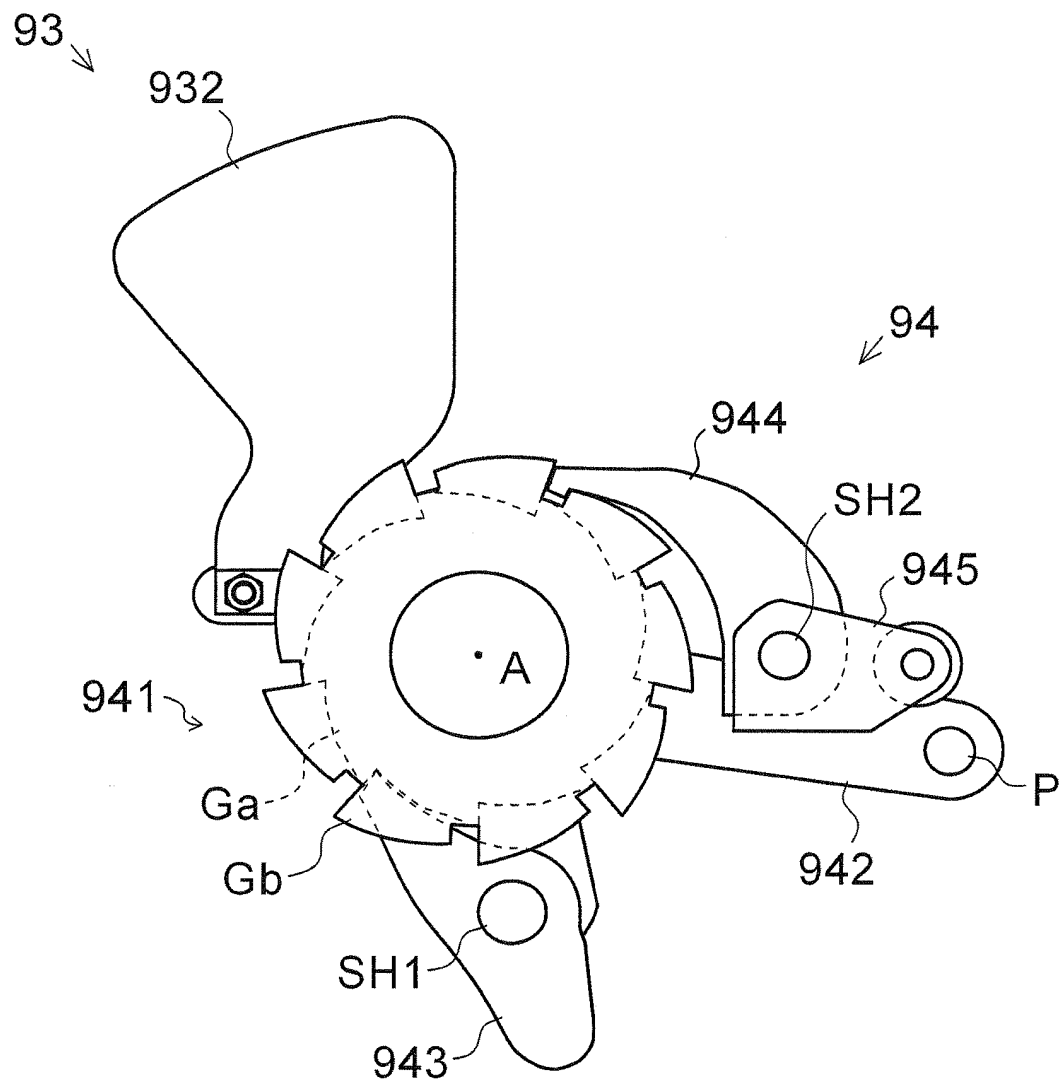


FIG. 5

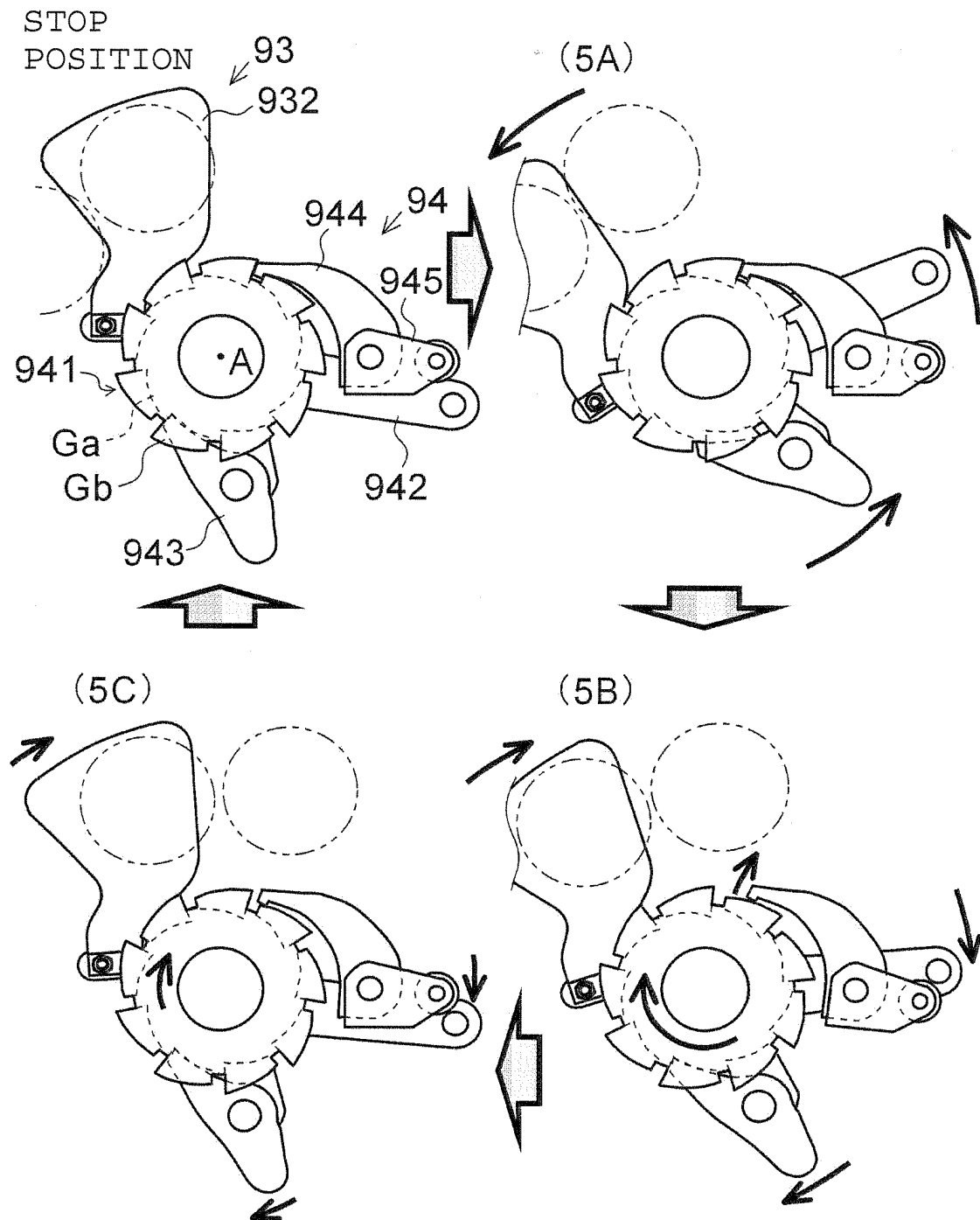
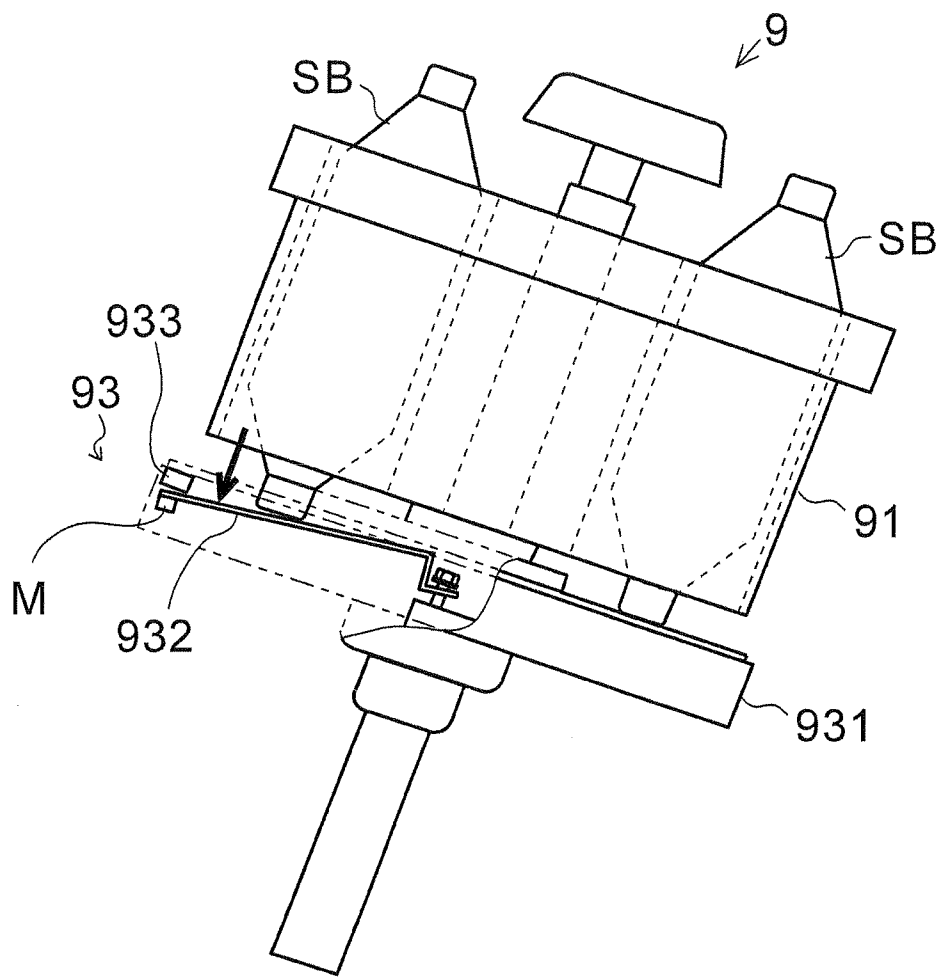


FIG. 6



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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