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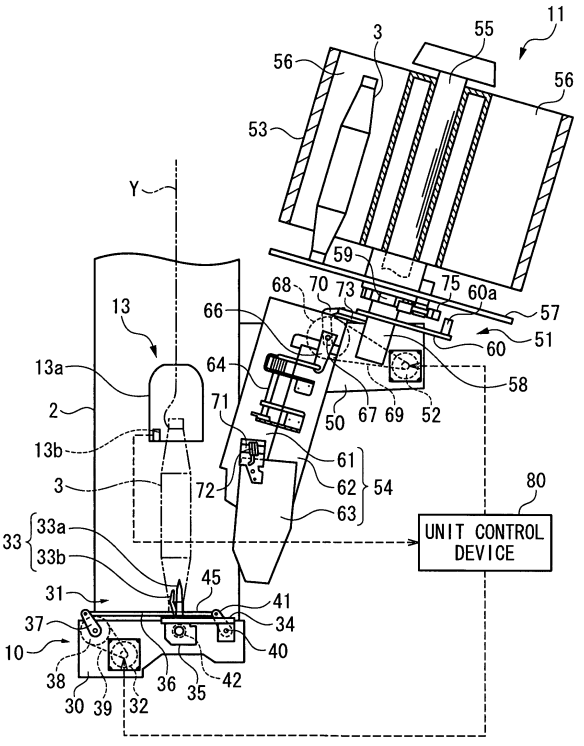
(54) Yarn winding device and textile machine

(57) A winding unit 1 includes a yarn supplying portion 10 having a bobbin holding and discharging mechanism 31 holding a bobbin 3 from which a yarn Y is unwound and discharging the unwanted bobbin 3 and a first driving motor driving the bobbin holding and discharging mechanism 31, a bobbin supplying portion 11 having a supply mechanism 51 including a magazine 53 that accommodates a plurality of the bobbins 3 and supplying one of the plurality of bobbins 3 accommodated in the magazine 53 to the yarn supplying portion 10 and a second driving motor 52 driving the supply mechanism 51, a winding portion winding the yarn Y unwound from the bobbin 3 held by the bobbin holding and discharging mechanism 31, around a winding tube, and a unit control device 80 independently controlling the first driving motor 32 and the second driving motor 52.

FIGURE 3



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a yarn winding device that winds a yarn unwound from a bobbin held by a yarn supplying portion, around a winding tube, and a textile machine comprising the yarn winding device.

Description of the Related Art

[0002] An automatic winder is conventionally known which has a large number of yarn winding devices (winding units) arranged in a line and each winding a yarn unwound from a supplying bobbin, rewinds the yarn around a winding tube to form a package. Each of the yarn winding devices in the automatic winder has a bobbin supplying portion which supplies a bobbin to a yarn supplying portion in which a yarn is to be unwound; the bobbin supplying portion is known to be based on any of various systems. One of these systems, a magazine syatem uses a magazine which accommodates a plurality of bobbins and which is intermittently rotated at a predetermined pitch to supply bobbins to the yarn supplying portion one by one.

[0003] The Unexamined Japanese Patent Application Publication (Tokkai-Hei) No. 9-183571 and U.S. Patent No. 4,844,358 disclose yarn winding devices comprising a bobbin supplying portion based on the magazine syatem. These conventional yarn winding devices have a yarn supplying portion including a bobbin holding portion (skewer) holding a bobbin and a bobbin supplying portion including a magazine, the yarn supplying portion and the bobbin supplying portion being coupled to one driving motor. The single driving motor drives the yarn supplying portion and the bobbin supplying portion. That is, the yarn winding devices are configured such that the yarn supplying portion and the bobbin supplying portion are moved in conjunction with each other to perform an operation of replacing the bobbin by, for example, using the single driving motor to rotate the magazine of the bobbin supplying portion to drop one bobbin from the magazine toward the bobbin holding portion while changing the position (posture) of the bobbin holding portion of the yarn supplying portion.

BRIEF SUMMARY OF THE INVENTION

[0004] In the above-described conventional yarn winding devices, the single driving motor is used to drive the yarn supplying portion having the bobbin holding portion and the bobbin supplying portion having the magazine. Thus, the yarn supplying portion and the bobbin supplying portion cannot be independently driven. This makes it impossible to optimize each of the operations of the yarn supplying portion and the bobbin supplying portion according to the operational status of the yarn winding device in order to increase the efficiency of the yarn winding operation (to improve productivity).

[0005] An object of the present invention is to provide a yarn winding device that can independently drive the yarn supplying portion and the bobbin supplying portion.

[0006] A yarn winding device of a first invention is characterized by comprising a yarn supplying portion having a bobbin holding and discharging mechanism holding a bobbin from which a yarn is unwound and discharging the bobbin, and a first driving means for driving the bobbin holding and discharging mechanism, a bobbin supplying portion having a supply mechanism including a magazine that accommodates a plurality of the bobbins and supplying one of the plurality of bobbins accommodated in the magazine to the yarn supplying portion, and a second driving means for driving the supply mechanism, a winding portion winding the yarn unwound from the bobbin held by the bobbin holding and discharging mechanism, around a winding tube, and a control means for independently controlling the first driving means and the second driving means.

[0007] This configuration independently controls the driving of the bobbin holding and discharging mechanism by the first driving means of the yarn supplying portion and the driving of the supply mechanism by the second driving means of the bobbin supplying portion. That is, the configuration allows to independently perform a bobbin holding operation and a bobbin discharging operation in the yarn supplying portion, and a bobbin supplying operation in the bobbin supplying portion, respectively. Therefore, the operations of the yarn supplying portion and the bobbin supplying portion can be optimized according to the operational status of the yarn winding device in order to improve the efficiency of the yarn winding operation and thus productivity.

[0008] A second invention of the yarn winding device in the first invention is characterized in that the control means uses the first driving means to drive the bobbin holding and discharging mechanism to control the bobbin holding operation and the bobbin discharging operation of the bobbin holding and discharging mechanism regardless of an operation of supplying the bobbin which operation is performed by the bobbin supplying portion.

[0009] This configuration allows the yarn supplying portion to independently perform the bobbin holding operation and the bobbin discharging operation regardless of the bobbin supplying operation performed by the bobbin supplying portion. Thus, a bobbin replacing operation by the yarn supplying portion can be optimized to improve the productivity. For example, by optimally controlling the bobbin replacing operation according to the type of the bobbin used, it is possible to reduce the frequency of failures to replace the bobbin (failures to hold or discharge the bobbin).

[0010] Furthermore, the conventional yarn winding devices fail to discharge the bobbin by operating only the yarn supplying portion and without operating the maga-

zine, resulting in inconvenience to users. During a maintenance operation for the yarn supplying portion in which, for example, yarn wastes attached to the yarn supplying portion are removed or the operation of the yarn supplying portion is adjusted, when the bobbin is discharged from the bobbin holding portion, the magazine automatically supplies a new bobbin to the bobbin holding portion. This disadvantageously makes it difficult to perform the maintenance operation for the yarn supplying portion. However, the present invention enables the bobbin to be discharged from the yarn supplying portion without the need to operate the magazine. Consequently, the maintenance of the yarn supplying portion can be easily performed with the bobbin removed, facilitating the maintenance operation.

[0011] A third invention of the yarn winding device in the first or second invention is characterized in that the bobbin holding and discharging mechanism has a bobbin holding portion pivotably provided on a frame, and the control means controls a pivoting operation of the bobbin holding portion driven by the first driving means regardless of the operation of supplying the bobbin which operation is performed by the bobbin supplying portion.

[0012] This configuration controls the pivoting operation of the bobbin holding portion regardless of the bobbin supplying operation by the bobbin supplying portion. Thus, the operation of the bobbin holding portion can be optimized.

[0013] A fourth invention of the yarn winding device in the third invention is characterized in that the control means controls a posture of the bobbin held by the bobbin holding portion during pivoting, according to type of the bobbin.

[0014] This configuration controls the posture of the bobbin during pivoting according to the type of the bobbin used. This enables a reduction in the frequency of failures to hold the bobbin.

[0015] A fifth invention of the yarn winding device in the fourth invention is

characterized by further comprising an unwinding assisting device assisting unwinding of the yarn from the bobbin held by the bobbin holding portion, and the control means controls the posture of the bobbin held by the bobbin holding portion according to an operating condition of the unwinding assisting device.

[0016] According to this configuration, where the unwinding assisting device fails to operate correctly owing to the incorrect posture of the bobbin held by the bobbin holding portion, the bobbin holding portion can be pivotably driven to correct the posture of the bobbin.

[0017] A sixth invention of the yarn winding device in any one of the third to fifth inventions is characterized in that the bobbin holding and discharging mechanism further has a flip board pivotably provided on the frame and flipping up the bobbin held by the bobbin holding portion to discharge the bobbin to exterior of the yarn supplying portion, and the control means controls a pivoting operation of the flip board driven by the first driving means regardless of the operation of supplying the bobbin which operation is performed by the bobbin supplying portion.

[0018] This configuration controls the pivoting operation of the flip board regardless of the bobbin supplying operation of the bobbin supplying portion. Thus, a bobbin discharging operation by the flip board can be optimized.

[0019] A seventh invention of the yarn winding device in any one of the first to sixth inventions is characterized in that at least one of the yarn supplying portion and the bobbin supplying portion is removably attached to a machine body.

[0020] This configuration allows at least one of the yarn supplying portion and the bobbin supplying portion to be separately removed from the machine body. The yarn supplying portion or the bobbin supplying portion can thus be replaced or repaired as required.

[0021] A eighth invention of the yarn winding device in any one of the first to seventh inventions is characterized in that at least one of the first driving means and the second driving means is a stepping motor.

[0022] This configuration allows the bobbin holding and discharging operations of the yarn supplying portion or the bobbin supplying operation of the bobbin supplying portion to be easily controlled by controlling the stepping motor by pulse control.

[0023] A ninth invention of the yarn winding device in any one of the first to seventh inventions is characterized in that at least one of the first driving means and the second driving means is a fluid pressure cylinder.

[0024] This configuration allows a power transmission mechanism to be relatively simply configured which transmits a driving force from the first driving means or the second driving means to a driving target.

[0025] A textile machine according to a tenth invention comprises a plurality of yarn winding devices each winding a yarn unwound from a bobbin around a winding tube and a control means for controlling the plurality of yarn winding devices, the textile machine being characterized in that each of the yarn winding devices comprises a yarn supplying portion having a bobbin holding and discharging mechanism holding the bobbin from which the yarn is unwound and discharging the bobbin, and a first driving means for driving the bobbin holding and discharging mechanism, a bobbin supplying portion having a supply mechanism including a magazine that accommodates a plurality of the bobbins and supplying one of the plurality of bobbins accommodated in the magazine to the yarn supplying portion, and a second driving means for driving the supply mechanism, and a winding portion winding the yarn unwound from the bobbin held by the bobbin holding and discharging mechanism, around the winding tube, and the control means independently controls the first driving means and the second driving means of each of the yarn winding devices.

[0026] In this configuration, the control means for controlling the plurality of yarn winding devices independently and intensively controls the driving of the bobbin holding and discharging mechanism by the first driving means

of the yarn supplying portion of each of the yarn winding device and the driving of the supply mechanism by the second driving mechanism of the bobbin supplying portion of the yarn winding device. That is, the yarn supplying portion and the bobbin supplying portion can independently perform a bobbin holding and discharging operations and a bobbin supplying operation, respectively. Therefore, the operations of the yarn supplying portion and the bobbin supplying portion can be optimized according to the operational status of the yarn winding device in order to improve the efficiency of the yarn winding operation and thus productivity.

[0027] Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Fig. 1 is a schematic drawing of the configuration of an automatic winder according to the present embodiment.

Fig. 2 is a schematic side view of a winding unit.

Fig. 3 is an enlarged view of a lower structure (a yarn supplying portion and a bobbin supplying portion) of the winding unit in Fig. 1.

Fig. 4 is a perspective view of the yarn supplying portion.

Fig. 5 is a drawing showing the yarn supplying portion during the supply of a bobbin.

Fig. 6 is a drawing showing the yarn supplying portion in a bobbin holding condition.

Fig. 7 is a drawing showing the yarn supplying portion during the discharge of the bobbin.

Fig. 8 is a drawing of a peripheral portion of a ratchet wheel as viewed from the direction of a rotating axis.

Fig. 9 is a drawing illustrating an operation of an unwinding assisting device performed when the bobbin is inclined.

Fig. 10 is an enlarged view of the yarn supplying portion and bobbin supplying portion using air cylinders as driving means.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0029] Now, an embodiment of the present invention will be described. The present embodiment is an example in which the present invention is applied to an automatic winder that winds a yarn unwound from a bobbin, rewind around a winding tube to form a winding package.

[0030] Fig. 1 is a schematic drawing showing the configuration of an automatic winder. Fig. 2 is a schematic side view of one winding unit in the automatic winder. Fig. 3 is an enlarged view of a lower structure of the winding unit in Fig.2. As shown in Figs. 1 and 2, an automatic winder 100 (textile machine) comprises a plurality of winding units 1 (yarn winding devices) arranged in a line in one direction (which is perpendicular to the sheet of Fig. 2). Furthermore, the automatic winder 100 has a doffing device 3 that can reciprocate along the direction in which the winding units 1 are arranged in a line. The doffing device 3 removes full winding packages 6 formed by the plurality of winding units 1 and installs empty winding tubes 7 in the winding units 1.

[0031] As shown in Fig. 2, each of the winding units 1 has a yarn supplying portion 10 that holds a cylindrical bobbin 3, a bobbin supplying portion 11 that supplies the bobbin 3 to the yarn supplying portion 10, and a winding portion 12 that winds a yarn Y unwound from the bobbin 3, around a winding tube 7. The winding unit 1 forms the winding package 6 with a predetermined length and a predetermined shape.

[0032] In the description below, the "bobbin" includes a "production bobbin" around which a predetermined amount of yarn has been wound, a "yarn remaining bobbin" around which a small amount of yarn remains, and an "empty bobbin" with no yarn. However, these bobbins are collectively referred to as the "bobbin" unless a particular description is required. The same type of bobbins 3 with an equal weight, an equal length, and the like are basically used for each of the winding units 1. However, the type of the bobbin 3 may be switched depending on the situation.

[0033] The yarn supplying portion 10 and the bobbin supplying portion 11 will be described below in detail. Furthermore, an unwinding assisting device 13, a tension applying device 14, a yarn splicing device 15, a clearer 16, and a waxing device 17 are disposed between the yarn supplying portion 10 and the winding portion 12 in this order; the unwinding assisting device 13 is located closest to the yarn supplying portion 10. Furthermore, the following are each attached to a machine body 2 of the winding unit 1: the yarn supplying portion 10, the bobbin supplying portion 11, the unwinding assisting device 13, the tension applying device 14, the yarn splicing device 15, the clearer 16, the waxing device 17, and the winding device 12.

[0034] The unwinding assisting device 13 is configured to lower a cylinder 13a that covers the bobbin 3, in conjunction with unwinding of the yarn Y from the bobbin 3 to reduce balloon resistance to assist the unwinding of the yarn Y from the bobbin 3. More specifically, a yarn detecting sensor 13b that detects the yarn Y from the bobbin 3 is provided inside the cylinder 13a. As the yarn Y is unwound from the bobbin 3, the amount of yarn on the upper part of the bobbin decreases. Once the yarn detecting sensor 13 stops detecting the yarn Y on the bobbin 3, the unwinding assisting device 13 lowers the cylinder 13a to a position where the yarn Y is detected. For example, an optical sensor having a light emitting element and a light receiving element is used as the yarn detecting sensor 13b.

[0035] The tension applying device 14 applies tension to the traveling yarn Y. As the tension applying device 14, for example, a gate type may be used which has fixed comb teeth and movable comb teeth disposed so as to be movable relative to the fixed comb teeth.

[0036] The yarn splicing device 15 splices a yarn supplying-side yarn (lower yarn) to a winding-side yarn (upper yarn) after the yarn has been cut owing to a yarn defect detected by the clearer 16 or after yarn breakage has occurred during unwinding of the yarn from the yarn supplying bobbin 3. As the yarn splicing device 15, what is called the air yarn splicing device 15 (air splicer) may be used which has an untwisting nozzle that untwists each of an upper yarn end and a lower yarn end and a twisting nozzle that applies whirling air currents to both untwisted yarn ends to twist the yarn ends together.

[0037] The clearer 16 detects a yarn defect such as slab and has a cutter to cut the yarn when a yarn defect is detected. Furthermore, the waxing device 17 applies wax to the yarn Y.

[0038] A lower yarn catching and guiding member 18 and an upper yarn catching and guiding member 19 are provided below and above the yarn splicing device 15; the lower yarn catching and guiding member 18 sucks, catches, and guides the bobbin 3-side lower yarn to the yarn splicing device 15, and the upper yarn catching and guiding member 19 sucks, catches, and guides the winding package 6-side upper yarn to the yarn splicing device 15. The upper yarn catching and guiding member 19 is shaped like a pipe, and is disposed so as to be pivotable upward and downward around a shaft 19a. The upper yarn catching and guiding member 19 has a mouth 19b at a tip portion thereof. Similarly, the lower yarn catching and guiding member 18 is shaped like a pipe, and is disposed so as to be pivotable upward and downward around a shaft 18a. The lower yarn catching and guiding member 18 has a suction port 18b at a tip portion thereof. Moreover, an appropriate negative pressure source is connected to the upper yarn catching and guiding member 19 and the lower yarn catching and guiding member 18. Air can be sucked through the mouth 19b at the tip portion of the upper yarn catching and guiding member 19 and the suction port 18b at the tip portion of the lower yarn catching and guiding member 18 to catch the respective yarn ends.

[0039] The winding portion 12 comprises a cradle 20 having a pair of cradle arms rotatably and removably supporting the winding tube 7, and a traverse drum 21 that can contact with a surface of the winding tube 7 supported by the cradle 20 or a surface of the winding package 6 formed around the winding tube 7. The winding portion 12 is configured such that the traverse drum 21 kept in contact with the winding tube 7 (or package surface) is rotationally driven by a drum driving motor (not shown in the drawings) to traverse the yarn Y, while rotating the winding tube 7 in conjunction with the traverse drum 21 to form the winding package 6 around an outer periphery of the winding tube 7.

[0040] Now, the yarn supplying portion 10 will be described in detail. As shown in Figs. 2 and 3, the yarn supplying portion 10 comprises a yarn supplying portion frame 30 removably provided at the bottom of the machine body 2, a bobbin holding and discharging mechanism 31 which holds the bobbin 3 (production bobbin) from which the yarn Y is to be unwound and which discharge the unwanted bobbin 3 (empty bobbin or yarn remaining bobbin with a defective yarn remaining thereon), and a first driving motor 32 (first driving means) that drives the bobbin holding and discharging mechanism 31.

[0041] The bobbin holding and discharging mechanism 31 includes a bobbin holding peg 33 (bobbin holding portion) that is inserted into the cylindrical bobbin 3 to hold the bobbin 3 and a flip board 34 that discharges the bobbin 3 held by the bobbin holding peg 33 to the exterior of the yarn supplying portion 10.

[0042] Fig. 4 is a perspective view of the yarn supplying portion 10. Furthermore, Fig. 5 shows the yarn supplying portion 10 to which the bobbin is being supplied. Furthermore, Fig. 6 shows the yarn supplying portion 10 in which the bobbin holding peg 33 is holding the bobbin 3. Moreover, Fig. 7 shows the yarn supplying portion 10 discharging the bobbin.

[0043] The bobbin holding peg 33 has a first holding piece 33a shaped like a protruding piece, and a second holding piece 33b shaped like a protruding piece shorter than the first holding piece 33a and coupled to the first holding piece 33a. The first holding piece 33a has a base portion 35 installed at an end of a shaft 42 rotatably supported by the yarn supplying portion frame 30 so as to be rotatable relative to the shaft 42. The second holding piece 33b is coupled to the shaft 42 so as to be pivotable integrally with the shaft 42 with respect to the yarn supplying portion frame 30. Moreover, the first holding piece 33a is biased by a spring (not shown in the drawings) so as to overlap the second holding piece 33b in a side view (as shown in Figs. 5 and 7). That is, the shaft 42 rotates to allow the second holding piece 33b, coupled to the shaft 42, and the first holding piece 33a, biased by the spring, to pivot overlappingly and integrally with respect to the yarn supplying portion frame 30.

[0044] However, in an upright condition (see Fig. 6), further leftward pivoting of the first holding piece 33a in the figure is regulated by a stopper (not shown in the drawings). On the other hand, unlike in the case of the first holding piece 33a, the leftward pivoting, from the upright condition, of the second holding piece 33b, which is shorter than the first holding piece 33a, is not regulated. The second holding piece 33b can pivot inclinedly further leftward than the first holding piece 33a. That is, both holding pieces 33a, 33b can be set in one of two conditions, namely, the holding pieces 33a and 33b can be overlappingly closed as shown in Figs. 5 and 7 or can be opened as shown in Fig. 6.

[0045] Furthermore, the second holding piece 33b is coupled to a horizontally extending coupling rod 36 via

a swinging piece 44 fixed to the shaft 42. The coupling rod 36 is coupled to one end (idle end) of a swinging piece 37 swingably provided on the yarn supplying portion frame 30. The swinging piece 37 is coupled via a pulley 38 and a belt 39 to an output shaft of a first driving motor 32 fixed to the yarn supplying portion frame 30.

[0046] As shown in Fig. 4, the flip board 34 is disposed so as to sandwich the first holding piece 33a and the second holding piece 33b of the bobbin holding peg 33 between opposite parts of the flip board 34 in a vertical direction with respect to the sheet of Fig. 3. The flip board 34 is pivotably attached to the yarn supplying portion frame 30 via a shaft 40. The flip board 34 is configured so as to be pivotable between a horizontal standby position (Fig. 6), and a bobbin receiving position (Fig. 5) in which the flip board 34 is placed by pivoting clockwise (right-handed direction) from the standby position in Fig. 6, and a flip-up position (Fig. 7) in which the flip board 34 is placed by pivoting further in the right-handed direction from the bobbin receiving position. Furthermore, a swinging piece 41 is fixed to the shaft 40, the pivoting shaft of the flip board 34 and the swinging piece 41 is coupled to the swinging piece 44 via a coupling rod 45.

[0047] The first driving motor 32 is composed of a stepping motor and controlled by a pulse signal from a unit control device 80 described below. The first driving motor 32 drives both the bobbin holding peg 33 and the flip board 34 of the bobbin holding and discharging mechanism 31.

[0048] That is, the rotational driving force of the first driving motor 32 is transmitted to the coupling rod 36 via the swinging piece 37. Movement of the coupling rod 36 in a horizontal direction pivotably drives the second holding piece 33b of the bobbin holding peg 33. Furthermore, when the second holding piece 33b is thus pivotably driven, the first holding piece 33a, coupled to the second holding piece 33b, pivots integrally with the second holding piece 33b so that the first holding piece 33a overlaps the second holding piece 33b.

[0049] However, as described above, with the first holding piece 33a standing upright (the condition shown in Fig. 6), when the coupling rod 36 moves further leftward, the further leftward pivoting of the first holding piece 33a is regulated by the stopper (not shown in the drawings). Thus, only the second holding piece 33b pivots leftward. As s result, both holding pieces 33a, 33b are opened. Thus, the first holding piece 33a and the second holding piece 33b inserted in the cylindrical bobbin 3 (see Figs. 3 and 6) tightly contacts with an inner surface of the bobbin 3. This prevents the bobbin 3 from slipping off the bobbin holding peg 33.

[0050] Furthermore, the bobbin holding peg 33 is configured to be placed in one of three different positions, the position in which the bobbin holding peg 33 is located while the bobbin 3 is being supplied from the bobbin supplying portion 11, the position in which the bobbin holding peg 33 is located to hold the bobbin 3 from which the yarn is unwound, and the position in which the bobbin holding peg 33 is located while the unwanted bobbin 3 is being discharged. That is, the bobbin holding peg 33 is pivotable between the three positions, the bobbin supplying position (Fig. 5) in which the bobbin holding peg 33 is inclined slightly rightward with respect to the vertical direction, and the bobbin holding position (Fig. 6) in which the first and second holding pieces 33a, 33b are almost upright and open, and the bobbin discharging position (Fig. 7) in which the bobbin holding peg 33 is placed by tilting further rightward from the bobbin supplying position in Fig. 5.

[0051] Moreover, when the coupling rod 36 is driven in the horizontal direction by the first driving motor 32 to cause the bobbin holding peg 33 to pivot, the driving force of the first driving motor 32 is transmitted to the flip board 34 via the coupling rod 45 and the swinging piece 41. The flip board 34 is thus pivotably driven.

[0052] As shown in Fig. 6, when the bobbin holding peg 33 is in the bobbin holding position, in which the bobbin holding peg 33 stands almost upright, the flip board 34 is in the horizontal standby position. In this position, a lower end of the bobbin 3 held by the bobbin holding peg 33 abuts against a top surface of the flip board 34. In this condition, when the flip board 34 pivots clockwise (right-handed direction) in the figure as shown in Fig. 7, the bobbin holding peg 33 also pivots clockwise to close the first and second holding pieces 33a, 33b. Thus, the slip-off preventing condition of the bobbin 3 is canceled. Moreover, when the flip board 34 pivots to the flip-up position, the bobbin 3 is flipped up rightward in the figure by the flip board 34 to slip off the bobbin holding peg 33. The bobbin 3 is discharged to the exterior (rightward) of the yarn supplying portion 10.

[0053] The bobbin holding peg 33, the flip board 34, the first driving motor 32, and the like constituting the yarn supplying portion 10 are all attached to the yarn supplying portion frame 30, which is removable from the machine body 2. That is, the yarn supplying portion 10 is removably provided on the machine body 2. Thus, the yarn supplying portion 10 can be removed from the machine body 2 for replacement, repairs, or the like. The yarn supplying portion frame 30 can be configured so as to be installed on and removed from the machine body 2, for example, using screws.

[0054] Now, the bobbin supplying portion 11 will be described. As shown in Figs. 2 and 3, the bobbin supplying portion 11 comprises a supply mechanism 51 that supplies the bobbin 3 to the yarn supplying portion 10 and a second driving motor 52 (second driving means) that drives the supply mechanism 51.

[0055] The supply mechanism 51 has a magazine 53 that accommodates a plurality of the bobbins 3 and a guide chute 54 located below the magazine 53 to guide and drop one of the plurality of production bobbins 3 accommodated in the magazine 53, toward the yarn supplying portion 10. Furthermore, the machine body 2 has a supply portion frame 50 that can be installed on and removed from the machine body 2, for example, using

screws. The magazine 53 and the guide chute 54 are attached to the supply portion frame 50 in the posture in which the magazine 53 and the guide chute 54 are slightly inclined with respect to the vertical direction so as to face the bobbin holding peg 33 of the yarn supplying portion 10.

[0056] The magazine 53 is rotatable around a rotating shaft 55 supported by the supply portion frame 50. A plurality of bobbin accommodating spaces 56 each accommodating the production bobbins 3 are arranged inside the magazine 53 in a circumferential direction. A bobbin receiving plate 57 is provided below the magazine 53 to receive the plurality of bobbins 3 accommodated in each of the plurality of bobbin accommodating spaces 56. A notch portion (not shown in the drawings) is formed in the bobbin receiving plate 57. The magazine 53 is thus configured such that when the magazine 53 pivots to position one of the bobbins 3 above the notch portion, that bobbin 3 falls, via the notch portion, to the guide chute 54 and then to the yarn supplying portion 10.

[0057] A cylindrical member 58 installed outside the rotating shaft 55 is fixed to the bottom of the magazine 53 and a ratchet wheel 59 is fixed to an outer peripheral surface of the cylindrical member 58. That is, the ratchet wheel 59 and the magazine 53 rotate integrally. Fig. 8 is a drawing of a peripheral part of the ratchet wheel 59 as viewed from a rotating shaft thereof. As shown in Fig. 8, a stop latch 74 and a rotatable roller 75 are provided outside the ratchet wheel 59; the stop latch 74 engages the ratchet wheel 59 to regulate the rotation thereof. The stop latch 74 and the roller 75 are coupled together by a coupling member 76. Moreover, the cylindrical member 58 has a turning plate 60 having a pin 60a and which is turnable with respect to the cylindrical member 58. The turning plate 60 has the pin 60a and a pawl portion 60b. When the driving force of the second driving motor 52, described below, is transmitted to the turning plate 60, which thus performs a turning operation, the pin 60a of the turning plate 60 pushes out the roller 75. The stop latch 74, coupled to the roller 75, then slips off the ratchet wheel 59 to cancel the regulation of the rotation of the ratchet wheel 59. Moreover, the pawl portion 60b of the turning plate 60 causes the ratchet wheel 59 to pivot by one pitch to in turn cause the magazine 53 to pivot.

[0058] The guide chute 54 comprises a pair of first guide plates 61 fixed to the supply portion frame 50, a pair of second guide plates 62 that are pivotable with respect to the first guide plates 61, and a pair of third guide plates 63. However, the guide plates 61, 62, 63 positioned farther from the reader are not shown in the drawings.

[0059] As shown in Fig. 3, the first guide plate 61 and the second guide plate 62 are coupled together via a rod 64 and the second guide plate 62 is pivotable closer to (outward) and farther from (inward) the reader around the rod 64 with respect to the first guide plate 61. Furthermore, the rod 64 is coupled to a shaft member 67 via a lever 66. Moreover, the shaft member 67 is coupled to an output shaft of the second driving motor 52, fixed to the supply portion frame 50 via a pulley 68 and a belt 69. Additionally, one end of an L-shaped lever 70 is fixed to the shaft member 67. The other end of the lever 70 is coupled via a coupling member 73 to the turning plate 60, provided on the above-described magazine 53. When the shaft member 67 rotates, the lever 70 swings up and down around the shaft member 67. Moreover, the coupling member 73 pivots along a plane parallel to the turning plate 60. The pivoting of the coupling member 73 turns the turning plate 60.

[0060] The third guide plate 63 is located outside the first guide plate 61 and the second guide plate 62 (closer to the reader) and pivotably coupled to the first guide plate 61 via a shaft 71. Furthermore, the third guide plate 63 is biased inward (farther from the reader; closing direction) by a torsion spring 72 provided around the shaft 71, and is thus pressed against the second guide plate 62.

[0061] The second driving motor 52 is composed of a stepping motor and controlled by a pulse signal from the unit control device 80, described below. The second driving motor 52 drives both the magazine 53 and the guide chute 54 of the supply mechanism 51.

[0062] That is, the rotational driving force of the second driving motor 52 is transmitted to the shaft member 67 via the belt 69 and the pulley 68. The rotation of the shaft member 67 is transmitted to the turning plate 60 via the lever 70 to cause the pin 60a of the turning plate 60 to push out the roller 75 of the ratchet wheel 59. The regulation of rotation of the ratchet wheel 59 by the stop latch 74 is thus canceled. Moreover, the pawl portion 60b of the turning plate 60 causes the ratchet wheel 59 to pivot by one pitch. Then, the magazine 53, pivoting integrally with the ratchet wheel 59, also pivots. The pivoting of the magazine 53 shifts each of the bobbin accommodating spaces 56 to the adjacent position in the circumferential direction. At this time, only the bobbin 3 positioned above the notch portion of the bobbin receiving plate 57 falls down through the notch portion.

[0063] On the other hand, before the bobbin 3 is fed from the magazine 53 to the guide chute 54, the pair of second guide plates 62 and the pair of third guide plates 63 have been caused to pivot outward (have been opened) with respect to the first guide plate 61. This is because the pair of second guide plates 62 and the pair of third guide plates 63 are retracted so as to, if the bobbin 3 falls accidentally from the magazine 53 when the bobbin 3 is not to be supplied, prevent the bobbin 3 from reaching the yarn supplying portion 10 via the guide chute 54 and from coming into contact with the balloon of the yarn Y while the yarn Y is being unwound from the bobbin 3.

[0064] In this condition, when the shaft member 67 is rotationally driven by the second driving motor 52, the rotation is transmitted to the second guide plate 62 via the lever 66 and the rod 64. The second guide plates 62 then pivot inward (closing direction) of the first guide plate 61. Furthermore, in conjunction with the pivoting of the

second guide plates 62, the third guide plates 63 pressed against the second guide plates 62 by the torsion spring 72 also pivot inward with respect to the first guide plate 61. The pair of second guide plates 62 and the pair of third guide plates 63 which are open with respect to the first guide plate 61 pivot inward to form a supply passage for the bobbin 3 extending from the magazine 53 toward the yarn supplying portion 10. The bobbin 3 having fallen from the magazine 53 is guided to the yarn supplying portion 10 via the guide plates 61, 62, 63.

[0065] The magazine 53, the guide chute 54, the second driving motor 52, and the like constituting the bobbin supplying portion 11 are all attached to the supply portion frame 50, which is removable from the machine body 2. That is, the bobbin supplying portion 11 is removably provided on the machine body 2. Thus, the bobbin supplying portion 11 can be removed from the machine body 2 for replacement, repairs, or the like. The supply portion frame 50 can be configured so as to be installed on and removed from the machine body 2, for example, using screws.

[0066] Now, a description will be given of the unit control device 80 (control means), which controls a yarn winding operation of the winding unit 1. The unit control device 80 is composed of a CPU (Central Processing Unit) that is an arithmetic processing unit, a ROM (Read-Only Memory) that stores programs executed by the CPU and data used for the programs, a RAM (Random Access Memory) that temporarily stores data while any of the programs is being executed, and the like. The unit control device 80 receives instructions from a control device 101 that controls the general operation of the automatic winder 100, to control the operations of the components of the winding units 1 including the yarn supplying portion 10, the bobbin supplying portion 11, the unwinding assisting device 13, the yarn splicing device 15, and the winding portion 12.

[0067] In particular, in the present embodiment, in connection with the control of the yarn supplying portion 10 and the bobbin supplying portion 11, the unit control device 80 is configured to independently control the first driving motor 32, which drives the bobbin holding and discharging mechanism 31 of the yarn supplying portion 10, and the second driving motor 52, which drives the supply mechanism 51 of the bobbin supplying portion 11, by outputting independent pulse control signals to the first driving motor 32 and the second driving motor 52. Description will be given below of the operations of the yarn supplying portion 10 and the bobbin supplying portion 11, which are independently controlled by the unit control device 80.

[0068] First, the unit control device 80 drives the bobbin holding and discharging mechanism 31 of the yarn supplying portion 10 using the first driving motor 32, to cause the bobbin holding peg 33 to pivot to the bobbin supplying position, in which the bobbin holding peg 33 is inclined to face the bobbin supplying portion 11 as shown in Fig. 5. At this time, in conjunction with the pivoting operation of the bobbin holding peg 33, the flip board 34 also pivots to the bobbin receiving position, in which the flip board 34 is slightly inclined with respect to the horizontal direction.

[0069] On the other hand, the unit control device 80 drives the supply mechanism 51 of the bobbin supplying portion 11 using the second driving motor 52. That is, the unit control device 80 causes the magazine 53 to pivot to drop one of the production bobbins 3, while causing the second guide plates 62 and the third guide plates 63 of the guide chute 54 to pivot inward with respect to the first guide plate 61 to form a supply passage for the bobbin 3 extending from the magazine 53 toward the yarn supplying portion 10. Then, the bobbin 3 having fallen from the magazine 53 is guided to the bobbin holding peg 33 by the guide chute 54. The first holding piece 33a and the second holding piece 33b of the bobbin holding peg 33 are inserted into the bobbin 3. At the same time, the lower end surface of the bobbin 3 abuts against the flip board 34. After the holding of the bobbin 3 by the bobbin holding peg 33 is completed (after the bobbin holding peg 33 is inserted into the bobbin 3), the second guide plates 62 and the third guide plates 63 are caused to pivot outward by the second driving motor 52 to open the guide chute 54 again.

[0070] Then, as shown in Fig. 6, the bobbin holding peg 33 inserted in the bobbin 3 is caused to pivot counterclockwise by the first driving motor 32 to the bobbin holding position, where the bobbin holding peg 33 stands almost upright.

[0071] At this time, the second holding piece 33b pivots to a position located further leftward of the first holding piece 33a, the pivoting of which is regulated by the stopper (not shown in the drawings). Thus, both holding pieces 33a, 33b are opened to tightly contact with the inner surface of the bobbin 3. At the same time, the flip board 34 is placed in the horizontal standby position. The lower end surface of the bobbin abuts against the flip board 34 to stand the bobbin 3 upright. Thus, the bobbin 3 is held by the bobbin holding peg 33 so as to stand upright and to be prevented from slipping off.

[0072] When the bobbin 3 is held so as to stand upright, the unit control device 80 controls the appropriate portions of the winding unit 1 to start a yarn winding operation. That is, the cylinder 13a of the unwinding assisting device 13 is lowered to cover the bobbin 3. While the unwinding assisting device 13 is assisting unwinding of the yarn Y from the bobbin 3, the winding portion 12 winds the unwound yarn Y around the winding tube 7.

[0073] When all of the yarn Y on the bobbin 3 is wound around the winding tube 7 or if the clearer 16 detects a yarn defect so frequently that the unit control device 80 determines that the yarn on the bobbin 3 has low quality, the bobbin holding and discharging mechanism 31 is driven using the first driving motor 32 to discharge the unwanted bobbin 3 (empty bobbin or defective (yarn remaining) bobbin). That is, the first driving motor 32 is used to cause the flip board 34 to pivot clockwise from

the horizontal standby position, shown in Fig. 6, to the flip-up position, shown in Fig. 7. At the same time, the bobbin holding peg 33 also pivots clockwise. However, at this time, the locking of the first holding piece 33a by the stopper is canceled. Thus, the bias force of the spring (not shown in the drawings) closes the first holding piece 33a and the second holding piece 33b to cancel the slip-off preventing condition of the bobbin 3. Consequently, the flip board 34 pivots to the flip-up position to allow the bobbin 3 to slip off the bobbin holding peg 33. The bobbin 3 is further flipped up and discharged rightward in Fig. 7 by the flip board 34.

[0074] As described above, with the winding unit 1 according to the present embodiment, for example, when the bobbin supplying portion 11 supplies the bobbin 3 to the yarn supplying portion 10, the bobbin supplying portion 11 and the yarn supplying portion 10 can cooperatively perform the operation of supplying the bobbin 3 to the yarn supplying portion 10 (causing the magazine 53 to pivot and opening the guide chute 54) and the operation of holding the bobbin (operation of causing the bobbin holding peg 33 to pivot). On the other hand, the unit control device 80 independently controls the first driving motor 32 of the yarn supplying portion 10 and the second driving motor 52 of the bobbin supplying portion 11. This makes it possible to allow the yarn supplying portion 10 and the bobbin supplying portion 11 to independently perform the operation of holding and discharging the bobbin 3, and the bobbin supplying operation, respectively, according to the situation.

[0075] For example, the bobbin 3 can be removed from the yarn supplying portion 10 without the need to operate the bobbin supplying portion 11. In this case, even when the bobbin 3 is removed from the yarn supplying portion 10 for maintenance or the like, another bobbin 3 is prevented from being fed from the magazine 53 to the yarn supplying portion 10. Thus, the maintenance of the yarn supplying portion 10 can be achieved with the bobbin 3 removed, facilitating the maintenance operation.

[0076] Moreover, the unit control device 80 is configured so as to drive the bobbin holding and discharging mechanism 31 using the first driving motor 32 to optimally control the operation of holding the bobbin 3 and the operation of discharging the bobbin 3 as described below in (1) and (2), regardless of the bobbin supplying operation of the bobbin supplying portion 11.

(1) The unit control device 80 controls the pivoting operation of the bobbin holding peg 33 based on the first driving motor 32, according to the type of the bobbin 3 regardless of the bobbin supplying operation of the bobbin supplying portion 11.

A speed at which the bobbin falls from the magazine 53 varies depending on the type (weight or the like) of the bobbin 3. When the bobbin supplying portion 11 supplies the bobbin 3, the production bobbin 3 from which the yarn is being unwound with the yarn end held by the magazine 53 falls toward the yarn supplying portion 11 while contacting with the guide chute 54. Thus, the reduced weight of the bobbin 3 causes the unwinding resistance of the yarn or the resistance of the contact with the guide chute 54 to more seriously affect the falling speed. The falling speed thus decreases.

However, with the conventional configuration, in which the yarn supplying portion 10 operates in conjunction with the bobbin supplying portion 11, even when the speed at which the bobbin falls from the magazine 53 varies depending on the type (weight or the like) of the bobbin 3, it is impossible to change a timing at which the bobbin holding peg 33 reaches the bobbin supplying position, shown in Fig. 5. Thus, when a heavier bobbin 3 falls, the bobbin holding peg 33 may fail to reach the bobbin holding position, resulting in a failure to hold the bobbin 3 (a failure to insert the peg 33 into the bobbin 3).

Thus, the unit control device 80 controls a speed at which the bobbin holding peg 33 pivots to the bobbin supplying position depending on the type (weight or the like) of the bobbin 3 used. Specifically, when the bobbin 3 is heavy, since the bobbin 3 falls at a higher speed, the pivoting speed of the bobbin holding peg 33 is increased to allow the bobbin holding peg 33 to quickly reach the bobbin supplying position (the position shown in Fig. 5). In contrast, when the bobbin 3 is light, since the bobbin 3 falls at a lower speed, the pivoting speed of the bobbin holding peg 33 is reduced.

Alternatively, the unit control device 80 may be configured so as to change a timing at which the bobbin holding peg 33 starts to pivot toward the bobbin supplying position (standby time until the bobbin holding peg 33 starts to pivot), depending on the type (weight or the like) of the bobbin 3, with the pivoting speed of the bobbin holding peg 33 remaining unchanged. Furthermore, where the bobbin 3 is long, when the bobbin holding peg 33 pivots from the bobbin supplying position, shown in Fig. 5, to the bobbin holding position, shown in Fig. 6, the posture of the bobbin 3 held by the bobbin holding peg 33 may become unstable. As a result, during the pivoting, the bobbin 3 may slip off the bobbin holding peg 33. Thus, the unit control device 80 controls the pivoting speed of the bobbin holding peg 33 holding the bobbin 3 (that is, the posture of the bobbin 3 during pivoting) depending on the type (weight or the like) of the bobbin 3.

Specifically, where the bobbin 3 is long, the pivoting speed of the bobbin holding peg 33 is reduced to stabilize the posture of the pivoting bobbin 3. On the other hand, where the bobbin 3 is short, the pivoting speed of the bobbin holding peg 33 is increased to cause the bobbin holding peg 33 to pivot quickly to the bobbin holding position. This enables a reduction in the amount of time until the yarn winding operation is started.

Moreover, the unit control device 80 can control the posture of the bobbin 3 depending on the operating conditions of other members constituting the yarn winding device.

For example, the yarn winding device according to the present embodiment comprises the unwinding assisting device 13, which assists the unwinding of the yarn Y from the bobbin 3. As described above, the unwinding assisting device 13 is configured so as to, when the yarn detecting sensor 13b stops detecting the yarn Y on the bobbin 3, lower the cylinder 13a to the position where the yarn Y is detected.

However, where the bobbin holding peg 33 insufficiently holds the bobbin 3 or the bobbin 3 is held at a certain angle to the upright condition as shown in Fig. 9, the yarn detecting sensor 13b, provided in the cylinder 13a, may be turned on to detect the bobbin 3 itself. In this case, even though the yarn Y has been unwound from the bobbin 3 and the cylinder 13a must otherwise be lowered, the yarn detecting sensor 13b erroneously detects that the yarn Y is still present even at the current position of the cylinder 13a. This prevents the cylinder 13a from being lowered. Where this condition remains, the yarn Y fails to be stably unwound from the bobbin 3. The tension of the unwound yarn Y disadvantageously varies to degrade the quality of the winding package 6.

Thus, where the yarn detecting sensor 13 is already on while the cylinder 13a is still in an initial position (the position in which the cylinder 13a is placed immediately before the lowering is started) immediately above the bobbin 3 where the yarn detecting sensor 13 does otherwise not detect the yarn Y or where the yarn detecting sensor 13 remains on for at least a predetermined time after the lowering of the cylinder 13a has been started, the unit control device 80 determines that the bobbin holding peg 33 fails to correctly hold the bobbin 3 to prevent the unwinding assisting device 13 from operating correctly.

The unit control device 80 thus controls the posture of the bobbin 3 held by the bobbin holding peg 33. That is, the second holding piece 33b of the bobbin holding peg 33 is rotationally driven using the first driving motor 32 to close the first holding piece 33a and the second holding piece 33b to cancel the holding condition of the bobbin 3. Subsequently, both holding pieces 33a, 33b are opened again to re-hold and set the bobbin 3 in the correct posture (upright posture). In order to be able to correctly sense whether or not the bobbin 3 is in the correct posture before the unwinding the yarn Y is started, even with a variation in the length of the bobbin 3, the unit control device 80 may be configured so as to change the initial position (the position in which the cylinder 13a is placed immediately before the lowering is started) of the cylinder 13a depending on the length of the bobbin 3.

(2) The unit control device 80 controls the bobbin discharging operation of the flip board 34 based on the first driving motor 32, regardless of the bobbin supplying operation of the bobbin supplying portion 11.

[0077] Where the speed at which the flip board 34 pivots is fixed, a position where the discharged bobbin 3 lands varies depending on the type (length or the like) of the bobbin 3. The thus varying landing position of the bobbin 3 makes it difficult to recover the discharged bobbin 3 by using a device (for example, a conveyor) that recovers the discharged bobbin 3. Thus, the unit control device 80 controls the pivoting speed of the flip board 34 depending on the type (length or the like) of the bobbin 3.

[0078] Specifically, where the bobbin 3 is short, the pivoting speed of the flip board 34 is increased to allow the bobbin 3 to reach a predetermined landing position. On the other hand, where the bobbin 3 is long, the pivoting speed of the flip board 34 is reduced to prevent the bobbin 3 from landing beyond the predetermined landing position.

[0079] As described above, in the yarn winding device according to the present embodiment, the unit control device 80 independently controls the first driving motor 32 of the yarn supplying portion 10 and the second driving motor 52 of the bobbin supplying portion 11. Thus, the operations of the yarn supplying portion 10 and the bobbin supplying portion 11 can be optimized according to the operational status of the winding unit 1 to reduce the frequency of failures to replace the bobbin (failures to hold or discharge the bobbin 3). This enables an increase in the efficiency of the yarn winding operation to improve the productivity.

[0080] Furthermore, the bobbin 3 can be removed from the yarn supplying portion 10 without the need to operate the bobbin supplying portion 11. That is, even when the bobbin 3 is removed from the yarn supplying portion 10 for maintenance or the like, another bobbin 3 is prevented from being fed from the magazine 53 to the yarn supplying portion 10. Thus, the maintenance of the yarn supplying portion 10 can be achieved with the bobbin 3 removed, facilitating the maintenance operation.

[0081] Furthermore, the yarn supplying portion 10 and the bobbin supplying portion 11 are each removably provided on the machine body 2 and can thus be separately removed from the machine body 2. Consequently, each of the yarn supplying portion 10 and the bobbin supplying portion 11 can be replaced or repaired as required. Not both the yarn supplying portion 10 (yarn supplying portion frame 30) and the bobbin supplying portion 11 (supply portion frame 50) need to be removably attached to the machine body 2. It is possible that only one of the yarn supplying portion 10 and the bobbin supplying portion 11 is removable.

[0082] Moreover, the driving means for driving the bobbin holding and discharging mechanism 31 of the yarn supplying portion 10 and the driving means for the supply mechanism 51 of the bobbin supplying portion 11 are

each composed of a stepping motor. Thus, controlling the stepping motors by pulses makes it possible to easily control the operation of holding and discharging the bobbin 3, which is performed by the yarn supplying portion 10, and the bobbin supplying operation performed by the bobbin supplying portion 11.

[0083] One or both of the driving means for driving the bobbin holding and discharging mechanism 31 of the yarn supplying portion 10 and the driving means for the supply mechanism 51 of the bobbin supplying portion 11 may be composed of a fluid pressure cylinder such as an air cylinder.

[0084] Fig. 10 shows an example of a yarn supplying portion 10A and a bobbin supplying portion 11A using air cylinders as first driving means and second driving means, respectively. In Fig. 10, a first air cylinder 32A as first driving means is fixed to the yarn supplying portion frame 30. A rod tip of the first air cylinder 32A is coupled to a swinging piece 90. A swinging shaft of the swinging piece 90 is the same as that of the swinging piece 37, coupled to the coupling rod 36. Consequently, the first air cylinder 32A swingably drives the swinging piece 90 to transmit a driving force to the coupling rods 36, 45 via the swinging piece 37. Thus, the bobbin holding peg 33 and the flip board 34 are each pivotably driven.

[0085] Furthermore, a second air cylinder 52A as second driving means is fixed to the supply portion frame 50. A rod tip of the second air cylinder 52A is coupled to a swinging piece 91. The swinging piece 91 is coupled to the shaft member 67. Consequently, the second air cylinder 52A swingably drives the swinging piece 91 to rotationally drive the shaft member 67. Each of the magazine 53 and the guide chute 54 is thus driven.

[0086] Thus, the adoption of the air cylinders as driving means allows the pulleys 38, 68 and the belts 39, 69, shown in Fig. 3, to be omitted compared to the adoption of the motors. Furthermore, particularly for the yarn supplying portion 10A, it is possible to omit the swinging piece 90, which converts the reciprocating linear motion of the air cylinder 32A into swinging motion, and the swinging piece 37, which converts the swinging motion into reciprocating linear motion of the coupling rod 36, to allow the air cylinder 32A to directly drive the coupling rod 36 of the yarn supplying portion 10A in the horizontal direction. In this manner, a power transmission mechanism can be relatively simply configured which transmits the driving force of the driving means to a driving target such as the bobbin holding peg 33 or the magazine 53.

[0087] The yarn supplying portion 10 may be configured such that the bobbin holding peg 33 and the flip board 34 are independently driven by different driving means. Furthermore, the bobbin supplying portion 11 may be configured such that the magazine 53 and the guide chute 54 are independently driven by different driving means.

[0088] Additionally, in the above-described embodiment, as shown in Fig. 3, the unit control device 80 of the winding unit 1 is configured to independently control the first driving means (first driving motor 32) of the yarn supplying portion 10 and the second driving means (second driving motor 52) of the bobbin supplying portion 11. However, a control means for controlling the first and second driving means may be provided outside the winding unit. For example, the control device 101, shown in Fig. 1 and controlling the whole automatic winder 100 (textile machine) comprising the plurality of winding units 1, may be configured to independently and intensively control the first and second driving means of the winding units 1. With this configuration, for example, operation means (not shown in the drawings) of the control device 101 can be used to easily control the plurality of winding units on the main body side of the automatic winder 100

[0089] While the present invention has been described with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, it is intented by the appended claims to cover all modifications of the present invention that fall within the true spirit and scope of the invention.

Claims

1. A yarn winding device (1) comprising a winding portion (12) winding a yarn unwound from a bobbin (3) around a winding tube (7), the yarn winding device being **characterized by** comprising:

   a yarn supplying portion (10) having a bobbin holding and discharging mechanism (31) holding said bobbin (3) and discharging the bobbin (3), and a first driving means (32) for driving said bobbin holding and discharging mechanism (31), a bobbin supplying portion (11) having a supply mechanism (51) including a magazine (53) that accommodates a plurality of the bobbins (3) and supplying one of the plurality of bobbins (3) accommodated in said magazine (53) to said yarn supplying portion (10), and a second driving means (52) for driving said supply mechanism (51), and a control means (80) for independently controlling said first driving means (32) and said second driving means (52).

2. A yarn winding device (1) according to Claim 1, **characterized in that** said control means (80) uses said first driving means (32) to drive said bobbin holding and discharging mechanism (31) to control said bobbin holding operation and said bobbin discharging operation of said bobbin holding and discharging mechanism regardless of an operation of supplying said bobbin which operation is performed by said bobbin supplying portion (11).

3. A yarn winding device (1) according to Claim 1 or 2, **characterized in that** said bobbin holding and discharging mechanism (31) has a bobbin holding portion (33) pivotably provided on a frame (30), and said control means (80) controls a pivoting operation of said bobbin holding portion (33) driven by said first driving means (32) regardless of said operation of supplying said bobbin (3) which operation is performed by said bobbin supplying portion (11).

4. A yarn winding device (1) according to Claim 3, **characterized in that** said control means (80) controls a posture of said bobbin (3) held by said bobbin holding portion (33) during pivoting, according to type of said bobbin (3).

5. A yarn winding device (1) according to Claim 3, **characterized by** further comprising an unwinding assisting device (13) assisting unwinding of the yarn from said bobbin (3) held by said bobbin holding portion (33), and said control means (80) controls the posture of said bobbin (3) held by said bobbin holding portion (33) according to an operating condition of said unwinding assisting device (13).

6. A yarn winding device (1) according to any one of Claims 3 to 5, **characterized in that** said bobbin holding and discharging mechanism (31) further has a flip board (34) pivotably provided on said frame (30) and flipping up said bobbin (3) held by said bobbin holding portion (33) to discharge said bobbin (3) to exterior of said yarn supplying portion (10), and said control means (80) controls a pivoting operation of said flip board (34) driven by said first driving means (32) regardless of said operation of supplying said bobbin (3) which operation is performed by said bobbin supplying portion (11).

7. A yarn winding device (1) according to any one of Claims 1 to 6, **characterized in that** at least one of said yarn supplying portion (10) and said bobbin supplying portion (11) is removably attached to a machine body (2).

8. A yarn winding device (1) according to any one of Claims 1 to 7, **characterized in that** at least one of said first driving means (32) and said second driving means (52) is a stepping motor.

9. A yarn winding device (1) according to any one of Claims 1 to 7, **characterized in that** at least one of said first driving means (32) and said second driving means (52) is a fluid pressure cylinder.

10. A textile machine (100) comprising a plurality of yarn winding devices (1) each winding a yarn unwound from a bobbin (3) around a winding tube (7) and control means (80) for controlling the plurality of yarn winding devices, said textile machine (100) being **characterized in that** each of said yarn winding devices (1) comprises a yarn supplying portion (10) having a bobbin holding and discharging mechanism (31) holding the bobbin (3) from which the yarn is unwound and discharging the bobbin (3), and a first driving means (32) for driving said bobbin holding and discharging mechanism (31), a bobbin supplying portion (11) having a supply mechanism (51) including a magazine (53) that accommodates a plurality of said bobbins (3) and supplying one of the plurality of bobbins (3) accommodated in said magazine (53) to said yarn supplying portion (10), and a second driving means (52) for driving said supply mechanism (51), and a winding portion (12) winding the yarn unwound from said bobbin (3) held by said bobbin holding and discharging mechanism (31), around said winding tube (7), and said control means (80) independently controls said first driving means (32) and said second driving means (52) of each of said yarn winding devices (1).

FIGURE 1

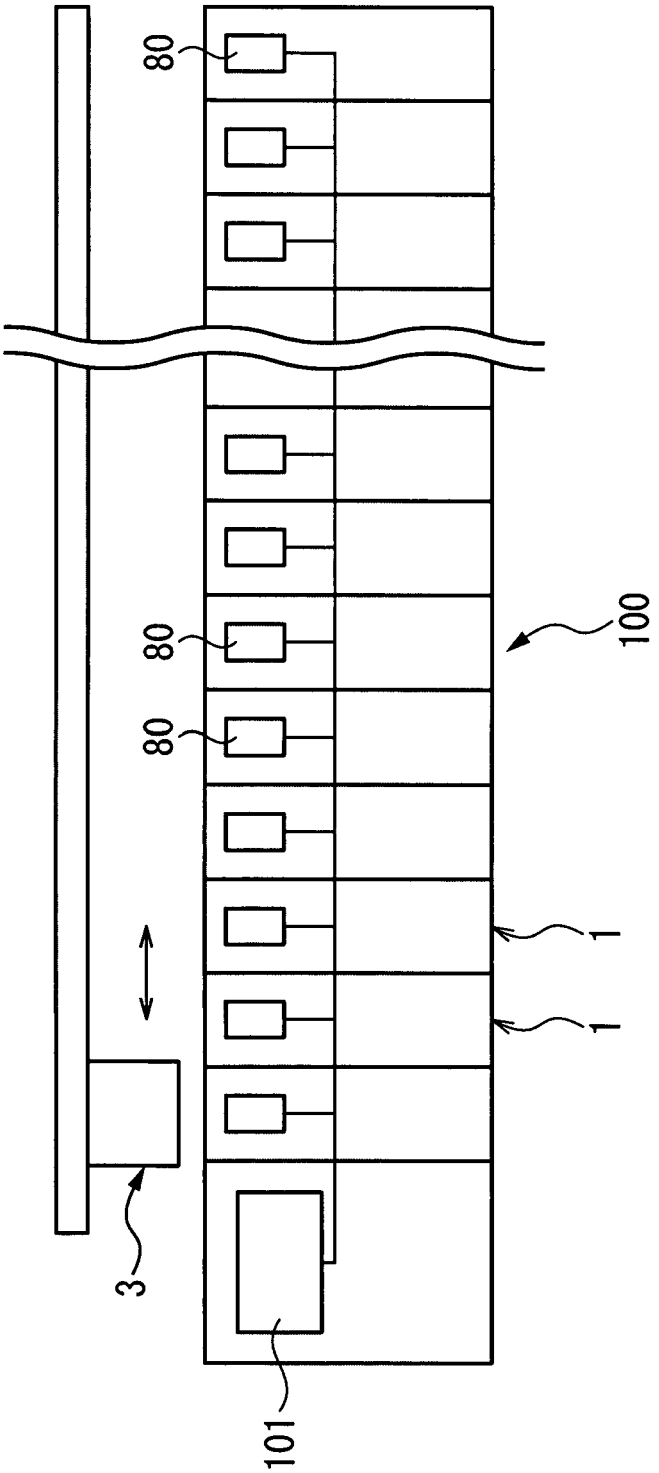

FIGURE 2

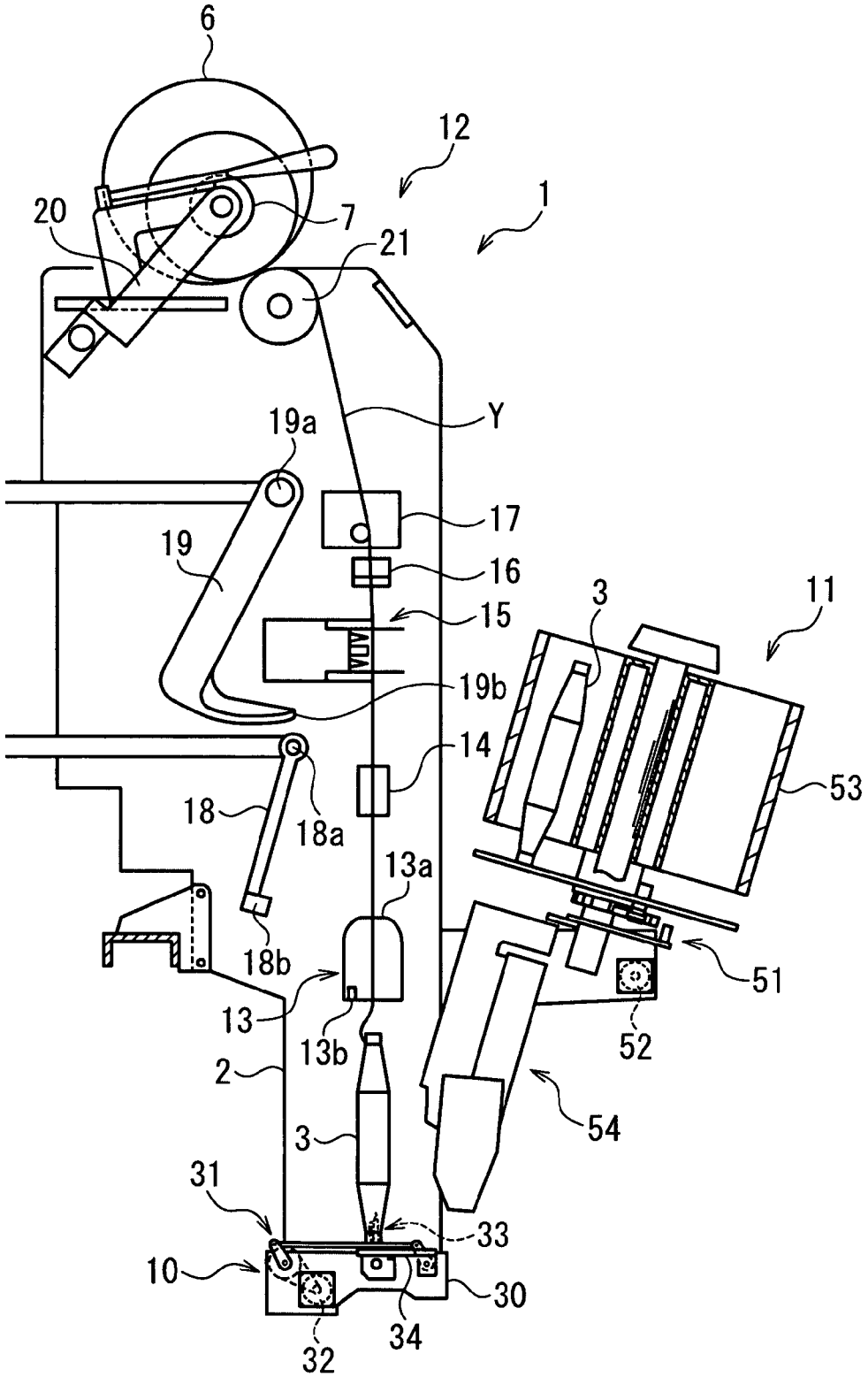
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FIGURE 3

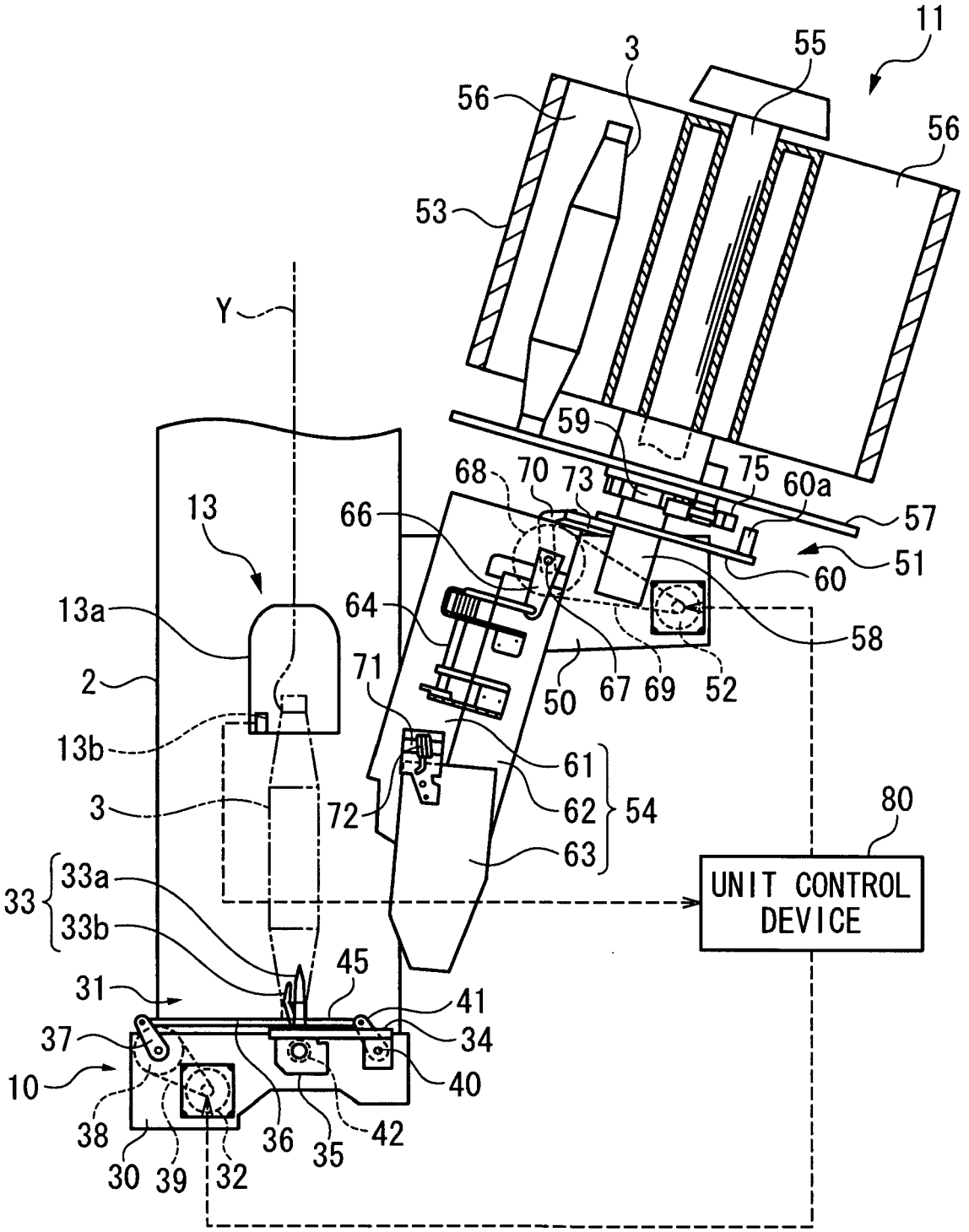
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FIGURE 4

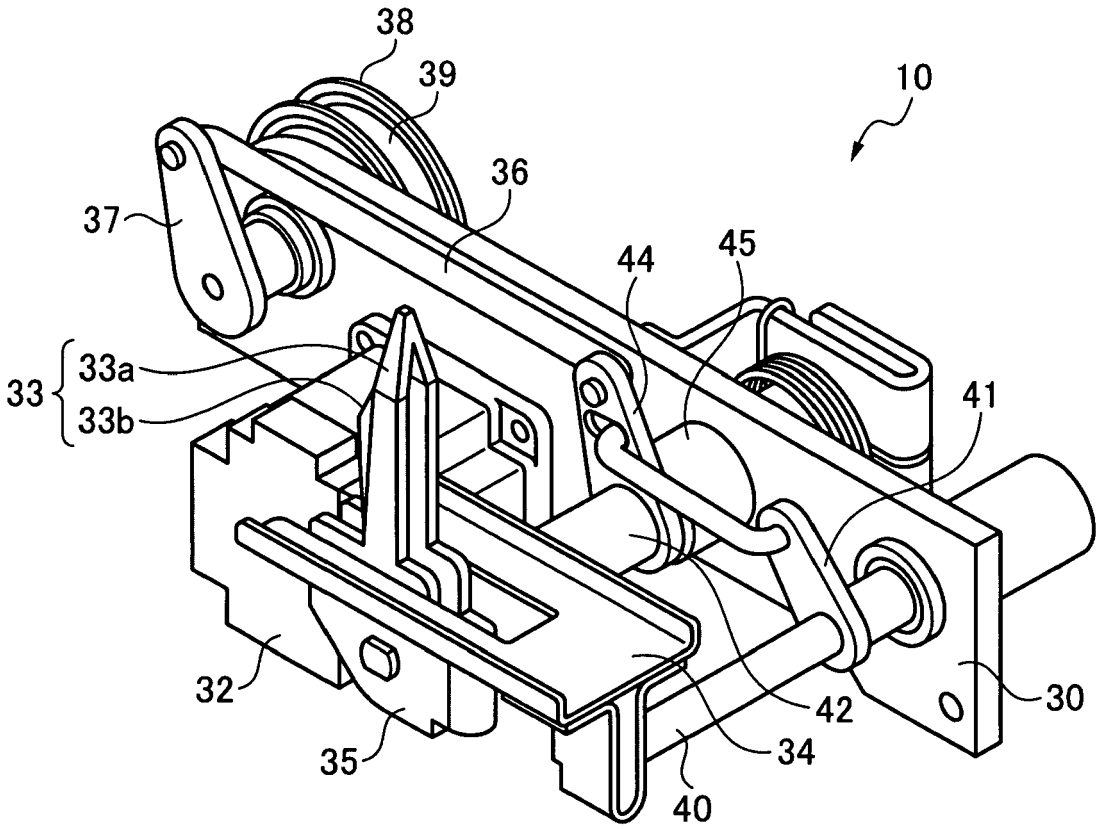


FIGURE 5

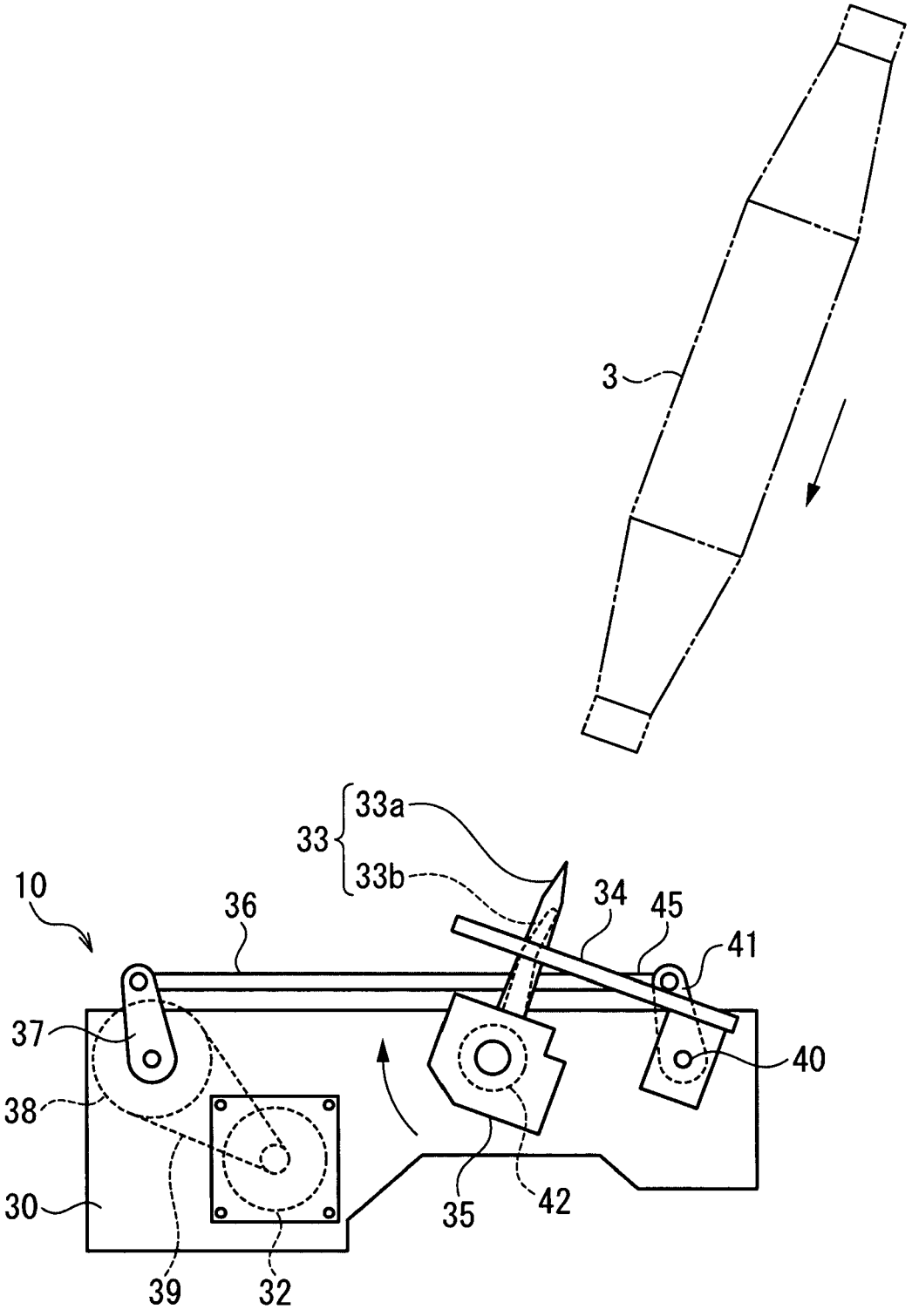


FIGURE 6

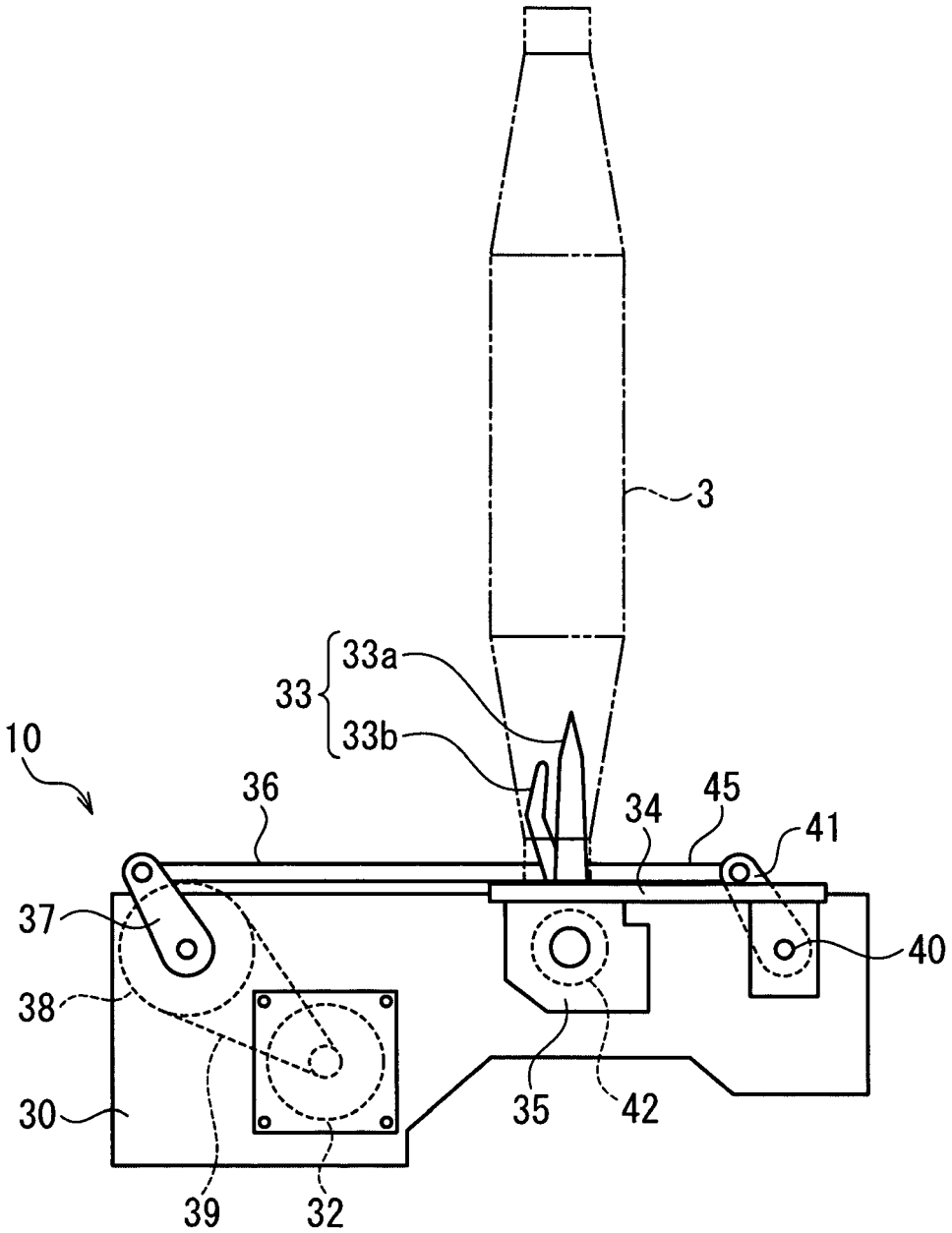


FIGURE 7

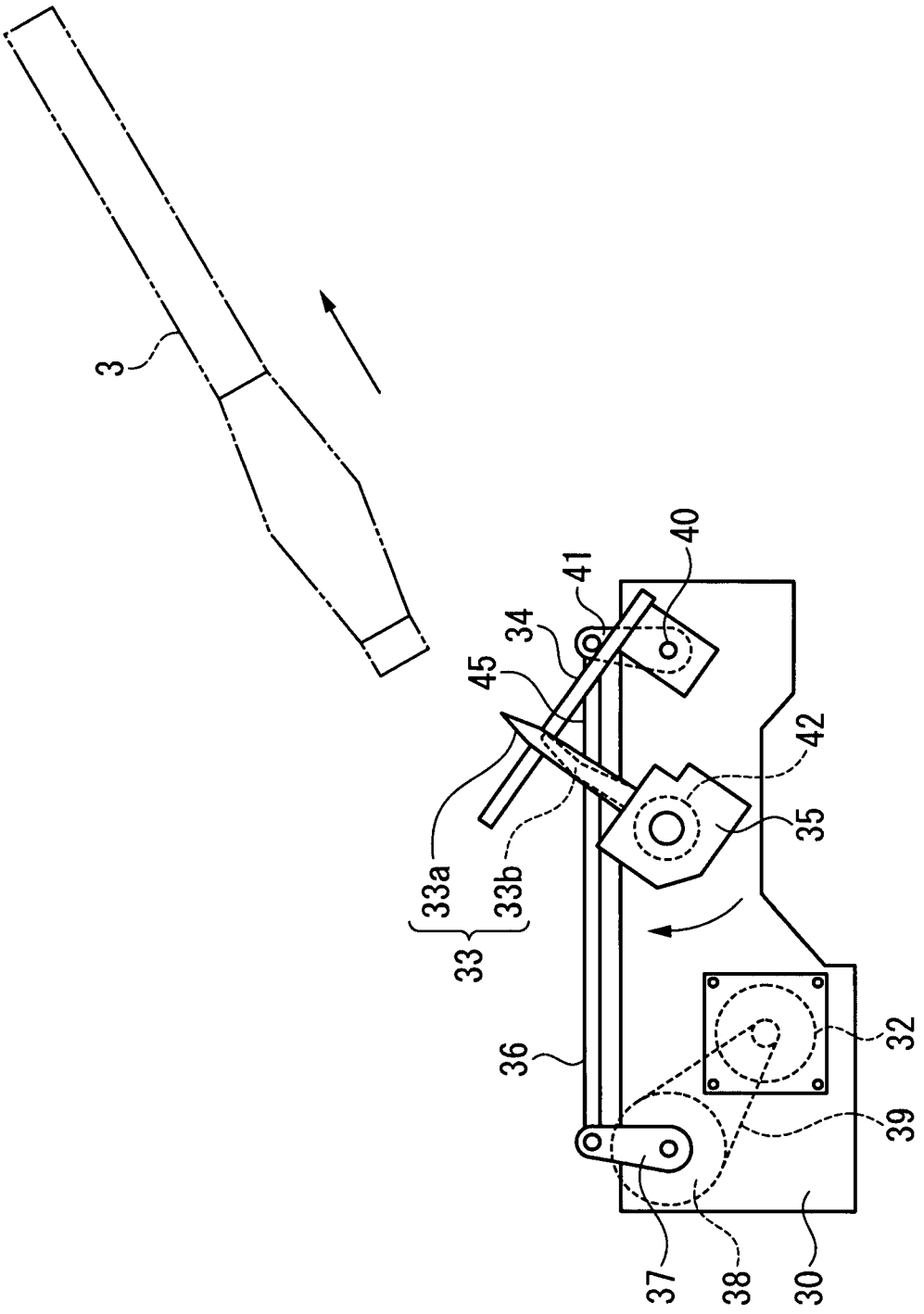


FIGURE 8

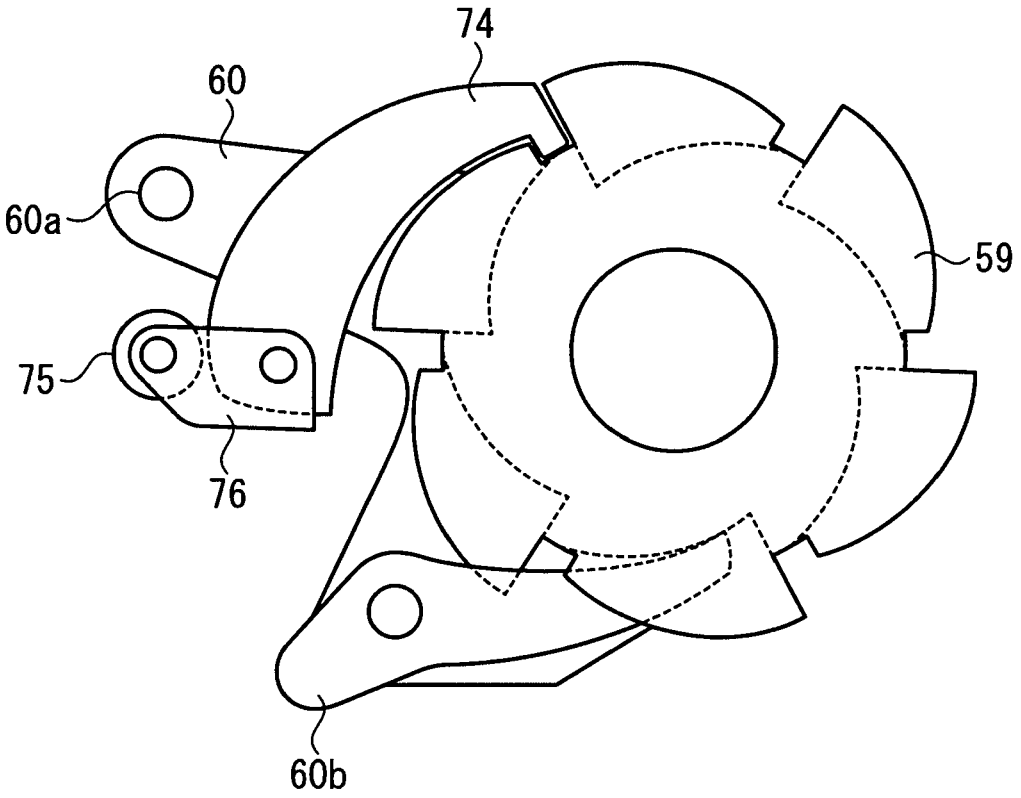


FIGURE 9

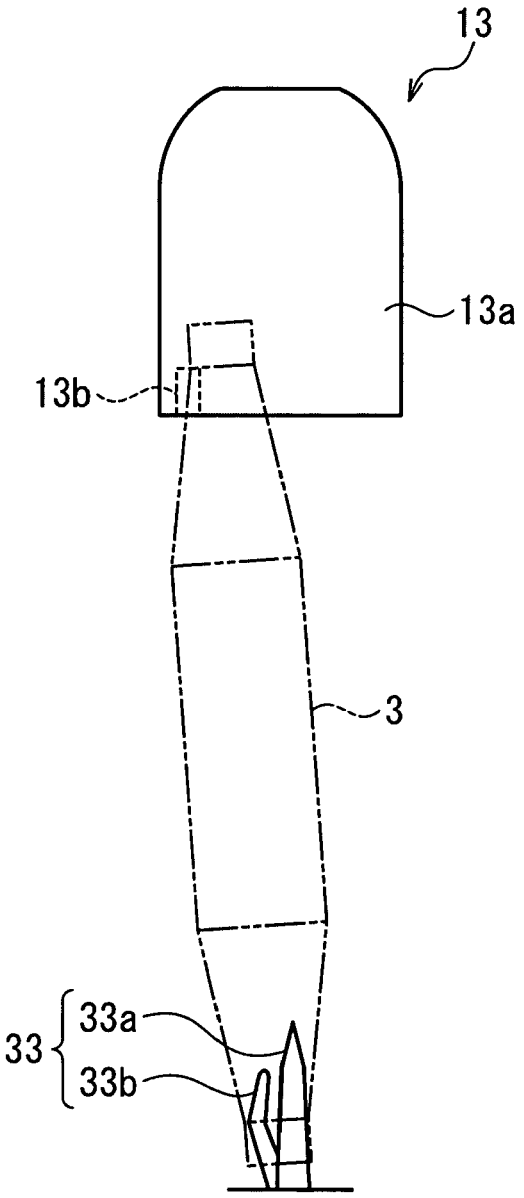
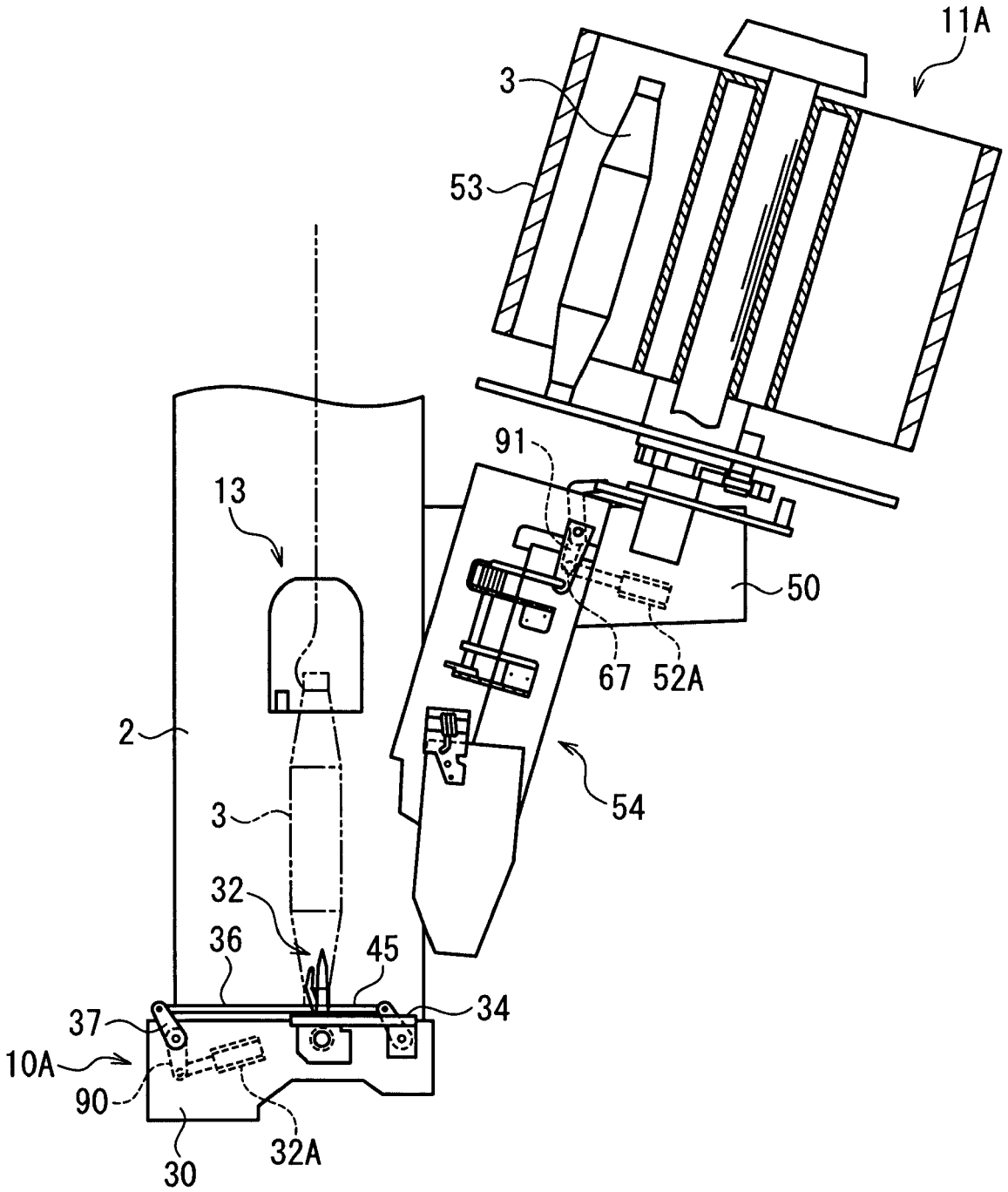


FIGURE 10



REFERENCES CITED IN THE DESCRIPTION

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- US 4844358 A **[0003]**