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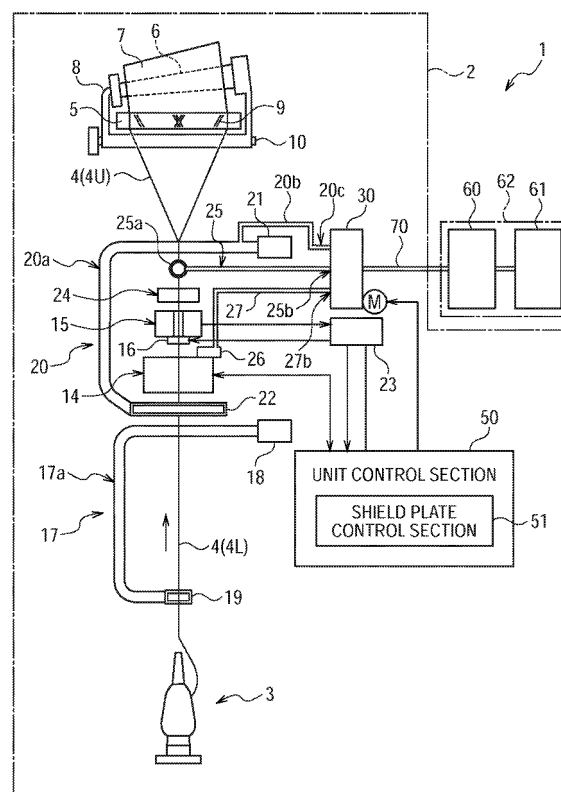
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(54) **Automatic winder**

(57) The invention relates to an automatic winder (1) that includes a yarn winding device (2) winding a yarn (4) unwound from a yarn supplying bobbin (3) around a winding bobbin (6, 7) while traversing the yarn (4), to form a package (7), and a negative pressure source (62) generating a negative pressure. The yarn winding device (2) has a plurality of suction portions (25, 27, 20) for sucking yarn waste and/or foreign matter attached to the running yarn (4). Each base ends (25n, 27b, 20c) of the plurality of suction portions (25, 27, 20) is joined to the negative pressure source (62) via a suction control unit (30).

FIGURE 1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a technique for simplifying the configuration of an automatic winder.

Description of Related Art

[0002] The Unexamined Japanese Patent Application Publication (Tokkai) No. 2001-159038 discloses a configuration including a shield plate that stops a suction flow in a coupling pipe that couples a suction mouth that sucks and holds a package-side yarn end, to a blower duct.

BRIEF SUMMARY OF THE INVENTION

[0003] In general, yarn winding units comprising an automatic winder each need to remove foreign matter attached to a traveling yarn and pick up a yarn end from a package. The automatic winder normally includes a negative pressure source. Each of the yarn winding units includes a cleaning pipe that sucks and removes the foreign matter attached to the traveling yarn, utilizing the negative pressure source, and a suction mouth that picks up the yarn end from the package utilizing the negative pressure source. The cleaning pipe and the suction mouth need not constantly continue sucking the foreign matter and the yarn end, respectively, during operation. Rather, the cleaning pipe and the suction mouth can reasonably suck the foreign matter and the yarn end only when predetermined conditions are met.

[0004] However, to realize this operation, each of the cleaning pipe and the suction mouth inevitably needs to include a controllable shutter. The configuration of the automatic winder is thus complicated. Thus, the cleaning pipe and the suction mouth have room for improvement in terms of costs and maintenance.

[0005] The present invention has been made in view of the above-described problems. A main object of the present invention is to provide a technique for simplifying the configuration of an automatic winder having a plurality of members connected to the negative pressure source to suck the foreign matter or the yarn.

[0006] The problems to be solved by the present invention have been described. Now, means for solving the problems and the effects of the means will be described.

[0007] An aspect of the present invention provides an automatic winder comprising a yarn winding device winding a yarn unwound from a yarn supplying bobbin around a winding bobbin while traversing the yarn, to form a package, and a negative pressure source generating a negative pressure. The automatic winder is configured as follows. The yarn winding device has a plurality of suction portion for sucking at least one of the yarn and

foreign matter. Each of base ends of the plurality of suction portion is joined to the negative pressure source via a suction control section. This configuration provides an automatic winder having a configuration simpler than that in which suction by the plurality of suction portion is controlled by the suction control sections provided for the respective suction portion.

[0008] The automatic winder is further configured as follows. The suction control section includes an integrally formed shield plate that is pivotally movable so as to close and occlude or open each of the base ends of the plurality of suction portion. This arrangement can be adopted to simplify the configuration of the suction control section.

[0009] The automatic winder is further configured as follows. The suction control section is configured to be able to selectively control the suction by the plurality of suction portion. This arrangement realizes very free control such that the suction by any one of the plurality of suction portion is permitted, whereas the suction by the other suction portion is inhibited.

[0010] The automatic winder is further configured as follows. The base ends of the plurality of suction portion are displaced relative to one another in a direction in which the shield plate moves pivotally. This arrangement realizes very free control such that the suction by any one of the plurality of suction portion is permitted, whereas the suction by the other suction portion is inhibited. The selective control may replace control based on the pivotal angle of the shield plate.

[0011] The automatic winder is further configured as follows. The yarn winding device comprises, as the suction portion, at least two of a first dust collecting portion for sucking the foreign matter attached to the traveling yarn, a second dust collecting portion for sucking yarn waste generated in a yarn splicing device splicing a lower yarn that is a yarn on the yarn supplying bobbin side and an upper yarn that is a yarn on the package side, and an upper yarn sucking, catching, and guiding portion for sucking, catching, and guiding the upper yarn to the yarn splicing device. That is, effects of the suction control section are significantly exerted when the yarn winding device includes at least two of the above-described portion.

[0012] The automatic winder is further configured as follows. The yarn winding device comprises, as the suction portion, a first dust collecting portion for sucking the foreign matter attached to the traveling yarn, a second dust collecting portion for sucking yarn waste generated in a yarn splicing device splicing a lower yarn that is a yarn on the yarn supplying bobbin side and an upper yarn that is a yarn on the package side, and an upper yarn sucking, catching, and guiding portion for sucking, catching, and guiding the upper yarn to the yarn splicing device. The suction control section includes an integrally formed shield plate that is pivotally movable so as to close and occlude or open each of the base ends of the plurality of suction portion. The yarn winding device includes a first suction channel as a channel formed in the first dust collecting portion, a second suction channel as a channel

formed in the second dust collecting portion, and a third suction channel as a channel formed in the upper yarn sucking, catching, and guiding portion, and the shield plate is pivotally moved to selectively allow each of the suction channels to be connected to the negative pressure source. The following series of operations are performed simply by pivotally moving the shield plate: during a steady-state operation of the yarn winding device, the foreign matter attached to the traveling yarn is sucked and removed and yarn waste generated in the yarn splicing device is sucked and collected as required, and for yarn splicing, the suction is suspended and the upper yarn is sucked, caught, and guided to the yarn splicing device.

[0013] 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

[0014]

Figure 1 is a schematic front view and a block diagram showing a yarn winding unit in an automatic winder according to an embodiment of the present invention.

Figure 2 is an exploded view of a suction control unit according to the embodiment of the present invention.

Figure 3 is a sectional view taken along line 3-3 in Figure 2.

Figure 4 is a sectional view taken along line 4-4 in Figure 3.

Figure 5 is a flowchart showing the flow of control performed by a unit control section and a shield plate control portion.

Figure 6 is the suction control unit during a steady-state operation.

Figure 7 is the suction control unit during collection of yarn waste.

Figure 8 is the suction control unit during yarn splicing.

Figure 9 is a variation of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] An embodiment of the present invention will be described below. Figure 1 is a schematic front view and a block diagram showing a yarn winding unit in an automatic winder according to an embodiment of the present invention.

[0016] First, a yarn winding unit 2 (yarn winding device) in an automatic winder 1 will be described with reference to Figure 1. The yarn winding unit 2 winds a yarn 4 unwound from a yarn supplying bobbin 3 around a winding

tube 6 while traversing the yarn 4 by a traverse drum 5, to form a corn-shaped package 7. Figure 1 shows only one yarn winding unit 2. However, a large number of the yarn winding units 2 are arranged in a line on a frame (not shown in the drawings) so as to comprise the automatic winder 1.

[0017] In the specification, the winding tube 6 and the package 7 are collectively called a winding bobbin. That is, the winding bobbin with no yarn layer formed thereon corresponds to the winding tube 6. The winding bobbin with a yarn layer formed thereon corresponds to the package 7.

[0018] The yarn winding unit 2 includes a cradle 8 on which the winding tube 6 is removably supported, and the traverse drum 5 that rotates at a predetermined rotation number in contact with the peripheral surface of the winding tube 6 or the package 7. The cradle 8 is configured to be able to sandwichingly hold and rotatably support the winding tube 6 at the opposite ends thereof.

The cradle 8 is configured to be able to tilt around a pivotal shaft 10. The cradle 8 is configured to move pivotally to allow absorption of an increase in the thickness of the yarn layer associated with winding of the yarn 4 around the winding bobbin 6, 7. A traverse groove 9 through which the yarn 4 is traversed with respect to the winding bobbin 6, 7 is engraved in the peripheral surface of the traverse drum 5. The winding bobbin 6, 7 comes into rolling contact with the traverse drum 5 and rotates in conjunction with rotation of the traverse drum 5.

[0019] A unit control section 50 controlling the yarn winding unit 2 is provided for each of the yarn winding units 2.

[0020] Next, a yarn splicing device 14, a yarn clearer (yarn monitor) 15, a waxing device 24, and a cleaning pipe 25 (suction portion, first dust collecting portion) will be described. That is, the yarn winding unit 2 is configured such that the yarn splicing device 14, the yarn clearer 15, the waxing device 24, and the cleaning pipe 25 are arranged in this order in a yarn traveling path between the yarn supplying bobbin 3 and the traverse drum 5; the yarn splicing device 14 and yarn clearer 15 from the yarn supplying bobbin 3.

[0021] The yarn splicing device 14 is configured to splice a lower yarn 4L that is the yarn 4 on the yarn supplying bobbin 3 side and an upper yarn 4U that is the yarn 4 on the package 7 side at when the yarn 4 is cut by the yarn clearer 15, having detected a yarn detect, or when the yarn 4 from the yarn supplying bobbin 3 is broken. The yarn splicing device 14 includes a dust collector 26 that temporarily accommodates yarn waste generated in the yarn splicing device 14. To allow the yarn waste accommodated in the dust collector 26 to be sucked and collected, the dust collector 26 includes a yarn waste collecting pipe 27 (suction portion, second dust collecting portion). A base end 27b of the yarn waste collecting pipe 27 is connected to a suction control unit 30 (suction control section) described below.

[0022] The yarn clearer 15 detects a thickness defect

in the yarn 4. An appropriate sensor detects the thickness of the yarn 4 passing through a detection section of the yarn clearer 15. A signal from the sensor is analyzed by an analyzer 23. Thus, a yarn defect such as slub is detected. The yarn clearer 15 includes a cutter 16 with which the yarn 4 is immediately cut when a yarn defect is detected in the yarn 4.

[0023] A lower yarn sucking, catching, and guiding portion 17 for sucking, catching, and guiding the lower yarn 4L on the yarn supplying bobbin 3 side to the yarn splicing device 14 is provided below the yarn splicing device 14. An upper yarn sucking, catching, and guiding portion 20 (suction portion) for sucking, catching, and guiding the upper yarn 4U on the package 7 side to the yarn splicing device 14 is provided above the yarn splicing device 14. The upper yarn sucking, catching, guiding portion 20 is composed of a suction mouth 20a configured to be pivotally movable around a shaft 21, and a coupling pipe 20b that couples the suction mouth 20a to the suction control unit 30 described below. A base end 20c of the upper yarn sucking, catching, guiding portion 20 is connected to the suction control unit 30. The lower yarn sucking, catching, guiding portion 17 is also shaped like a pipe and includes a suction port 19 at the tip thereof. The lower yarn sucking, catching, guiding portion 17 is composed of a relay pipe 17a configured to be pivotally movable around a shaft 18, and a coupling pipe (not shown in the drawings) that couples the relay pipe 17a to a blower duct 60.

[0024] The waxing device 24 applies appropriate wax to the traveling yarn 4.

[0025] The cleaning pipe 25 sucks and removes foreign matter attached to the traveling yarn 4. A base end 25b of the cleaning pipe 25 is connected to the suction control unit 30. A suction port 25a is formed at the tip of the cleaning pipe 25. The suction port 25a of the cleaning pipe 25 is located in proximity to the yarn 4 traveling between the waxing device 24 and the traverse drum 5.

[0026] As described above, in the present embodiment, the yarn winding unit 2 has a plurality of suction portion for sucking at least one of the yarn 4 and foreign matter. Specifically, the yarn winding unit 2 includes, as the suction portion, (i) the cleaning pipe 25, which sucks the foreign matter attached to the traveling yarn 4, (ii) the yarn waste collecting pipe 27, which sucks the yarn waste generated in the yarn splicing device 14, and (iii) the upper yarn sucking, catching, and guiding portion 20 (suction portion), which sucks, catches, and guides the upper yarn 4U to the yarn splicing device 14. The base end 25b of the cleaning pipe 25, the base end 27b of the yarn waste collecting pipe 27, and the base end 20c of the upper yarn sucking, catching, and guiding portion 20 (suction portion) are all connected to the suction control unit 30.

[0027] The blower duct 60 is coupled to a negative pressure generating device 61 (not shown in the drawings). A negative pressure source 62 that generates negative pressure is composed of the blower duct 60 and

the negative pressure generating device 61. The blower duct 60 extends along the direction in which the yarn winding units 2 are arranged in a line. The suction control unit 30, provided in each of the yarn winding units 2, is connected to the blower duct 60 via a blower pipe 70.

[0028] The automatic winder 1 is composed of the plurality of yarn winding units 2, arranged in a line, and the negative pressure source 62, shared by the yarn winding units 2.

[0029] In the above-described configuration, each of the yarn winding units 2 includes the suction control unit 30. The base ends 25b, 27b, 20c of the plurality of suction portion 25, 27, 20 are joined to the negative pressure source 62 via the suction control unit 30. The base ends 25b, 27b, 20c are connected to the suction control unit 30. The suction control unit 30 and the negative pressure source 62 are connected together via the blower pipe 70. The configuration of the suction control unit 30 will be described below in detail with reference to Figures 2 to 4. Figure 2 is an exploded view of the suction control unit according to the embodiment of the present invention. Figure 3 is a sectional view taken along line 3-3 in Figure 2. Figure 4 is an end view taken along line 4-4 in Figure 3.

[0030] As shown in Figure 2, the suction control unit 30 is composed of a first flat plate portion 31 fixed to a frame (not shown in the drawings) of the yarn winding unit 2, a second flat plate portion 32 located opposite the first flat plate portion 31, a shutter 33 (shield plate) interposed between the first flat plate portions 31 and the second flat plate portion 32, and a shutter driving mechanism 34 serving as a driving source that pivotally moves the shutter 33.

[0031] The second flat plate portion 32 includes (i) a cleaning hole 32a to which the base end 25b of the cleaning pipe 25 is connected, (ii) a yarn waste hole 32b to which the base end 27b of the yarn waste collecting pipe 27 is connected, and (iii) a suction hole 32c to which the base end 20c of the coupling pipe 20b is connected. On the other hand, a blower hole 31c to which the blower pipe 70 is connected is formed in the first flat plate portion 31.

[0032] When the second flat plate portion 32 is fixedly fastened to the first flat plate portion 31, the center of the blower hole 31c aligns substantially with the center of the suction hole 32c.

[0033] The shutter 33 is integrally formed substantially like a fan as shown in Figure 3. Between the first flat plate portion 31 and the second flat plate portion 32, the shutter 33 is pivotally movable around a pivotal shaft 33a so as to close and occlude or open each of the base ends 25b, 27b, 20c.

[0034] The shutter driving mechanism 34 is composed of a stepping motor 35 provided on the first flat plate portion 31, a pulley 36 fixed to the pivotal shaft 33a of the shutter 33, and a flat belt 37 wound around an output shaft of the stepping motor 35 and the pulley 36. An output from the stepping motor 35 is transmitted to the shutter 33 via the flat belt 37 and the pulley 36.

[0035] A seal member 38 is interposed between the first flat plate portion 31 and the second flat plate portion 32 to maintain the air tightness of a space in which the shutter 33 moves pivotally.

[0036] As shown in Figure 4, the cleaning hole 32a, the yarn waste hole 32b, the suction hole 32c, the blower hole 31c, to which the blower pipe 70 is connected, communicate with one another (are joined together) via a junction space G formed between the first flat plate portion 31 and the second flat plate portion 32 as the space in which the shutter 33 moves pivotally. A thick arrow in Figure 4 generally denotes the direction of the flow of air generated by the suction by the negative pressure source 62.

[0037] Next, the arrangement aspect of the cleaning hole 32a, the yarn waste hole 32b, and the suction hole 32c, and the shape of the shutter 33 will be described in detail with reference to Figure 3. In Figure 3, the contours of the cleaning hole 32a and the yarn waste hole 32b are generally shown by an alternate long and two short dashes line. The contour of the suction hole 32c is omitted because the contour of the suction hole 32c overlaps the contour of the blower hole 31c. As shown in Figure 3, the cleaning hole 32a, the yarn waste hole 32b, the suction hole 32c are displaced in this order in a pivotal movement direction of the shutter 33 denoted by reference character S. Specifically, when the pivotal shaft 33a of the shutter 33 is assumed to be the center, the yarn waste hole 32b is provided clockwise side away from the suction hole 32c. The cleaning hole 32a is provided clockwise side away from the yarn waste hole 32b. The suction control unit 30 can selectively control the suction by the suction portion 25, 27, 20. When the shutter 33 is positioned as shown in Figure 3, the shutter 33 closes and occludes all of the cleaning hole 32a, the yarn waste hole 32b, and the suction hole 32c. The shutter 33 moves pivotally clockwise or counterclockwise to open only the cleaning hole 32a as shown in Figure 6, to open only the cleaning hole 32a and the yarn waste hole 32b as shown in Figure 7, or to open only the suction hole 32c as shown in Figure 8.

[0038] Next, control by the unit control section 50 will be described. The unit control section 50 shown in Figure 1 includes a CPU (Central Processing Unit), a ROM (Read Only Memory), and a RAM (Random Access Memory). The ROM of the unit control section 50 stores control software that allows the CPU and the like to function as shield plate control section 51. Control by the unit control section 50 and the shield plate control section 51 will be described according to the control flow shown in Figure 5.

[0039] When the automatic winder 1 is powered on (S300), the shutter 33 is positioned to close and occlude all of the cleaning hole 32a, the yarn waste hole 32b, and the suction hole 32c as shown in Figure 3. The shield plate control section 51 transmits an appropriate instruction to the stepping motor 35 to pivotally move the shutter 33 to open only the cleaning hole 32a as shown in Figure

6 (S310). An automatic doffing device (not shown in the drawings) places the yarn 4 from the yarn supplying bobbin 3 onto the winding tube 6, thus allowing the yarn winding unit 2 to start winding the yarn 4. During the winding, the base end 25b of the cleaning pipe 25 is prevented from being closed and occluded by the shutter 33 (see also Figure 4). Thus, foreign matter (for example, wax powder or yarn waste attached to the yarn 4) attached to the traveling yarn 4 is sucked and removed by the blower duct 60 upon passing by the suction port 25a.

[0040] The unit control section 50 determines whether or not yarn splicing has been requested (S320). If the yarn splicing has not been requested (S320: N), the unit control section 50 advances the processing to step S350. If the yarn splicing has been requested (S320: YES), the shield plate control section 51 transmits an appropriate signal to the stepping motor 35 to allow the stepping motor 35 to pivotally move the shutter 33 counterclockwise through a large angle which shutter 33 is positioned to open only the cleaning hole 32a, thus opening only the suction hole 32c as shown in Figure 8 (S330). Then, the mouth 22 of the upper yarn sucking, catching, and guiding portion 20 is brought into a suction state. When the unit control section 50 pivotally moves the upper yarn sucking, catching, and guiding portion 20, the upper yarn sucking, catching, and guiding portion 20 sucks and catches the yarn end on the outer periphery of the package 7. The unit control section 50 stands by until receiving a signal indicating that yarn splicing is completed from the yarn splicing device 14 (S340: NO). When the unit control section 50 receives the signal (S340: YES), the shield plate control section 51 transmits an appropriate signal to the stepping motor 35 to allow the stepping motor 35 to bring the suction control unit 30 into the state shown in Figure 6 again. The unit control section 50 advances the processing to step S350.

[0041] The unit control section 50 uses a timer circuit (not shown in the drawings) to measure elapsed time from the winding start time. If the elapsed time has not reached a predetermined value (S350: NO), the processing returns to step S310. If the elapsed time has reached the predetermined value (S350: YES), the shield plate control section 51 transmits an appropriate signal to the stepping motor 35 to allow the stepping motor 35 to pivotally move the shutter 33 counterclockwise which is positioned to close and occlude the yarn waste hole 32b and the suction hole 32c as shown in Figure 6, so as to open the yarn waste hole 32b in addition to the cleaning hole 32a as shown in Figure 7, an appropriate signal is sent the stepping motor 35 (S360). Thus, the yarn waste generated in the yarn splicing device 14 is sucked and collected by the blower duct 60. After the the unit control section 50 resets the timer circuit (S370), the unit control section 50 then transmits an appropriate signal to the stepping motor 35 to allow the stepping motor 35 to bring the suction control unit 30 into the state shown in Figure 6 again. The unit control section 50 returns the processing to step S310.

[0042] The automatic winder 1 includes the yarn winding unit 2, which winds the yarn 4 unwound from the yarn supplying bobbin 3 around the winding bobbin 6, 7 while traversing the yarn 4, to form the package 7, and the negative pressure source 62, which generates negative pressure. The yarn winding unit 2 has the plurality of suction portion (25, 27, 20) for sucking at least one of the yarn 4 and foreign matter. Each of the bases 25b, 27b, 20c of the plurality of suction portion 25, 27, 20 is joined to the negative pressure source 62 via the suction control unit 30. This provides the automatic winder 1 having a configuration simpler than that in which the suction by the plurality of suction portion 25, 27, 20 is controlled by the suction control sections provided for the respective suction portion 25, 27, 20.

[0043] The suction control unit 30 includes the integrally formed shutter 33, which is pivotally movable so as to close and occlude or open the each of the base ends 25b, 27b, 20c of the plurality of suction portion 25, 27, 20. This arrangement can be adopted to provide the suction control unit 30 of a simple structure.

[0044] In the above-described embodiment, the shutter 33 is integrally formed. However, the "integrally formed shutter 33" includes both a shutter composed of one plate and a shutter formed by joining a plurality of plates together.

[0045] The suction control unit 30 is configured to be able to selectively control the suction by the plurality of suction portion 25, 27, 20. This arrangement realizes very free control such that the suction by any one of the plurality of suction portion 25, 27, 20 is permitted, whereas the suction by the other suction portion is inhibited.

[0046] The base ends 25b, 27b, 20c of the suction portion 25, 27, 20 are preferable to be displaced relative to one another in the direction in which the shutter 33 moves pivotally. This arrangement realizes very free control such that the suction by any one of the plurality of suction portion 25, 27, 20 is permitted, whereas the suction by the other suction portion is inhibited. Moreover, the selective control may replace control based on the pivotal angle of the shutter 33.

[0047] The yarn winding unit 2 includes, as the suction portion, the cleaning pipe 25, which sucks the foreign matter attached to the traveling yarn 4, the yarn waste collecting pipe 27, which sucks the yarn waste generated in the yarn splicing device 14 splicing the lower yarn 4L that is the yarn 4 on the yarn supplying bobbin 3 side and the upper yarn 4U that is the yarn 4 on the package 7 side, and the upper yarn sucking, catching, and guiding portion 20 for sucking, catching, and guiding the upper yarn 4U to the yarn splicing device 14. The effects of the suction control unit 30 are significantly exerted when the yarn winding unit 2 includes the above-described portion.

[0048] The above-described embodiment may be modified such that the yarn winding unit 2 includes, as the suction portion, any two of the cleaning pipe 25, the yarn waste collecting pipe 27, and the upper yarn sucking, catching, and guiding portion 20. In this case, the

above-described effects are also significantly exerted.

[0049] The yarn winding device 2 includes the cleaning channel 25r (see also Figure 2), formed in the cleaning pipe 25, the yarn waste channel 27r, formed in the yarn waste collecting pipe 27, and the suction channel 20r, formed in the upper yarn sucking, catching, and guiding portion 20, and the shutter 33 is pivotally moved to selectively allow each of the suction channels 25r, 27r, 20r to be connected to the negative pressure source 62. This arrangement allows the following series of operations to be performed simply by pivotally moving the shutter 33: during a steady-state operation of the yarn winding unit 2, the foreign matter attached to the traveling yarn 4 is sucked and removed and the yarn waste generated in the yarn splicing device 14 is sucked and collected as required, and for yarn splicing, the suction is suspended and the upper yarn 4U is sucked, caught, and guided to the yarn splicing device 14.

[0050] In the above-described embodiment, the cleaning hole 32a, the yarn waste hole 32b, and the suction hole 32c are disposed in this order counterclockwise as shown in Figure 3. Alternatively, the cleaning hole 32a, the yarn waste hole 32b, and the suction hole 32c may be disposed in this order clockwise.

[0051] The preferred embodiment of the present invention has been described. However, the above-described embodiment may be varied as follows.

[0052] See Figures 6 and 9 in comparison. Figure 9 is a diagram similar to Figure 6, showing a first variation of the present invention. That is, in the above-described embodiment, the shutter 33 is formed like a fan as shown in Figure 6.

To open only the cleaning hole 32a, the shutter 33 is positioned counterclockwise away from the cleaning hole 32a as shown in Figure 9. In contrast, in the present variation, the shutter 33 includes a bulging portion 39 that bulges rightward (that is, clockwise) as viewed from the pivotal shaft 33a as shown in Figure 9. The bulging portion 39 includes a hole 40 that overlaps the cleaning hole 32a when the shutter 33 is positioned as shown in Figure 6. A felt air-tightness holding member 41 surrounding the hole 40 is stuck between the shutter 33 and the first flat plate portion 31. Because of the presence of the air-tightness holding member 41, the present variation enables possible air leakage to be inhibited during the steady-state operation, compared to the above-described embodiment.

[0053] 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 intended by the appended claims to cover all modifications of the present invention that fall within the true spirit and scope of the present invention.

Claims

1. An automatic winder (1) comprising a yarn winding device (2) winding a yarn unwound from a yarn supplying bobbin around a winding bobbin while traversing the yarn, to form a package, and a negative pressure source (62) generating a negative pressure, the automatic winder (1) being **characterized in that** the yarn winding device (2) has a plurality of suction portion (25, 27, 20) for sucking at least one of the yarn and foreign matter, and each of base ends of the plurality of suction portion (25, 27, 20) is joined to said negative pressure source (62) via a suction control section (30). 5
2. The automatic winder (1) according to Claim 1, **characterized in that** the suction control section (30) includes an integrally formed shield plate (33) that is pivotally movable so as to close and occlude or open each of said base ends of the plurality of suction portion (25, 27, 20). 10 20
3. The automatic winder (1) according to Claim 1 or Claim 2, **characterized in that** the suction control section (30) is configured to be able to selectively control the suction by the plurality of suction portion (25, 27, 20). 25
4. The automatic winder (1) according to Claim 2, **characterized in that** the base ends of said plurality of suction portion (25, 27, 20) are displaced relative to one another in a direction in which the shield plate (33) moves pivotally. 30
5. The automatic winder (1) according to any one of Claims 1 to 4, **characterized in that** the yarn winding device (2) comprises, as the suction portion, at least two of a first dust collecting portion (25) for sucking the foreign matter attached to the traveling a yarn, second dust collecting portion (27) for sucking yarn waste generated in a yarn splicing device splicing a lower yarn that is a yarn on the yarn supplying bobbin side and an upper yarn that is a yarn on the package side, and an upper yarn sucking, catching, and guiding portion (20) for sucking, catching, and guiding the upper yarn to the yarn splicing device. 35 40 45
6. The automatic winder (1) according to Claim 1, **characterized in that** the yarn winding device (2) comprises, as the suction portion, the first dust collecting portion (25) for sucking the foreign matter attached to the traveling yarn, the second dust collecting portion (27) for sucking yarn waste generated in a yarn splicing device splicing the lower yarn that is the yarn on the yarn supplying bobbin side and the upper yarn that is a yarn on the package side, and the upper yarn sucking, catching, and guiding portion (20) for sucking, catching, and guiding said upper yarn to the 50 55

yarn splicing device, and the suction control section (30) includes an integrally formed shield plate (33) that is pivotally movable so as to close and occlude or open each of the base ends of the plurality of suction portion (25, 27, 20), and **in that** the yarn winding device (2) includes a first suction channel (25r) as a channel formed in the first dust collecting portion (25), a second suction channel (27r) as a channel formed in the second dust collecting portion (27), and a third suction channel (20r) as a channel formed in the upper yarn sucking, catching, and guiding portion (20), and the shield plate is pivotally moved to selectively allow each of the suction channels to be connected to the negative pressure source (62).

FIGURE 1

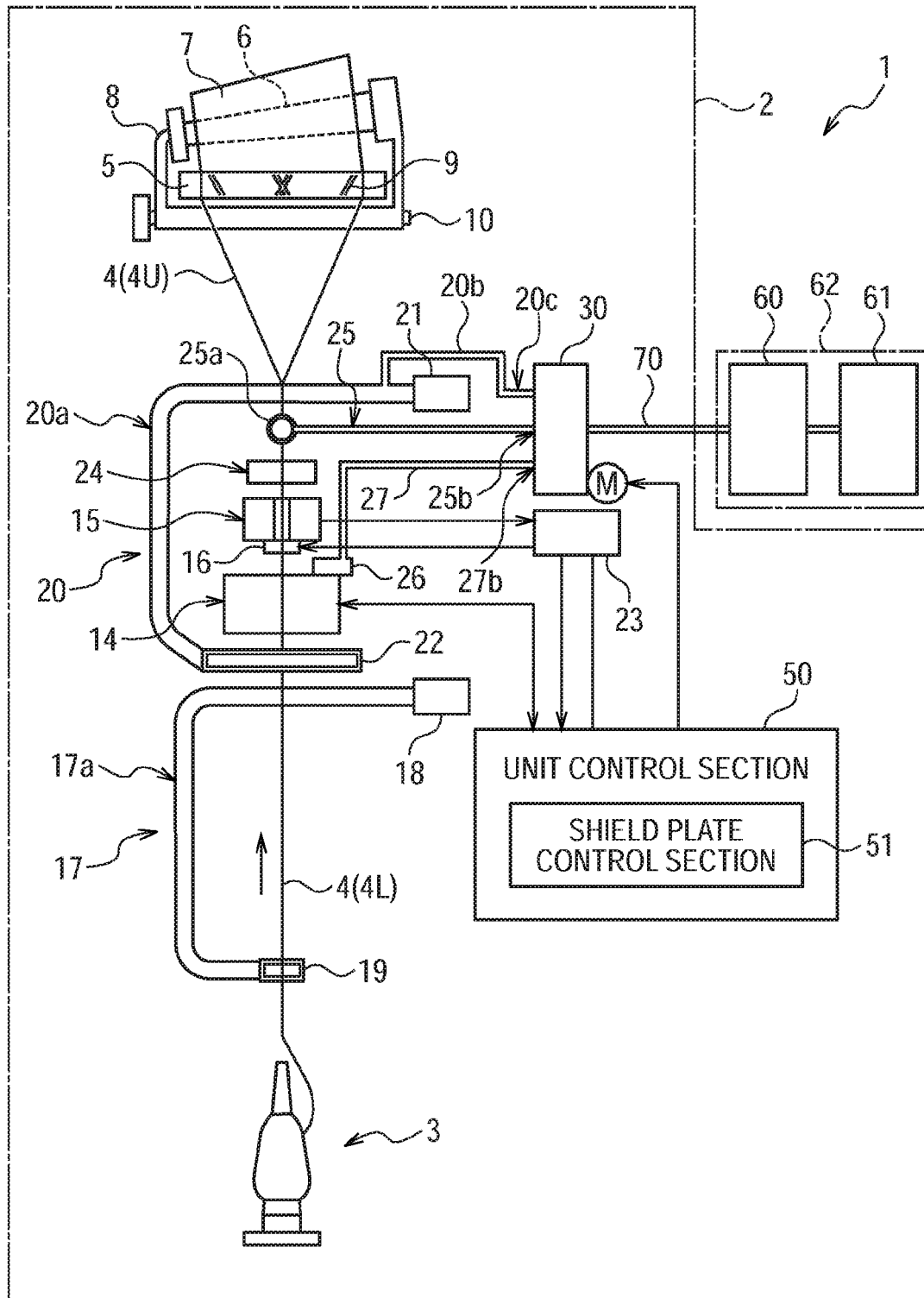


FIGURE 2

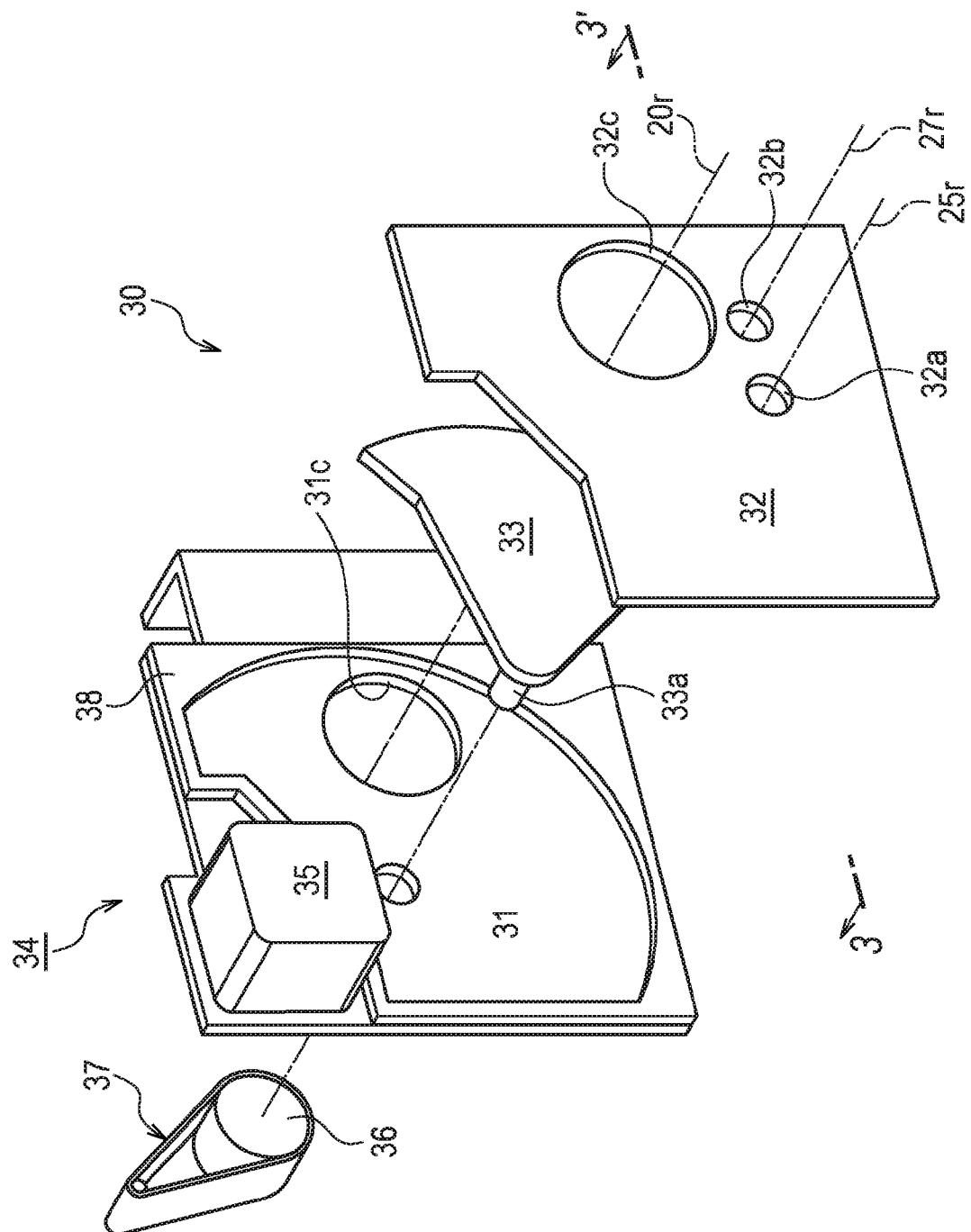


FIGURE 3

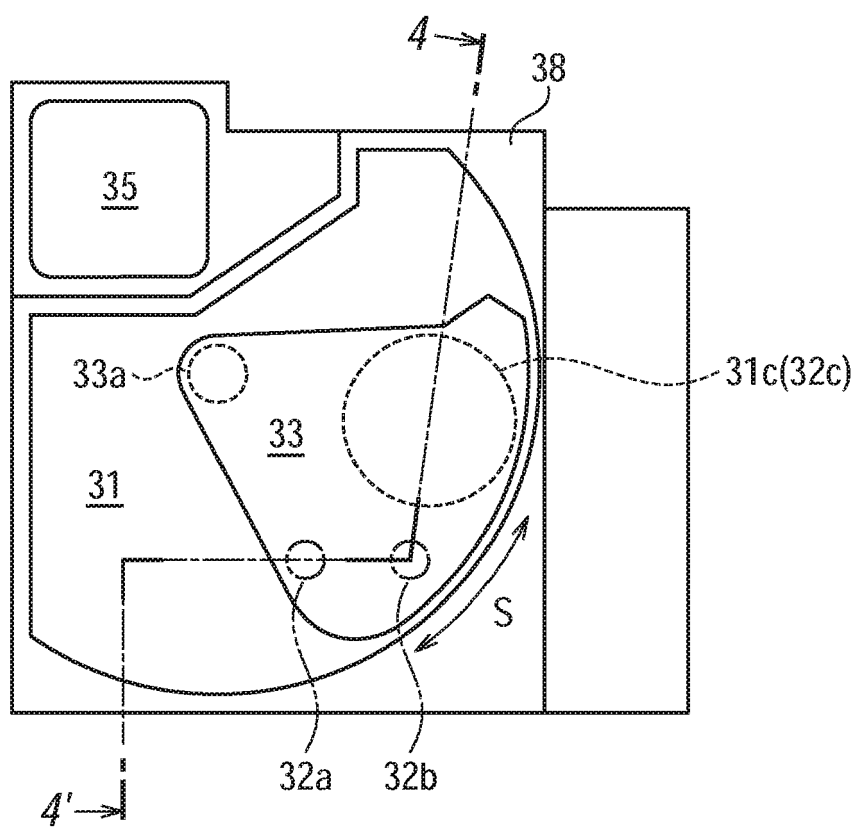


FIGURE 4

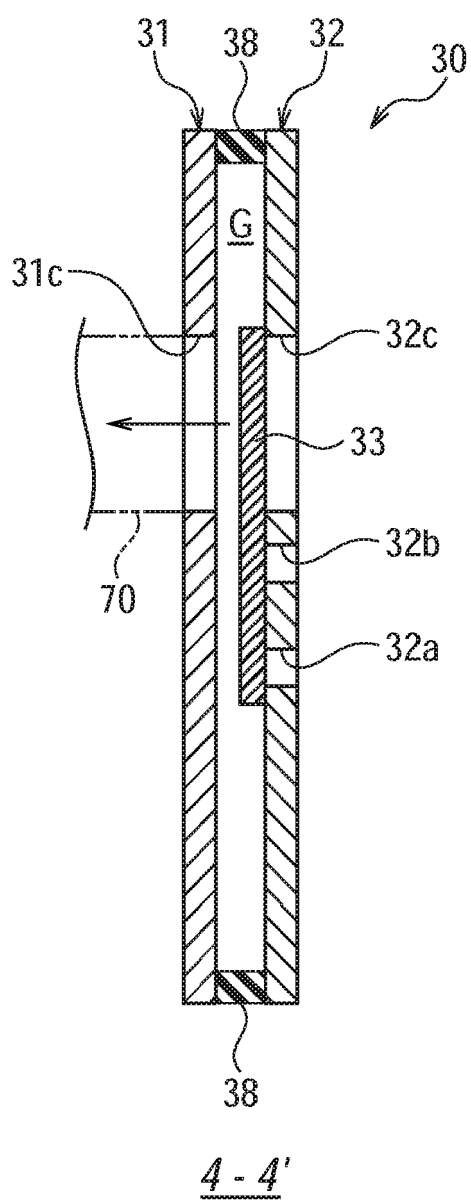


FIGURE 5

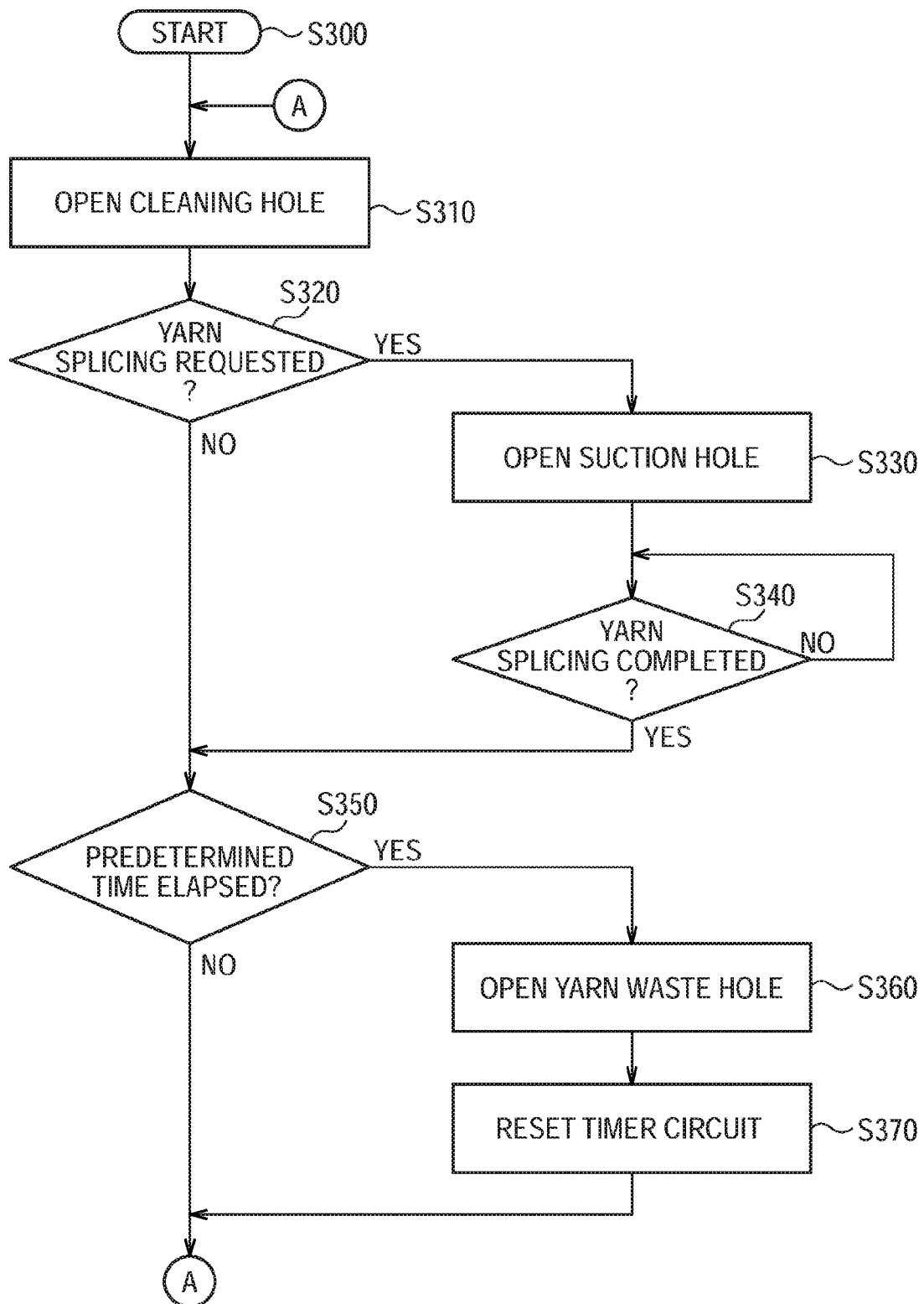


FIGURE 6

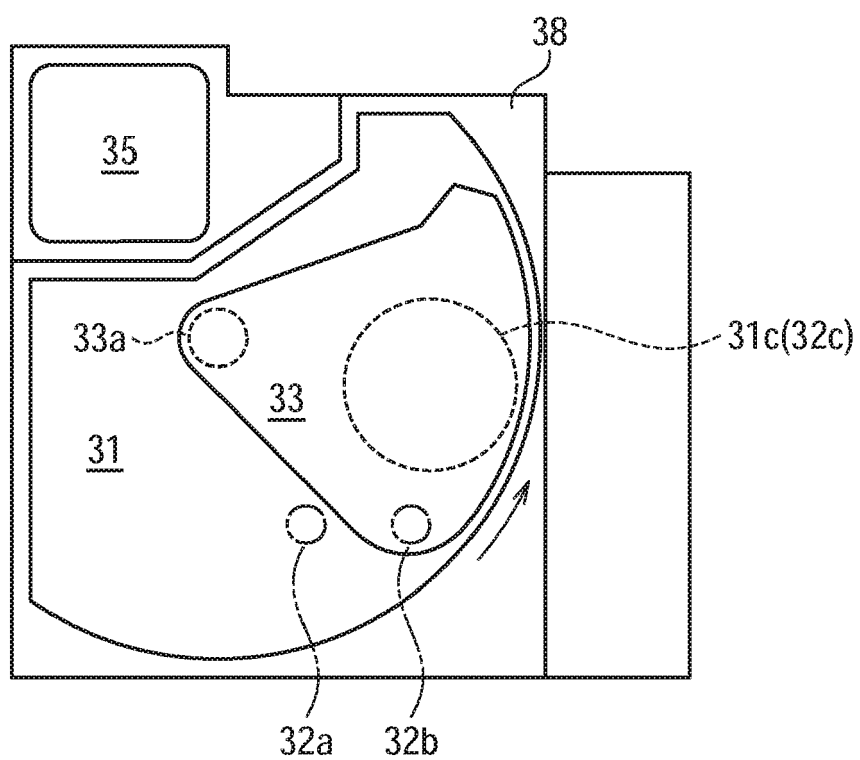


FIGURE 7

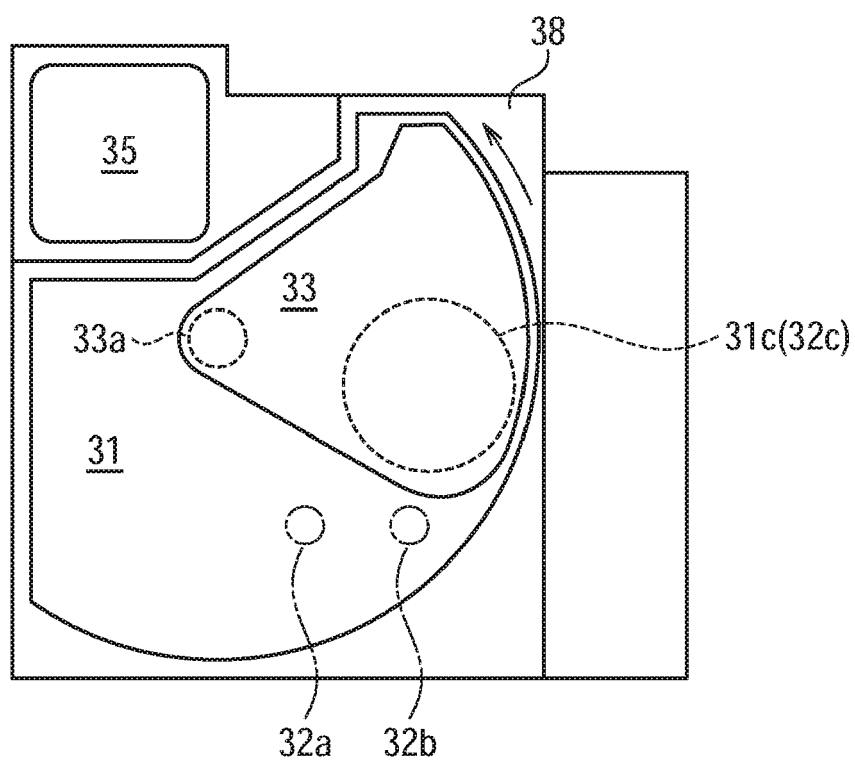


FIGURE 8

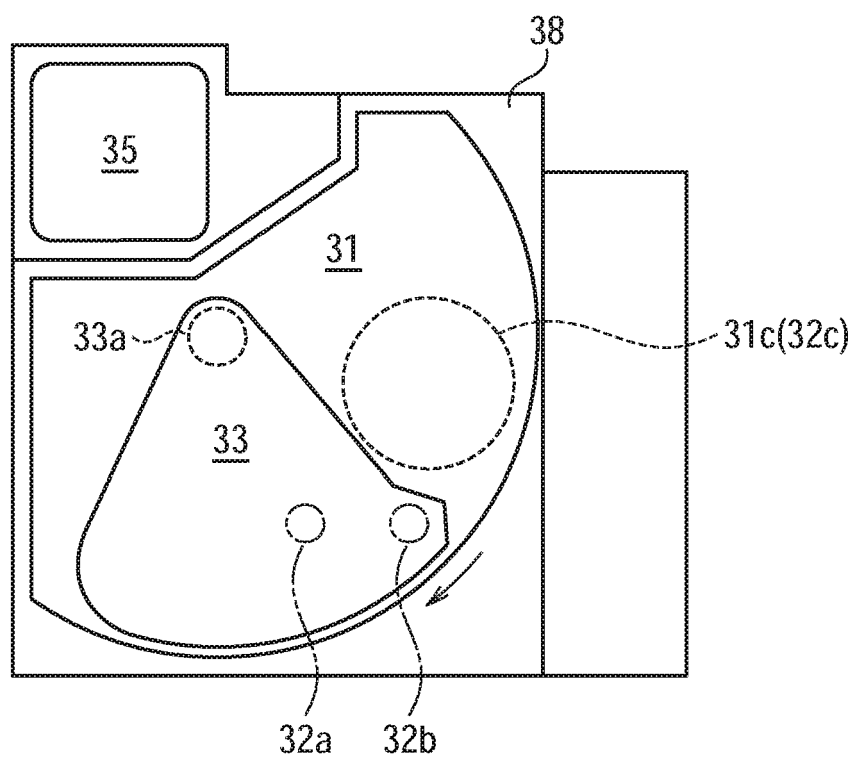
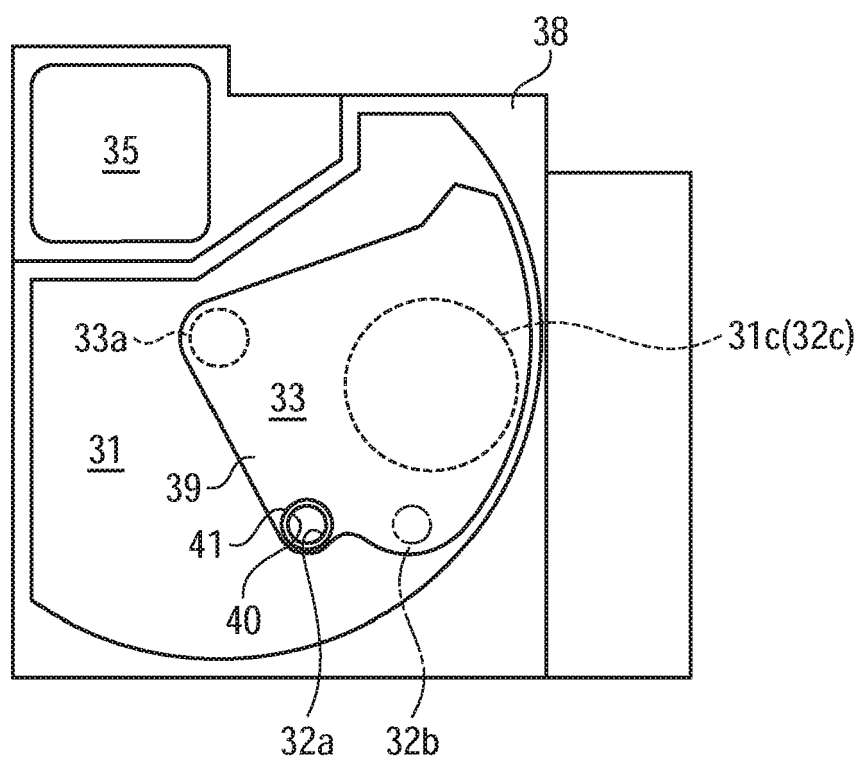


FIGURE 9



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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