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(54) **POT SPINNING MACHINE**

TOPFSPINMASCHINE

MÉTIER À FILER À POT

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(73) Proprietor: **Kabushiki Kaisha Toyota Jidoshokki Kariya-shi, Aichi 448-8671 (JP)**

(72) Inventors:

- **NAKAMURA, Yusuke**
Kariya-shi,
Aichi 448-8671 (JP)

- **TSUCHIDA, Daisuke**

Kariya-shi,
Aichi 448-8671 (JP)

- **SATO, Kohei**

Kariya-shi,
Aichi 448-8671 (JP)

(74) Representative: **TBK**

Bavariaring 4-6
80336 München (DE)

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Description

[0001] The present disclosure relates to a pot spinning machine.

BACKGROUND

[0002] A known pot spinning machine has a pot that has a cylindrical shape. The pot spinning machine delivers yarn through a yarn introduction pipe into a pot that is rotated at a high rotational speed, and winds the introduced yarn onto an inside wall of the pot by centrifugal force involved in rotation of the pot. The pot spinning machine gradually displaces a position of the yarn introduction pipe downward while reciprocating the yarn introduction pipe in a direction of a central axis of the pot to form a cake on the inside wall of the pot. The pot spinning machine performs yarn cutting to stop supply of the yarn to the yarn introduction pipe, and then rewinds the yarn onto a bobbin that is inserted into the pot. When the yarn cutting is performed in a state where a downward opening of the pot is opened, a part of the yarn that serves as a start point of rewinding (hereinafter called to as a rewinding start point) is pulled out of the pot and the yarn rewinding is likely to fail. The following will describe this in detail.

[0003] Before the yarn cutting, a predetermined tension is applied to the yarn delivered to the yarn introduction pipe. The tension of the yarn is released by the yarn cutting. An end portion of the yarn, which is produced by the yarn cutting, is discharged from the pot by the release of the tension of the yarn without adhering to the inside wall of the pot, and the discharged end portion of the yarn drags the yarn, which remains in the pot, out of the pot. The yarn, which ought to be deposited on the inside wall of the pot to serve as the rewinding start point, may be dragged out of the pot, and as a result, yarn rewinding onto the bobbin is likely to fail. The failure of the yarn rewinding may be caused by such a yarn that has been dragged out of the pot as described above and is wound around the yarn introduction pipe.

[0004] For example, Japanese Patent Application Publication No. 08-60430 mentions a pot spinning machine that includes a cylindrical pot having an opening that opens downward, a cylindrical housing having an opening that opens downward, an inner lid that closes the opening of the pot, and an outer lid that closes the opening of the housing. This pot spinning machine is configured such that the pot is rotated together with the inner lid.

[0005] In the pot spinning machine mentioned in Japanese Patent Application Publication No. 08-60430, the bobbin has to be inserted into the pot before the rewinding of the yarn of the cake in the pot onto the bobbin, but this has a following problem.

[0006] The outer lid closing the opening of the housing and the inner lid closing the opening of the pot have to be opened sequentially for the insertion of the bobbin

into the pot, and this requires the inner lid to be removed from the pot. However, if the rotation of the pot is stopped or rotational speed of the pot is decreased excessively for removal of the inner lid, the centrifugal force is disappeared or decreased, which leads to loosening of the cake. It is technically highly difficult to remove the inner lid from the pot while maintaining the rotational speed of the pot at a predetermined rotational speed or more to prevent the loosening of the cake. Additionally, if the yarn cutting is performed in a state where the inner lid is not attached to the pot and the opening of the pot is opened, the end portion of the yarn that is produced by the yarn cutting is discharged from the pot through the opening, which is likely to cause a failure of the yarn rewinding onto the bobbin as well.

[0007] The present disclosure, which has been made in light of the above-mentioned problem, is directed to providing a pot spinning machine wherein the success rate of yarn rewinding onto a bobbin is increased without a technological difficulty, such as removal of an inner lid from a rotating pot.

SUMMARY

[0008] In accordance with an aspect of the present disclosure, there is provided a pot spinning machine that includes a pot, a yarn introduction pipe, a fixed cover, and a lid. The pot has an opening that opens downward. The yarn introduction pipe introduces a yarn into the pot and has a yarn outlet from which the yarn is discharged into the pot at a bottom end of the yarn introduction pipe. The fixed cover surrounds the pot and has an opening that opens downward. The lid opens and closes the opening of the fixed cover. The lid has a projecting portion that is inserted into the pot through the opening of the pot when the opening of the fixed cover is closed by the lid. The projecting portion guides the yarn discharged from the yarn outlet of the yarn introduction pipe at yarn cutting to an inside wall of the pot.

[0009] Other aspects and advantages of the disclosure will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present disclosure together with objects and advantages thereof, may best be understood by reference to the following description of the embodiments together with the accompanying drawings in which:

FIG. 1 is a schematic view illustrating an exemplary configuration of a pot spinning machine according to a first embodiment of the present disclosure;

FIG. 2 is a plan view of a lid according to the first embodiment of the present disclosure;

FIG. 3 is a side view of the lid according to the first embodiment of the present disclosure;

FIG. 4 is a sectional view of the lid according to the first embodiment of the present disclosure taken along line IV-IV of FIG. 2;

FIG. 5 is a block diagram illustrating an exemplary configuration of a drive control system of the pot spinning machine according to the first embodiment of the present disclosure;

FIG. 6 is a flow chart illustrating a basic flow of a pot spinning method according to the first embodiment of the present disclosure;

FIG. 7 is a sectional view illustrating the pot spinning machine in a first state according to the first embodiment of the present disclosure;

FIG. 8 is a graph for explaining an operation of a yarn introduction pipe at a cake forming step;

FIG. 9 is a sectional view illustrating the pot spinning machine in a second state according to the first embodiment of the present disclosure;

FIG. 10 is a sectional view illustrating the pot spinning machine in a third state according to the first embodiment of the present disclosure;

FIG. 11 is a sectional view illustrating the pot spinning machine in a fourth state according to the first embodiment of the present disclosure;

FIG. 12 is a sectional view illustrating the pot spinning machine in a fifth state according to the first embodiment of the present disclosure;

FIG. 13 is a sectional view illustrating the pot spinning machine in a sixth state according to the first embodiment of the present disclosure;

FIG. 14 is a sectional view illustrating the pot spinning machine in a seventh state according to the first embodiment of the present disclosure;

FIG. 15 is a schematic view illustrating an exemplary configuration of a pot spinning machine according to a second embodiment of the present disclosure;

FIG. 16 is an inside view of a pot when viewed through an opening of the pot;

FIG. 17 is a view for explaining dimensions of components of the pot spinning machine according to the second embodiment of the present disclosure;

FIG. 18 is a view for explaining a situation where a string yarn is cut by a cutter;

FIG. 19 is a schematic view illustrating an exemplary configuration of a pot spinning machine according to a third embodiment of the present disclosure; and

FIG. 20 is a sectional view for explaining advantageous effects of the pot spinning machine according to the third embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0011] The following will describe embodiments of the present disclosure in detail with reference to the accompanying drawings.

First embodiment

20 <Configuration of pot spinning machine>

[0012] FIG. 1 is a schematic view illustrating a configuration of a pot spinning machine according to a first embodiment of the present disclosure.

25 **[0013]** As illustrated in FIG. 1, a pot spinning machine 1 includes a drafting device 10, a yarn suction pipe 12, a yarn introduction pipe 14, a pot 16, a fixed cover 18, a bobbin support part 20, and a lid 50. These elements cooperate to form a single spindle that represents a unit of spinning. The pot spinning machine 1 generally includes a plurality of spindles, but the following will focus on one of the spindles.

(Drafting device)

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[0014] The drafting device 10 is a device that draws out a yarn material. The drafting device 10 includes multiple pairs of rollers, such as a pair of back rollers 21, a pair of middle rollers 22, and a pair of front rollers 23. The pair of back rollers 21, the pair of middle rollers 22, and the pair of front rollers 23 are arranged in this order from upstream to downstream of a yarn material feed direction.

40 **[0015]** The pairs of rollers 21, 22, 23 are rotated by a drafting-device driving section that will be described later. When the rotational speeds of the pairs of rollers 21, 22, and 23 are compared by revolutions per minute (rpm), the rpm of the pair of middle rollers 22 is greater than the rpm of the pair of back rollers 21, and the rpm of the pair of front rollers 23 is greater than the rpm of the pair of middle rollers 22. As described above, the rpm of the pairs of rollers 21, 22, 23 are different from each other, and the drafting device 10 thinly draws out the yarn material by using the difference in rpm among the pairs of rollers 21, 22, 23, that is, the difference in rotational speed among the pairs of rollers 21, 22, 23.

(Yarn suction pipe)

[0016] The yarn suction pipe 12 draws a yarn 25 supplied by the drafting device 10, and feeds the drawn yarn 25 into the yarn introduction pipe 14. The yarn suction pipe 12 uses air swirl flow to introduce the yarn 25, which has been drawn out by the drafting device 10.

(Yarn introduction pipe)

[0017] The yarn introduction pipe 14 introduces the yarn 25, which has been fed from the drafting device 10 through the yarn suction pipe 12, into the pot 16. The yarn introduction pipe 14 has a long thin tube-like shape. The yarn introduction pipe 14 has a circular cross section in a direction perpendicular to a longitudinal direction of the yarn introduction pipe 14. The yarn introduction pipe 14 is disposed downstream of the drafting device 10, and is coaxial with the yarn suction pipe 12 and the pot 16. The yarn introduction pipe 14 penetrates through an upper portion of the pot 16 to be inserted into the pot 16. The yarn introduction pipe 14 has a yarn inlet 14a and a yarn outlet 14b at a top end and a bottom end of the yarn introduction pipe 14, respectively. The yarn 25 fed into the yarn introduction pipe 14 through the yarn inlet 14a passes through the yarn introduction pipe 14 and is discharged from the yarn outlet 14b of the yarn introduction pipe 14.

(Pot)

[0018] The pot 16 is used for yarn twisting, forming of a cake 24, and yarn rewinding. The cake 24 is a deposit of yarn that is formed on an inside wall 29 of the pot 16. The pot 16 has a cylindrical shape. The pot 16 is rotatable with respect to a central axis K of the pot 16. The central axis K of the pot 16 is parallel to a vertical direction. Accordingly, one side of the pot 16 is an upper side, and the other side is a lower side in the central axis K direction. The pot 16 has an opening 26 at a bottom end of the pot 16. The opening 26 of the pot 16 has a diameter equal to an inner diameter of the pot 16, and the opening 26 opens downward.

(Fixed cover)

[0019] The fixed cover 18 is disposed outward of the pot 16 and surrounds the pot 16. The fixed cover 18 is fixed to a fixing portion 27. The fixed cover 18 has a cylindrical shape, and has a diameter greater than that of the pot 16. The fixed cover 18 is coaxial with the pot 16. The fixed cover 18 has, at a top end of the fixed cover 18, an opening that is closed by the fixing portion 27. The fixed cover 18 has an opening 28 at a bottom end of the fixed cover 18. The opening 28 of the fixed cover 18 has a diameter equal to an inner diameter of the fixed cover 18, and the opening 28 opens downward. The opening 28 of the fixed cover 18 is disposed below the opening

26 of the pot 16.

(Bobbin support part)

[0020] The bobbin support part 20 supports a bobbin 30 below the pot 16. The bobbin support part 20 includes an elevating rail 31, a bobbin support member 32, and an air nozzle 33. The elevating rail 31 is moved up and down by a rail-driving section that will be described later. The bobbin support member 32 is attached to the elevating rail 31. The bobbin support member 32 is a portion of the bobbin support part 20 to which the bobbin 30 is attachable. The bobbin support member 32 is coaxial with the yarn introduction pipe 14 and the pot 16 such that the bobbin support member 32 faces the yarn introduction pipe 14 on the central axis K of the pot 16. Accordingly, the bobbin 30 faces the yarn introduction pipe 14 on the central axis K of the pot 16 in a state where the bobbin 30 is attached to the bobbin support member 32.

[0021] The bobbin 30 is tapered such that an outer diameter of the bobbin 30 changes sequentially from one end to the other end of the bobbin 30 in a direction of a central axis of the bobbin 30. The bobbin 30 is supported by the bobbin support member 32 such that the bobbin 30 stands on the bobbin support member 32 vertically. The outer diameter of the bobbin 30 is smaller than the smallest diameter of the cake 24 formed on the inside wall 29 of the pot 16. This configuration prevents the bobbin 30 from contacting the cake 24 when the bobbin 30 is inserted into the pot 16 through the opening 26 of the pot 16.

[0022] The air nozzle 33 blows air onto a yarn wound onto an inside wall area 29a of the pot 16. The inside wall area 29a of the pot 16 is a part of the inside wall 29 of the pot 16, and is located closer to the opening 26 of the pot 16 than an end 24b of the cake 24, which is formed on the inside wall 29 of the pot 16, on the winding end side is to the opening 26. A part of the yarn that serves as the rewinding start point for the bobbin 30 is wound onto the inside wall area 29a of the pot 16. The air nozzle 33 blows compressed air to discharge a part of the yarn serving as the rewinding start point from the pot 16.

[0023] The rewinding start point is a part of the yarn first rewound onto the bobbin 30 to form the cake 24. Accordingly, the yarn rewinding onto the bobbin 30 is started when a part of the yarn that serves as the rewinding start point is rewound onto the bobbin 30. In this embodiment, the rewinding start point is a part of the yarn, which is wound onto the inside wall 29 of the pot 16, located between the end 24b of the cake 24 on the winding end side and the opening 26 of the pot 16 in the direction of the central axis K of the pot 16. The end 24b of the cake 24 on the winding end side corresponds to an end of the cake 24 on the opening 26 side in the direction of the central axis K of the pot 16.

[0024] The air nozzle 33 is attached to the elevating rail 31 in the bobbin support part 20. The air nozzle 33

is disposed in a vicinity of the bobbin support member 32 such that the air nozzle 33 stands on the elevating rail 31 vertically.

[0025] The air nozzle 33 has an ejecting port 33a for ejecting compressed air. The ejecting port 33a of the air nozzle 33 is formed in a vicinity of a top end of the air nozzle 33. The air nozzle 33 is driven by an air-nozzle driving section, which will be described later, to eject compressed air from the ejecting port 33a such that the compressed air is obliquely blown onto the inside wall area 29a of the pot 16.

(Lid)

[0026] The lid 50 opens and closes the opening 28 of the fixed cover 18. The lid 50 is driven by a lid driving section, which will be described later, to be placed at a close position to close the opening 28 of the fixed cover 18 and at an open position to open the opening 28 of the fixed cover 18. The lid driving section, for example, includes an unillustrated elevating mechanism for moving the lid 50 in the vertical direction, i.e., an up-and-down direction, which is parallel to the direction of the central axis K of the pot 16 and an unillustrated horizontal movement mechanism for moving the lid 50 in the horizontal

[0027] FIG. 2 is a plan view of the lid according to the first embodiment of the present disclosure. FIG. 3 is a side view of the lid according to the first embodiment of the present disclosure. FIG. 4 is a sectional view of the lid taken along line IV-IV of FIG. 2.

[0028] The lid 50 is placed at the close position to keep the opening 28 of the fixed cover 18 closed. The lid 50 has a function to guide the yarn to prevent an end portion of the yarn from being discharged from the pot 16 through the opening 26 of the pot 16 at the yarn cutting. In the following description, the end portion of the yarn is a part of the yarn that includes a distal end of the yarn produced by the yarn cutting, and this end portion has a length from a yarn cutting position at which the yarn cutting is performed to the yarn outlet 14b of the yarn introduction pipe 14. In this embodiment, the yarn cutting is performed by the control of the rotation of the pairs of rollers of the drafting device 10, so that the yarn cutting position is determined depending on positions of the rollers of the drafting device 10.

[0029] The lid 50 includes a main body 51 having a

plate-like shape and a projecting portion 52 having a ring shape. The lid 50 is, preferably, an integral resin molding part. However, the material of the lid 50 is not limited to a resin material, and may be, for example, a metallic material or a ceramic material. That is, the material of the lid 50 is not limited to a specific material.

[0030] The main body 51 has a flat circular plate-like shape in a plan view. The main body 51 has a diameter D1 (FIG. 3) that is set corresponding to an outer diameter of the fixed cover 18 such that the opening 28 of the fixed cover 18 is closed by the lid 50. The diameter D1 of the main body 51 is, at least, equal to or greater than the inner diameter of the fixed cover 18 so that the lid 50 can close the opening 28 of the fixed cover 18. In this embodiment, for example, the diameter D1 of the main body 51 is equal to the outer diameter of the fixed cover 18.

[0031] The lid 50 is placed at the close position as illustrated in FIG. 1. The main body 51 is disposed such that an outer peripheral portion of a top surface 51a of the main body 51 is in contact with the bottom end of the fixed cover 18. The top surface 51a of the main body 51 faces a bottom end 16a of the pot 16, and a bottom surface 51b of the main body 51 faces the bobbin support member 32.

[0032] The projecting portion 52 is disposed on the top surface 51a of the main body 51. The projecting portion 52 is projected from the top surface 51a of the main body 51 by a projection length La in a thickness direction of the lid 50. The projecting portion 52 has a recess 53 (FIG. 4) inside the projecting portion 52. The projecting portion 52 has an outer diameter D2 (FIG. 3) that is smaller than an opening diameter of the opening 26 of the pot 16. The projecting portion 52 has a projecting end 52a that is rounded so as to have an arc shape in a sectional view as illustrated in FIG. 4. The projecting end 52a of the projecting portion 52 has a constant height as a whole in a circumferential direction of the projecting portion 52. However, the projecting end 52a of the projecting portion 52 does not necessarily have a constant height as a whole.

[0033] As illustrated in FIG. 1, the projecting portion 52 is inserted into the pot 16 through the opening 26 of the pot 16 when the opening 28 of the fixed cover 18 is closed by the lid 50 that is placed at the close position. In this state, the projecting portion 52 functions to guide the yarn discharged from the yarn outlet 14b of the yarn introduction pipe 14 at the yarn cutting to the inside wall 29 of the pot 16.

[0034] When the opening 28 of the fixed cover 18 is closed by the lid 50, the projecting portion 52 is inserted into the pot 16 by an insert length Lb (FIG. 1) of 0.1 mm or more from the bottom end 16a of the pot 16. Securing the insert length Lb of the projecting portion 52 of 0.1 mm or more efficiently restrains the end portion of the yarn produced by the yarn cutting from being discharged from the pot 16. The insert length Lb of the projecting portion 52 may be increased or decreased by change of the projection length La of the projecting portion 52. However,

if the insert length L_b of the projecting portion 52 is increased excessively, an area necessary for forming the rewinding start point may not be secured enough in the vicinity of the bottom end 16a of the pot 16. Accordingly, the upper limit of the insert length L_b of the projecting portion 52 is preferably set within a range that allows an area necessary for the forming the rewinding start point to be secured.

[0035] FIG. 5 is a block diagram illustrating an exemplary configuration of a drive control system of the pot spinning machine according to the first embodiment of the present disclosure.

[0036] As illustrated in FIG. 5, the pot spinning machine 1 includes a controller 61, a drafting-device driving section 62, a yarn-introduction-pipe driving section 63, a pot driving section 64, a rail driving section 65, a nozzle driving section 66, and a lid driving section 67.

(Controller)

[0037] The controller 61 centrally controls the whole operations of the pot spinning machine 1. The controller 61 is electrically connected to the drafting-device driving section 62, the yarn-introduction-pipe driving section 63, the pot driving section 64, the rail driving section 65, the nozzle driving section 66, and the lid driving section 67 for control.

(Drafting-device driving section)

[0038] The drafting-device driving section 62 rotates the pair of back rollers 21, the pair of middle rollers 22, and the pair of front rollers 23, at respective predetermined rotational speed. The drafting-device driving section 62 drives to rotate the pair of back rollers 21, the pair of middle rollers 22, and the pair of front rollers 23 by a drafting device driving signal provided to the drafting-device driving section 62 from the controller 61.

(Yarn-introduction-pipe driving section)

[0039] The yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14. The yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14 to move up and down. The yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14 to move up and down by a yarn-introduction-pipe driving signal provided to the yarn-introduction-pipe driving section 63 from the controller 61.

(Pot driving section)

[0040] The pot driving section 64 rotates the pot 16. The pot driving section 64 drives to rotate the pot 16 with respect to the central axis K of the pot 16 by a pot driving signal provided to the pot driving section 64 from the controller 61.

(Rail driving section)

[0041] The rail driving section 65 elevates the elevating rail 31. The rail driving section 65 drives the elevating rail 31 to move up and down such that the bobbin 30 attached to the bobbin support member 32 is moved up and down together with the air nozzle 33. The rail driving section 65 drives the elevating rail 31 to move up and down by a rail driving signal provided to the rail driving section 65 from the controller 61.

(Nozzle driving section)

[0042] The nozzle driving section 66 drives the air nozzle 33. The nozzle driving section 66 drives the air nozzle 33 to eject compressed air from the ejecting port 33a of the air nozzle 33. The nozzle driving section 66 drives the air nozzle 33 to eject compressed air from the ejecting port 33a by a nozzle driving signal provided to the nozzle driving section 66 from the controller 61.

(Lid driving section)

[0043] The lid driving section 67 drives the lid 50 to open and close the opening 28 of the fixed cover 18. The lid driving section 67 drives the lid 50 to be placed at the close position to close the opening 28 of the fixed cover 18 and placed at the open position to open the opening 28 of the fixed cover 18. The lid driving section 67 drives the lid 50 by a lid open/close driving signal provided to the lid driving section 67 from the controller 61.

(Pot spinning method)

[0044] FIG. 6 is a flow chart illustrating a basic flow of a pot spinning method according to the first embodiment of the present disclosure.

[0045] As illustrated in FIG. 6, the pot spinning method includes a draw-out step S1, a cake forming step S2, and a rewinding step S3.

[0046] The draw-out step S1 is a step wherein a yarn material, such as a roving, is drawn out into a predetermined thickness. The cake forming step S2 is a step to form the cake 24 wherein the yarn, which has been drawn out into a predetermined thickness at the draw-out step S1, is wound onto the inside wall 29 of the pot 16. The rewinding step S3 is a step wherein the yarn of the cake 24 is rewound onto the bobbin 30. The following will describe the operation of the pot spinning machine 1 performed at each step.

[0047] Before the pot spinning machine 1 is started, the yarn introduction pipe 14 is arranged near the yarn suction pipe 12, and the bobbin 30 is attached to the bobbin support member 32 of the bobbin support part 20 and is arranged below the pot 16 to be evacuated from the lid 50. The lid 50 is placed at the close position. Accordingly, the opening 28 of the fixed cover 18 is closed by the lid 50. The projecting portion 52 of the lid 50 is

arranged such that the projecting portion 52 is inserted into the pot 16.

(Draw-out step)

[0048] The draw-out step S1 is performed by the drafting device 10. The drafting-device driving section 62 drives to rotate the pair of back rollers 21, the pair of middle rollers 22, and the pair of front rollers 23 at respective predetermined rotational speeds by a drafting device driving signal provided to the drafting-device driving section 62 from the controller 61. Accordingly, the yarn material, such as a roving, is delivered by the rotations of the pairs of rollers 21, 22, 23.

[0049] The controller 61 sets the rotational speed of the pair of back rollers 21 to be lower than the rotational speed of the pair of middle rollers 22, and sets the rotational speed of the pair of middle rollers 22 to be lower than the rotational speed of the pair of front rollers 23. Accordingly, the yarn is drawn out between the pair of back rollers 21 and the pair of middle rollers 22 by differences in rotational speed between the pairs of rollers 21, 22. In a similar way, the yarn is drawn out between the pair of middle rollers 22 and the pair of front rollers 23 by differences in rotational speed between the pairs of rollers 22, 23.

[0050] As a result, the yarn material, such as a roving, is passed through the pair of back rollers 21, the pair of middle rollers 22, and the pair of front rollers 23 sequentially to be drawn out into a predetermined thickness. The yarn 25, which has been drawn out in this way, is introduced into the yarn suction pipe 12 by air swirl flow, and introduced into the yarn introduction pipe 14 through the yarn inlet 14a.

[0051] For the start of the draw-out step S1, the controller 61 provides a pot driving signal to the pot driving section 64 to rotate the pot 16 at a predetermined rotational speed. In contrast, the fixed cover 18 is stationary regardless of the rotation of the pot 16.

(Cake forming step)

[0052] The cake forming step S2 is performed with the yarn introduction pipe 14 and the pot 16. The yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14 to move down a predetermined amount by a yarn introduction pipe driving signal provided to the yarn-introduction-pipe driving section 63 from the controller 61. The pot driving section 64 drives the pot 16 to keep rotating by a pot driving signal provided to the pot driving section 64 from the controller 61. Since the yarn introduction pipe 14 is moved down, the yarn introduction pipe 14 is located away from the yarn suction pipe 12. The yarn 25 introduced from the yarn suction pipe 12 into the yarn introduction pipe 14 is discharged from the yarn outlet 14b of the yarn introduction pipe 14.

[0053] The yarn 25 discharged from the yarn outlet 14b of the yarn introduction pipe 14 is pressed onto the inside

wall 29 of the pot 16 by centrifugal force generated by the rotation of the pot 16. The yarn 25 pressed onto the inside wall 29 of the pot 16 is twisted by the rotation of the pot 16. As a result, the yarn 25 discharged from the yarn outlet 14b of the yarn introduction pipe 14 is wound onto the inside wall 29 of the pot 16 with the yarn 25 twisted by the rotation of the pot 16.

[0054] The yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14 by a yarn introduction pipe driving signal to displace a position of the yarn introduction pipe 14 relatively downward while driving the yarn introduction pipe 14 to reciprocate in the up-and-down direction at predetermined intervals as illustrated in FIG. 7. This winds and deposits the yarn 25 onto the inside wall 29 of the pot 16 while displacing a winding position of the yarn 25, so that the cake 24 is formed on the inside wall 29 of the pot 16.

[0055] FIG. 8 is a graph for explaining the operation of the yarn introduction pipe at the cake forming step. In FIG. 8, the vertical axis represents a position of the yarn introduction pipe in the direction of the central axis of the pot, and the horizontal axis represents time.

[0056] In FIG. 8, first, the yarn introduction pipe 14 moves down to a position P1 and moves up to a position P2 from the position P1, and the yarn introduction pipe 14 then moves down to a position P3 and moves up to a position P4 from the position P3. That is, the yarn introduction pipe 14 reciprocates in the up-and-down direction. Each of a term T1 wherein the yarn introduction pipe 14 moves from the position P1 to the position P3 and a term T2 wherein the yarn introduction pipe 14 moves from the position P2 to the position P4 defines one cycle of the reciprocating motion of the yarn introduction pipe 14. In order to displace the position of the yarn introduction pipe 14 relatively downward, the position P3 is lower than the position P1 and the position P4 is lower than the position P2. The amount of displacement between the position P1 and the position P3 in the up-and-down direction is referred to as a displacement amount H1. The amount of displacement between the position P2 and the position P4 in the up-and-down direction is referred to as a displacement amount H2. Each of the displacement amount H1 and the displacement amount H2 defines a displacement step of the yarn introduction pipe 14 in one cycle. That is, the yarn introduction pipe 14 is displaced relatively downward by a constant displacement step while reciprocally moving in the up-and-down direction in a constant cycle. Such motion of the yarn introduction pipe 14 continues until the yarn introduction pipe 14 reaches a position Pm. In this case, the position P1 defines an end 24a of the cake 24 on the winding start side illustrated in FIG. 1, and the position Pm defines the end 24b of the cake 24 on the winding end side illustrated in FIG. 1.

[0057] The controller 61 provides a yarn introduction pipe driving signal to the yarn-introduction-pipe driving section 63 to drive the yarn introduction pipe 14 as illustrated in FIGS. 7 and 8. This forms the cake 24 in a form

illustrated in FIG. 7 on the inside wall 29 of the pot 16. In this embodiment, the following operation is performed after the cake 24 is formed by the operation of the yarn introduction pipe 14 at the cake forming step S2.

[0058] The controller 61 moves down the yarn introduction pipe 14 by a predetermined amount Lh after the yarn introduction pipe 14 has reached the position Pm. This allows a yarn part 25a, which serves as the rewinding start point for the bobbin 30, to be wound onto the inside wall area 29a that is closer to the opening 26 of the pot 16 than the end 24b of the cake 24 on the winding end side is to the opening 26 of the pot 16 as illustrated in FIG. 9. The yarn part 25a may include a single yarn layer, or may include yarn layers. For the yarn part 25a to be formed of a single yarn layer, the yarn cutting has to be performed at least at a state where the yarn introduction pipe 14 has moved down from the position Pm to a position Pn. For the yarn part 25a to be formed of yarn layers, the yarn cutting is performed at least at a state where the yarn introduction pipe 14 has moved once such that the yarn introduction pipe 14 moves down from the position Pm to the position Pn and further moves up from the position Pn. The predetermined amount Lh is, preferably, not less than 3 mm and not more than 7 mm.

[0059] The following will describe the difference between "yarn cutting" and "yarn breakage".

[0060] The yarn cutting is intentionally performed when a predetermined amount of the yarn 25 is wound onto the inside wall 29 of the pot 16. In contrast, the yarn breakage is a phenomenon that the yarn 25 is broken for any reason before the predetermined amount of the yarn 25 is wound onto the inside wall 29 of the pot 16.

[0061] The yarn cutting is performed under control of the controller 61. Specifically, the controller 61 controls the drafting-device driving section 62 such that the drafting-device driving section 62 drives the pair of back rollers 21 and the pair of middle rollers 22 to stop while driving the pair of front rollers 23 to keep rotating. This control forces the yarn 25 to be cut downstream of the pair of middle rollers 22. The cake forming step S2 ends when the cake forming and the yarn cutting are performed as described above.

(Technical importance of lid)

[0062] The following will describe the technical importance of the lid 50.

[0063] The lid 50 opens and closes the opening 28 of the fixed cover 18 during the rotation of the pot 16, so that the lid 50 exhibits the following advantageous effects (1) to (3):

- (1) to reduce windage loss in the pot 16;
- (2) to secure safety around the pot 16; and
- (3) to restrain cotton fly from entering the pot 16.

[0064] The lid 50 fulfills a function to restrain the yarn discharged from the yarn outlet 14b of the yarn introduc-

tion pipe 14 at the yarn cutting from being discharged from the pot 16, and fulfills a function to guide the yarn discharged from the yarn outlet 14b of the yarn introduction pipe 14 at the yarn cutting such that the yarn is adhered to the inside wall area 29a of the pot 16. The following will describe these functions in detail.

[0065] First, the lid 50 remains at the close position until the yarn cutting is performed after the cake forming is started. Accordingly, the cake forming and the yarn cutting are performed in a state where the opening 28 of the fixed cover 18 is closed by the lid 50. The projecting portion 52 of the lid 50 is inserted into the pot 16 in a state where the opening 28 of the fixed cover 18 is closed by the lid 50.

[0066] If the yarn cutting is performed in such state, movement of the end portion of the yarn, which is produced by the yarn cutting, is accelerated downward. The end portion of the yarn discharged from the yarn outlet 14b of the yarn introduction pipe 14 is sequentially adhered to the inside wall 29 of the pot 16 while the tension is applied to the yarn, but a yarn end portion 25b is fallen out of the yarn outlet 14b of the yarn introduction pipe 14 by the release of the tension applied to the yarn as illustrated in FIG. 10, and is temporarily received by the recess 53 inside the projecting portion 52 that is inserted into the pot 16 through the opening 26 of the pot 16.

[0067] Then, the yarn end portion 25b is guided to the inside wall 29 of the pot 16 by the projecting portion 52. Specifically, the yarn end portion 25b received inside the projecting portion 52 is involved in the rotation of the pot 16 and adhered to the inside wall 29 of the pot 16 beyond the projecting end 52a of the projecting portion 52. The yarn end portion 25b beyond the projecting end 52a of the projecting portion 52 is guided along the projecting end 52a to the inside wall 29 of the pot 16. Accordingly, the yarn end portion 25b is adhered to the inside wall 29 of the pot 16 at a height approximately equal to that of the projecting end 52a of the projecting portion 52. This allows the yarn end portion 25b to be adhered to the inside wall area 29a of the pot 16, that is, at a position where the rewinding start point is desired to be formed, as illustrated in FIG. 11. Therefore, this ensures that the yarn to form the rewinding start point, including the yarn end portion 25b that is produced by the yarn cutting, is wound onto the inside wall area 29a of the pot 16.

[0068] The controller 61 controls the drafting-device driving section 62 and the yarn-introduction-pipe driving section 63, preferably, such that the yarn cutting is performed in a state where the yarn outlet 14b of the yarn introduction pipe 14 is placed at a height equal to that of the projecting end 52a of the projecting portion 52 of the lid 50, or in a state where the yarn outlet 14b is placed below the projecting end 52a. This control ensures that the yarn end portion 25b produced by the yarn cutting is received by the recess 53 inside the projecting portion 52. Accordingly, this control stabilizes a position at which the yarn end portion 25b is adhered to the inside wall 29 of the pot 16.

[0069] At the time of implementing the present disclosure, the yarn cutting may be performed in a state where the yarn outlet 14b of the yarn introduction pipe 14 is placed at a height above the projecting end 52a of the projecting portion 52 of the lid 50. In this case, the projecting portion 52 of the lid 50 is inserted into the pot 16 when the opening 28 of the fixed cover 18 is closed by the lid 50, so that the yarn end portion 25b produced by the yarn cutting is not discharged from the pot 16. However, in order to stabilize the position at which the yarn end portion 25b is adhered to the inside wall 29 of the pot 16, it is preferred that the yarn cutting is performed in a state where the yarn outlet 14b of the yarn introduction pipe 14 is placed at a height equal to that of the projecting end 52a of the projecting portion 52 of the lid 50 or in a state where the yarn outlet 14b of the yarn introduction pipe 14 is placed at a height below the projecting end 52a.

(Rewinding step)

[0070] The rewinding step S3 is performed with the pot 16, the bobbin 30, and the air nozzle 33. The rewinding step S3 is performed while the pot 16 keeps rotating. At the rewinding step S3, the lid driving section 67 drives the lid 50 to move from the close position to the open position by the lid driving signal provided to the lid driving section 67 from the controller 61. Accordingly, the opening 28 of the fixed cover 18 is opened as illustrated in FIG. 12.

[0071] Further at the rewinding step S3, the yarn-introduction-pipe driving section 63 drives the yarn introduction pipe 14 to move up by a yarn introduction pipe driving signal provided to the yarn-introduction-pipe driving section 63 from the controller 61. Accordingly, the yarn introduction pipe 14 is evacuated to a position so as not to contact the bobbin 30 before the bobbin 30 is inserted. Furthermore, at the rewinding step S3, the rail driving section 65 drives the elevating rail 31 to move up by a rail driving signal provided to the rail driving section 65 from the controller 61. Accordingly, the bobbin 30 attached to the bobbin support member 32 and the air nozzle 33 attached to the elevating rail 31 are moved up together. The bobbin 30 and the air nozzle 33 are inserted into the pot 16 sequentially through the opening 28 of the fixed cover 18 and the opening 26 of the pot 16.

[0072] After the rail driving section 65 drives to insert the bobbin 30 into the pot 16, the nozzle driving section 66 drives the air nozzle 33 to eject compressed air 34 by a nozzle driving signal provided to the nozzle driving section 66 from the controller 61 as illustrated in FIG. 13. The ejecting time of the compressed air 34 is set, preferably, for example, within a range of 0.2 seconds to 2 seconds. The air nozzle 33 blows the compressed air 34 onto the inside wall 29 of the pot 16 obliquely downward. The compressed air 34 is blown onto a part of the yarn wound onto the inside wall area 29a of the pot 16, i.e., the yarn end portion 25b that serves as the rewinding

start point for the bobbin 30. Accordingly, the yarn end portion 25b is pushed by the compressed air 34 and discharged from the pot 16 through the opening 26 of the pot 16.

[0073] After the yarn end portion 25b is discharged from the pot 16 by the compressed air 34 blown from the air nozzle 33, the yarn end portion 25b is late involved in the rotation of the pot 16 and wound onto the bobbin 30. This allows the yarn rewinding onto the bobbin 30 to be started after the bobbin 30 is surely inserted into the pot 16.

[0074] After all the yarn 25 of the cake 24 is rewound onto the bobbin 30, as illustrated in FIG. 14, the rail driving section 65 drives the elevating rail 31 to move down by a rail driving signal provided from the controller 61 to the rail driving section 65. This ends the rewinding step S3.

[0075] The bobbin 30 onto which a predetermined amount of the yarn 25 is rewound, i.e., the full bobbin 30 is achieved by the above-described operations. After that, the full bobbin 30 is removed from the bobbin support member 32, and an empty bobbin 30 is attached to the bobbin support member 32. The lid 50 is driven by the lid driving section 67 to be placed at the close position. Then, the above-described operation is repeated.

<Advantageous effects of the first embodiment

[0076] In the first embodiment of the present disclosure, the lid 50 is disposed to open and close the opening 28 of the fixed cover 18, and the yarn is guided to the inside wall 29 of the pot 16 by the projecting portion 52 that is inserted into the pot 16 when the opening 28 of the fixed cover 18 is closed by the lid 50. This configuration ensures that the yarn serving as the rewinding start point is wound onto the inside wall area 29a of the pot 16. Accordingly, the success rate of the yarn rewinding onto the bobbin 30 is increased without a technological difficulty, such as removal of an inner lid from a rotating pot.

[0077] In the first embodiment of the present disclosure, the insert length Lb of the projecting portion 52 of 0.1 mm or more from the bottom end 16a of the pot 16 is secured when the opening 28 of the fixed cover 18 is closed by the lid 50. This enables the projecting portion 52 to effectively restrain the yarn end portion 25b produced by the yarn cutting from being discharged from the pot 16.

[0078] In the first embodiment of the present disclosure, the controller 61 controls the drafting-device driving section 62 and the yarn-introduction-pipe driving section 63 such that the yarn cutting is performed in a state where the yarn outlet 14b of the yarn introduction pipe 14 is placed at a height equal to that of the projecting end 52a of the projecting portion 52 of the lid 50, or in a state where the yarn outlet 14b is placed below the projecting end 52a of the projecting portion 52. This control stabilizes a position at which the yarn end portion 25b is adhered to the inside wall 29 of the pot 16.

Second embodiment

[0079] When the yarn cutting is performed as described above, a part of the yarn that has fallen out of the yarn outlet 14b of the yarn introduction pipe 14 may remain in a space in the pot 16 in a state where the part of the yarn is away from the inside wall 29 of the pot 16. Such yarn that remains away from the inside wall 29 of the pot 16 is referred to as a string. In the description, the yarn that forms the string is referred to as a string yarn. The string yarn is curved by centrifugal force involved in the rotation of the pot 16, but exists in isolation from the yarn wound onto the inside wall 29 of the pot 16.

[0080] If the string yarn exists in the space in the pot 16 as described above, for example, the string yarn may contact an outer peripheral surface of the yarn introduction pipe 14 and may be wound onto the yarn introduction pipe 14. Furthermore, for example, the string yarn may contact an outer peripheral surface of the bobbin 30 that is being inserted into the pot 16, so that the yarn rewinding onto the bobbin 30 may be started sooner than expected. In any case, the yarn rewinding onto the bobbin 30 may result in failure.

<Configuration of pot spinning machine>

[0081] In the second embodiment of the present disclosure, as illustrated in FIG. 15, the pot spinning machine 1 includes a cutter 71 attached to the yarn introduction pipe 14 in order to prevent a failure of the yarn rewinding due to the presence of the string yarn, and further includes a guiding member 72 to prevent the yarn end from being wound onto the yarn introduction pipe 14 at the yarn breakage, and the lid 50 has the recess 53 of a predetermined size corresponding to the cutter 71 and the guiding member 72. In the second embodiment of the present disclosure, like reference numerals denote the like elements or parts of the pot spinning machine used in the description of the first embodiment and the detailed description of such elements or parts will be omitted.

(Cutter)

[0082] The cutter 71 is disposed to cut a string yarn 25c (FIG. 16) that exists in the space in the pot 16 and is in isolation from the inside wall 29 of the pot 16. The cutter 71 has a disc shape. The cutter 71 has a blade 71a that is formed over the whole outer peripheral portion of the cutter 71. The blade 71a of the cutter 71 has a circular shape when viewed from a direction of a central axis of the yarn introduction pipe 14. The blade 71a of the cutter 71 is sharp so as to cut the yarn 25. The cutter 71 may be made of a metallic material, such as cemented carbide.

[0083] The cutter 71 has a hole in a central portion, and a diameter of the hole corresponds to an outer diameter of the yarn introduction pipe 14. The yarn intro-

duction pipe 14 is inserted through the hole. An outer diameter of the cutter 71 is smaller than a smallest inner diameter of the cake 24 so that the blade 71a of the cutter 71 does not contact the cake 24.

(Guiding member)

[0084] The guiding member 72 is disposed at a bottom end portion of the yarn introduction pipe 14. The guiding member 72 has a circular truncated cone shape, and a bottom diameter of the guiding member 72 is smaller than a top diameter of the guiding member 72 in the direction of the central axis of the yarn introduction pipe 14. The guiding member 72 has a tapered surface 72a formed of an outer peripheral surface of the guiding member 72. In other words, the guiding member 72 has the tapered surface 72a on an outer periphery of the guiding member 72. A top surface of the guiding member 72 is attached firmly to a bottom surface of the cutter 71. In other words, the bottom surface of the cutter 71 is in contact with a top end of the guiding member 72 in the direction of the central axis of the yarn introduction pipe 14. The tapered surface 72a is formed to prevent the yarn end from being wound onto the yarn introduction pipe 14 at the yarn breakage.

[0085] The guiding member 72 is formed of, for example, a ceramic material or a metallic material. The metallic material allows the yarn introduction pipe 14 and the guiding member 72 to be formed integrally. In this case, the metallic material may be stainless steel. When the yarn introduction pipe 14 and the guiding member 72 are formed separately, the yarn introduction pipe 14 may be fixed to the guiding member 72 by means of adhesive joining, screwing, press fitting, or the like through a through hole that is formed through the guiding member 72 and has a diameter corresponding to the outer diameter of the yarn introduction pipe 14. On the other hand, the cutter 71 only has to be fixed, by means of screwing, adhesive joining, or the like, to the guiding member 72 that is formed integrally with the yarn introduction pipe 14 or fixed to the yarn introduction pipe 14. The cutter 71 may be directly fixed to the yarn introduction pipe 14.

(Lid)

[0086] The lid 50 includes the main body 51, the projecting portion 52, and the recess 53 integrally. The recess 53 is formed inside the projecting portion 52 such that the lid 50 is prevented from interfering with the cutter 71 and the guiding member 72. The recess 53 is recessed lower than the top surface 51a and the bottom surface 51b of the main body 51 as illustrated in FIG. 17. The recess 53 has a depth Lc from the projecting end 52a of the projecting portion 52, and the depth Lc of the recess 53 is greater than the projection length La of the projecting portion 52. The depth Lc of the recess 53 is greater than a distance Ld between the bottom end of the yarn introduction pipe 14 and the blade 71a of the cutter 71.

An inner diameter D3 of the recess 53 is greater than an outer diameter D4 of the cutter 71. When a bottom end of the guiding member 72 is arranged below the bottom end of the yarn introduction pipe 14, the distance Ld is defined by a distance between the bottom end of the guiding member 72 and the blade 71a of the cutter 71.

<Operation of pot spinning machine>

[0087] In the second embodiment of the present disclosure, the yarn cutting is performed after the yarn introduction pipe 14 is operated at the cake forming step S2 as illustrated in FIGS. 7 and 8. At this time, as illustrated in FIG. 16, a part of the yarn that is fallen out of the yarn outlet 14b of the yarn introduction pipe 14 may become the string yarn 25c and remain in the pot 16. Opposite ends of the string yarn 25c are supported such that the opposite ends of the string yarn 25c are caught by the yarn 25 wound onto the inside wall 29 of the pot 16. If the string yarn 25c exists in the pot 16 in such a way, as described above, the string yarn 25c may contact the outer peripheral surface of the yarn introduction pipe 14 or the outer peripheral surface of the bobbin 30, which leads to a failure of rewinding. In the pot spinning machine 1 according to the second embodiment, therefore, the yarn introduction pipe 14 is moved down by a predetermined amount after the yarn cutting performed by the drafting device 10 so that the string yarn 25c is cut by the cutter 71.

[0088] The following will describe a situation where the string yarn 25c is cut by the cutter 71.

[0089] When the yarn introduction pipe 14 is moved down in a state where the string yarn 25c exists in the pot 16, the string yarn 25c is guided by the tapered surface 72a of the guiding member 72 and contacts the cutter 71 as illustrated in FIG. 18, and the string yarn 25c is finally cut by the blade 71a of the cutter 71. After the string yarn 25c is cut, a yarn of the string yarn 25c is pressed onto the inside wall 29 of the pot 16 by centrifugal force involved in the rotation of the pot 16. As a result, the string yarn 25c is disappeared from the space in the pot 16. The string yarn 25c is cut by the cutter 71 in a state where the opening 28 of the fixed cover 18 is closed by the lid 50. Accordingly, the string yarn 25c cut by the cutter 71 is not likely to be discharged from the pot 16.

[0090] The string yarn 25c is formed at a height that is slightly upper than or approximately equal to that of the projecting end 52a of the projecting portion 52 of the lid 50. Accordingly, the yarn introduction pipe 14 needs to be further moved down for the cutting of the string yarn 25c by the cutter 71 after the yarn cutting is performed. In this state, if the depth Lc of the recess 53 is equal to the projection length La of the projecting portion 52, the bottom end of the yarn introduction pipe 14 may come up against a bottom surface of the recess 53, which may prevent the cutter 71 from contacting the string yarn 25c for cutting.

[0091] In contrast, when the depth Lc of the recess 53

is, at least, greater than the projection length La of the projecting portion 52, a distance for downward movement of the yarn introduction pipe 14 is secured more largely for the cutting of the string yarn 25c. This allows the blade 71a of the cutter 71 to contact the string yarn 25c easily. When the inner diameter D3 of the recess 53 is greater than the outer diameter D4 of the cutter 71, the blade 71a of the cutter 71 is prevented from interfering with the projecting portion 52 of the lid 50. Furthermore, when the depth Lc of the recess 53 is greater than the distance Ld, the cutter 71 is allowed to be moved down to a position lower than the projecting end 52a of the projecting portion 52. This ensures that the blade 71a of the cutter 71 contacts the string yarn 25c with the string yarn 25c supported by the projecting end 52a of the projecting portion 52.

Third embodiment

<Configuration of pot spinning machine>

[0092] The following will describe a pot spinning machine according to a third embodiment of the present disclosure.

[0093] In the third embodiment of the present disclosure, as illustrated in FIG. 19, a guiding hole 75 is formed in the bottom surface of the recess 53 of the lid 50. The guiding hole 75 contacts the tapered surface 72a of the guiding member 72 to correct an undesired displacement of the yarn introduction pipe 14. The undesired displacement of the yarn introduction pipe 14 may be caused by misalignment or tilt of the yarn introduction pipe 14 with respect to the central axis K of the pot 16. In the third embodiment of the present disclosure, like reference numerals denote the like elements or parts of the pot spinning machine used in the description of the first embodiment and the second embodiment, and the detailed description of such elements or parts will be omitted.

[0094] The guiding hole 75 is formed in a central portion of the bottom surface of the recess 53, and has a mortar shape. The guiding hole 75 is coaxial with the central axis K of the pot 16 in a state where the opening 28 of the fixed cover 18 is closed by the lid 50. The guiding hole 75 has, on an inner periphery, a taper guiding surface 75a that corresponds to the tapered surface 72a of the guiding member 72. The taper guiding surface 75a is inclined in the same way as the tapered surface 72a of the guiding member 72 is inclined.

<Operation of pot spinning machine>

[0095] In the third embodiment of the present disclosure, if the yarn introduction pipe 14 is undesirably displaced from the central axis K of the pot 16 when the yarn introduction pipe 14 is moved down to cut the string yarn 25c, the blade 71a of the cutter 71 may contact the projecting portion 52 of the lid 50. However, when the guiding hole 75 is formed in the bottom surface of the recess 53, as illustrated in FIG. 20, the tapered surface

72a of the guiding member 72 contacts the taper guiding surface 75a of the guiding hole 75 to make the position of the yarn introduction pipe 14 closer to the central axis K of the pot 16. This corrects the undesired displacement of the yarn introduction pipe 14, so that the blade 71a of the cutter 71 is prevented from contacting the projecting portion 52 of the lid 50.

<Modifications>

[0096] In the above-described embodiments, for example, the pot 16 is directly surrounded by the fixed cover 18, but the present disclosure is not limited to this configuration, and the pot 16 may be indirectly surrounded by the fixed cover 18 via a rotary cover, which is not illustrated. The rotary cover rotates together with the pot 16.

[0097] The lid 50 for closing the opening 28 of the fixed cover 18 may have a hole in a central portion of the lid 50.

Claims

1. A pot spinning machine (1) comprising:

a pot (16) having an opening (26) that opens downward;
 a yarn introduction pipe (14) introducing a yarn (25) into the pot (16) and having a yarn outlet (14b) from which the yarn (25) is discharged into the pot (16) at a bottom end of the yarn introduction pipe (14);
 a fixed cover (18) surrounding the pot (16) and having an opening (28) that opens downward; and
 a lid (50) opening and closing the opening (28) of the fixed cover (18), **characterized in that** the lid (50) has a projecting portion (52) that is inserted into the pot (16) through the opening (26) of the pot (16) when the opening (28) of the fixed cover (18) is closed by the lid (50), and the projecting portion (52) guides the yarn (25) discharged from the yarn outlet (14b) of the yarn introduction pipe (14) at yarn cutting to an inside wall (29) of the pot (16).

2. The pot spinning machine (1) according to claim 1, **characterized in that** the projecting portion (52) is inserted into the pot (16) by an insert length (Lb) of 0.1 mm or more from a bottom end (16a) of the pot (16) when the opening (28) of the fixed cover (18) is closed by the lid (50).

3. The pot spinning machine (1) according to claim 1 or 2, **characterized in that** the pot spinning machine (1) further comprises:

a drafting device (10) configured to draw out a

yarn material;

a drafting-device driving section (62) configured to drive the drafting device (10);

a yarn-introduction-pipe driving section (63) configured to drive the yarn introduction pipe (14); and

a controller (61) configured to control the drafting-device driving section (62) and the yarn-introduction-pipe driving section (63) such that the yarn cutting is performed in a state where the yarn outlet (14b) is placed at a height equal to that of a projecting end (52a) of the projecting portion (52), or in a state where the yarn outlet (14b) is placed below the projecting end (52a) of the projecting portion (52).

4. The pot spinning machine (1) according to any one of claims 1 to 3, **characterized in that**

the pot spinning machine (1) further comprises:

a guiding member (72) disposed at a bottom end portion of the yarn introduction pipe (14) and having a circular truncated cone shape; and

a cutter (71) attached to the yarn introduction pipe (14), the cutter (71) being in contact with a top end of the guiding member (72) in a direction of a central axis of the yarn introduction pipe (14), the cutter (71) having a disc shape,

the lid (50) has a recess (53) that is formed inside the projecting portion (52) such that the lid (50) is prevented from interfering with the cutter (71) and the guiding member (72), and a depth (Lc) of the recess (53) from the projecting end (52a) of the projecting portion (52) is at least greater than a projection length (La) of the projecting portion (52), and an inner diameter (D3) of the recess (53) is greater than an outer diameter (D4) of the cutter (71).

5. The pot spinning machine (1) according to claim 4, **characterized in that**

the cutter (71) has a blade (71a) on an outer periphery of the cutter (71), and the depth (Lc) of the recess (53) is greater than a distance (Ld) between the blade (71a) of the cutter (71) and the bottom end of the yarn introduction pipe (14) or a bottom end of the guiding member (72).

6. The pot spinning machine (1) according to claim 4 or 5, **characterized in that**

the guiding member (72) has a tapered surface

(72a) on an outer periphery of the guiding member (72), and
 a guiding hole (75) is formed in a bottom surface of the recess (53), and the guiding hole (75) con-
 tacts the tapered surface (72a) of the guiding member (72) to correct a displacement of the
 yarn introduction pipe (14).

Patentansprüche

1. Topfspinnmaschine (1) mit:

einem Topf (16), der eine Öffnung (26) hat, die nach unten geöffnet ist;
 einem Fadeneinführrohr (14), das einen Faden (25) in den Topf (16) einführt und einen Faden-
 auslass (14b) hat, aus dem der Faden (25) in den Topf (16) an einem unteren Ende des Fa-
 deneinführrohrs (14) abgegeben wird;
 einer festen Abdeckung (18), die den Topf (16) umgibt und eine Öffnung (28) hat, die nach un-
 ten geöffnet ist; und
 einem Deckel (50), der die Öffnung (28) der festen Abdeckung (18) öffnet und verschließt, **da-
 durch gekennzeichnet, dass**
 der Deckel (50) einen vorstehenden Abschnitt (52) hat, der durch die Öffnung (26) des Topfes
 (16) in den Topf (16) eingesetzt ist, wenn die Öffnung (28) der festen Abdeckung (18) durch
 den Deckel (50) verschlossen ist, und
 der vorstehende Abschnitt (52) den aus dem Faden-
 auslass (14b) des Fadeneinführrohrs (14) abgegebenen Faden (25) beim Fadenabschnei-
 den zu einer Innenwand (29) des Topfes (16) führt.

2. Topfspinnmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der vorstehende Abschnitt (52) mit einer Einsatzlänge (Lb) von 0,1 mm oder mehr von einem unteren Ende (16a) des Topfes (16) in den Topf (16) eingesetzt ist, wenn die Öffnung (28) der festen Abdeckung (18) durch den Deckel (50) verschlossen ist.

3. Topfspinnmaschine (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Topfspinnmaschine (1) ferner Folgendes aufweist:

eine Zugvorrichtung (10), die zum Herausziehen eines Fadenwerkstoffs konfiguriert ist;
 einen Zugvorrichtung-Antriebsteil (62), der zum Antreiben der Zugvorrichtung (10) konfiguriert ist;
 einen Fadeneinführrohr-Antriebsteil (63), der zum Antreiben des Fadeneinführrohrs (14) konfiguriert ist; und
 eine Steuerungseinrichtung (61), die konfigu-

riert ist, den Zugvorrichtung-Antriebsteil (62) und den Fadeneinführrohr-Antriebsteil (63) derart zu steuern, dass das Fadenschneiden in einem Zustand, in dem der Fadenauslass (14b) in einer Höhe angeordnet ist, die gleich derjenigen eines vorstehenden Endes (52a) des vorstehenden Abschnitts (52) ist, oder in einem Zustand durchgeführt wird, in dem der Fadenauslass (14b) unterhalb des vorstehenden Endes (52a) des vorstehenden Abschnitts (52) angeordnet ist.

4. Topfspinnmaschine (1) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass**

die Topfspinnmaschine (1) ferner Folgendes aufweist:

ein Führungsbauteil (72), das an einem unteren Endabschnitt des Fadeneinführrohrs (14) angeordnet ist und eine kreisförmige Kegelstumpfform hat; und
 eine Schneideinrichtung (71), die an dem Fadeneinführrohr (14) angebracht ist, wobei die Schneideinrichtung (71) mit einem oberen Ende des Führungsbauteils (72) in einer Richtung einer mittleren Achse des Fadeneinführrohrs (14) in Kontakt steht, wobei die Schneideinrichtung (71) eine Scheibenform hat,

der Deckel (50) eine Aussparung (53) hat, die innerhalb des vorstehenden Abschnitts (52) ausgebildet ist, sodass der Deckel (50) daran gehindert wird, die Schneideinrichtung (71) und das Führungsbauteil (72) zu beeinträchtigen, und
 eine Tiefe (Lc) der Aussparung (53) von dem vorstehenden Ende (52a) des vorstehenden Abschnitts (52) mindestens größer ist als eine Vorstehlänge (La) des vorstehenden Abschnitts (52), und ein Innendurchmesser (D3) der Aussparung (53) größer ist als ein Außendurchmesser (D4) der Schneideinrichtung (71).

5. Topfspinnmaschine (1) nach Anspruch 4, **dadurch gekennzeichnet, dass**

die Schneideinrichtung (71) eine Klinge (71a) an einem Außenumfang der Schneideinrichtung (71) hat, und
 die Tiefe (Lc) der Aussparung (53) größer ist als ein Abstand (Ld) zwischen der Klinge (71a) der Schneideinrichtung (71) und dem unteren Ende des Fadeneinführrohrs (14) oder einem unteren Ende des Führungsbauteils (72).

6. Topfspinnmaschine (1) nach Anspruch 4 oder 5, **da-**

durch gekennzeichnet, dass

das Führungsbauteil (72) eine abgeschrägte Fläche (72a) an einem Außenumfang des Führungsbauteils (72) hat, und
 5 ein Führungsloch (75) in einer Bodenfläche der Aussparung (53) ausgebildet ist und das Führungsloch (75) mit der abgeschrägten Fläche (72a) des Führungsbauteils (72) in Kontakt
 10 steht, um eine Verschiebung des Fadeneinführrohrs (14) zu korrigieren.

Revendications**1. Métier à filer à pot (1) comprenant :**

un pot tournant (16) ayant une ouverture (26) qui s'ouvre vers le bas ;
 un tuyau d'introduction de fil (14) introduisant un
 20 fil (25) dans le pot tournant (16) et ayant une sortie de fil (14b) à partir de laquelle le fil (25) est déchargé dans le pot tournant (16) au niveau d'une extrémité inférieure du tuyau d'introduction de fil (14) ;
 25 une couverture fixe (18) entourant le pot tournant (16) et ayant une ouverture (28) qui s'ouvre vers le bas ; et
 un couvercle (50) ouvrant et fermant l'ouverture (28) de la couverture fixe (18), **caractérisé en ce que :**
 30

le couvercle (50) a une partie en saillie (52) qui est insérée dans le pot tournant (16) à travers l'ouverture (26) du pot tournant (16),
 35 lorsque l'ouverture (28) de la couverture fixe (18) est fermée par le couvercle (50), et la partie en saillie (52) guide le fil (25) déchargé par la sortie de fil (14b) du tuyau d'introduction de fil (14) au niveau d'une coupe de fil, dans une paroi intérieure (29) du pot tournant (16).
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2. Métier à filer à pot (1) selon la revendication 1, caractérisé en ce que la partie en saillie (52) est insérée dans le pot tournant (16) selon une longueur d'insert (Lb) de 0,1 mm ou plus à partir d'une extrémité inférieure (16a) du pot tournant (16) lorsque l'ouverture (28) de la couverture fixe (18) est fermée par le couvercle (50).
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3. Métier à filer à pot (1) selon la revendication 1 ou 2, caractérisé en ce que le métier à filer à pot (1) comprend en outre :
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un dispositif d'étirage (10) configuré pour étirer un matériau de fil ;
 une section d'entraînement de dispositif d'éтира-

ge (62) configurée pour entraîner le dispositif d'étirage (10) ;

une section d'entraînement de tuyau d'introduction de fil (63) configurée pour entraîner le tuyau d'introduction de fil (14) ; et

un organe de commande (61) configuré pour commander la section d'entraînement de dispositif d'étirage (62) et la section d'entraînement de tuyau d'introduction de fil (63) de sorte que la coupe de fil est réalisée dans un état dans lequel la sortie de fil (14b) est placée à une hauteur égale à celle d'une extrémité en saillie (52a) de la partie en saillie (52) ou dans un état dans lequel la sortie de fil (14b) est placée au-dessous de l'extrémité en saillie (52a) de la partie en saillie (52).

4. Métier à filer à pot (1) selon l'une quelconque des revendications 1 à 3, caractérisé en ce que :
 le métier à filer à pot (1) comprend en outre :

un élément de guidage (72) disposé au niveau d'une partie d'extrémité inférieure du tuyau d'introduction de fil (14) et ayant une forme tronconique circulaire ; et

un dispositif de coupe (71) fixé sur le tuyau d'introduction de fil (14), le dispositif de coupe (71) étant en contact avec une extrémité supérieure de l'élément de guidage (72) dans une direction d'un axe central du tuyau d'introduction de fil (14), le dispositif de coupe (71) ayant une forme de disque,

le couvercle (50) a un évidement (53) qui est formé à l'intérieur de la partie en saillie (52) de sorte que l'on empêche le couvercle (50) d'interférer avec le dispositif de coupe (71) et l'élément de guidage (72), et

une profondeur (Lc) de l'évidement (53) à partir de l'extrémité en saillie (52a) de la partie en saillie (52) est au moins supérieure à une longueur de saillie (La) de la partie en saillie (52), et un diamètre interne (D3) de l'évidement (53) est supérieur à un diamètre externe (D4) du dispositif de coupe (71) .

5. Métier à filer à pot (1) selon la revendication 4, caractérisé en ce que :

le dispositif de coupe (71) a une lame (71a) sur une périphérie externe du dispositif de coupe (71), et

la profondeur (Lc) de l'évidement (53) est supérieure à une distance (Ld) entre la lame (71a) du dispositif de coupe (71) et l'extrémité inférieure du tuyau d'introduction de fil (14) ou une extrémité inférieure de l'élément de guidage (72).

6. Métier à filer à pot (1) selon la revendication 4 ou 5, caractérisé en ce que :

l'élément de guidage (72) a une surface progressivement rétrécie (72a) sur une périphérie externe de l'élément de guidage (72), et un trou de guidage (75) est formé dans une surface inférieure de l'évidement (53), et le trou de guidage (75) est en contact avec la surface progressivement rétrécie (72a) de l'élément de guidage (72) pour corriger un déplacement du tuyau d'introduction de fil (14).

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FIG. 1

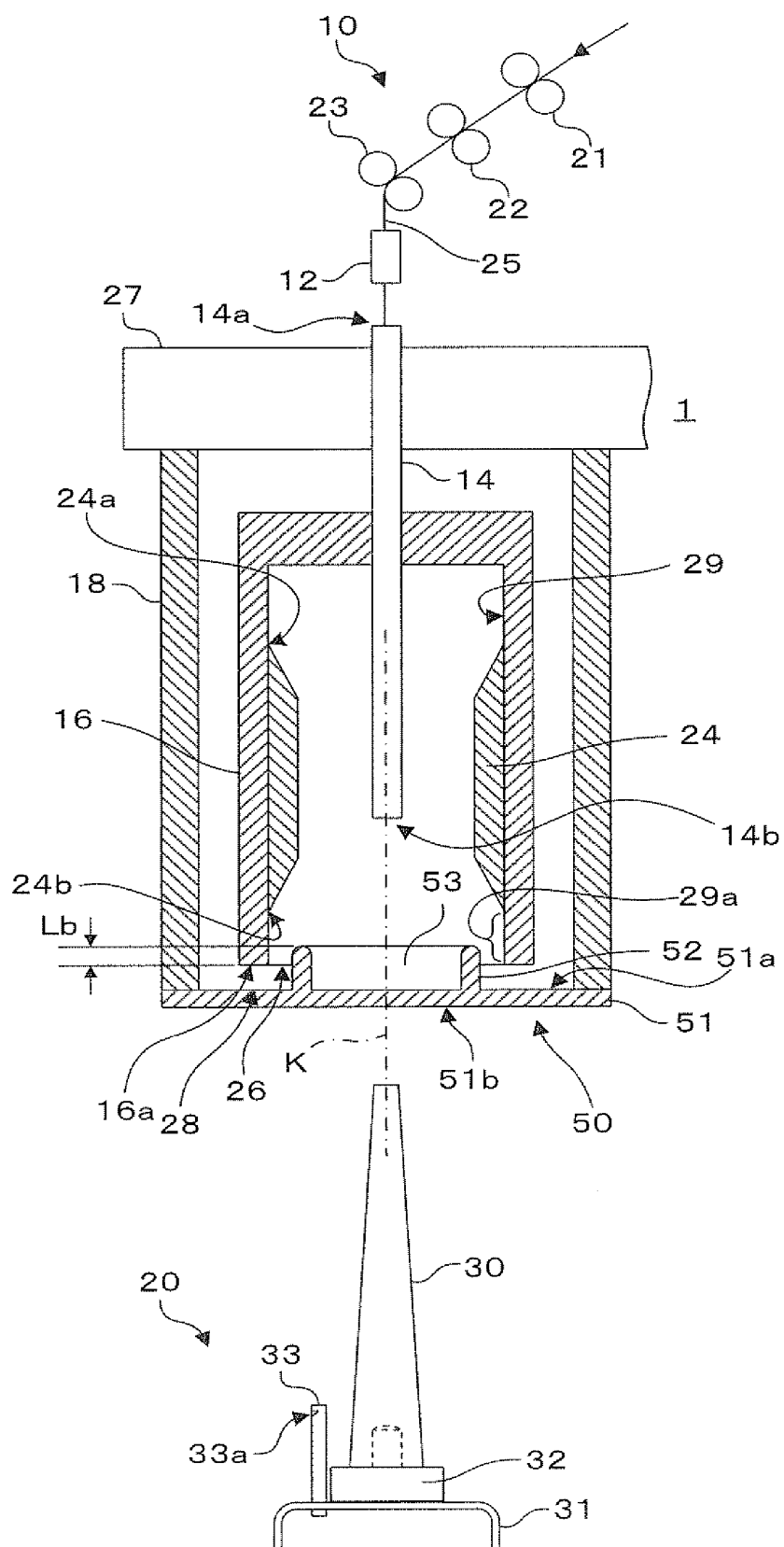


FIG. 2

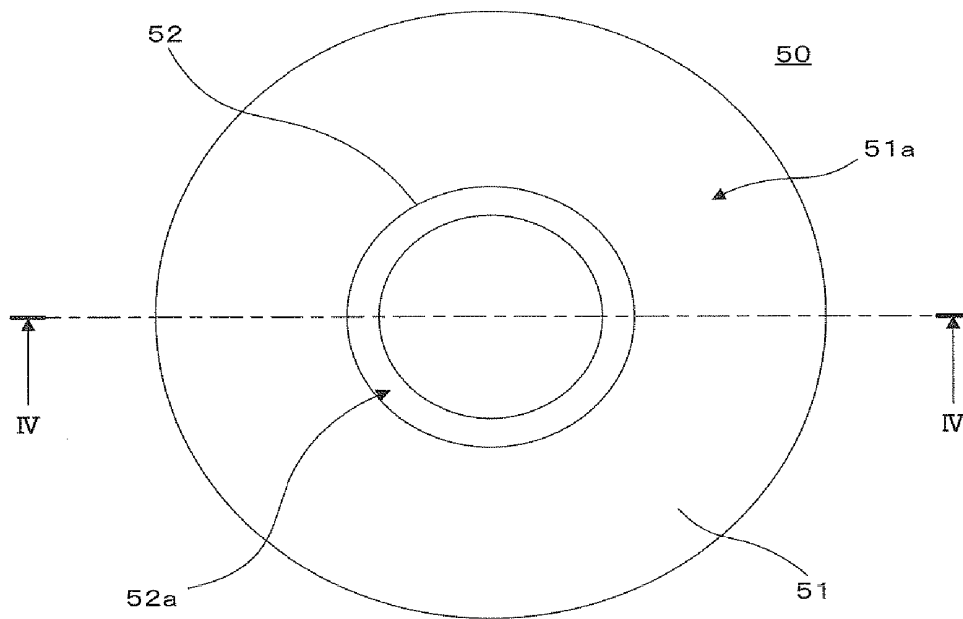


FIG. 3

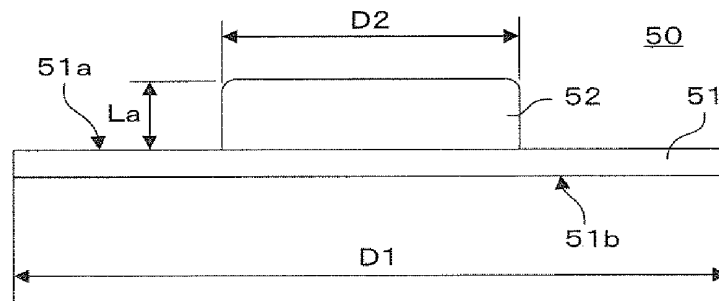


FIG. 4

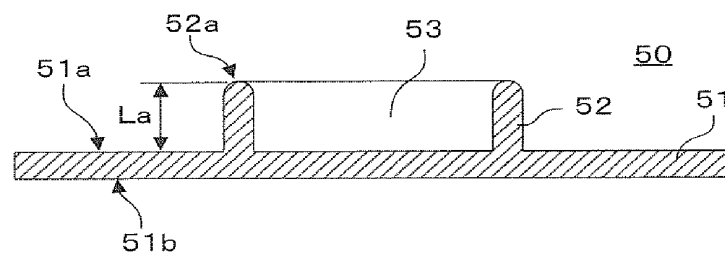


FIG. 5

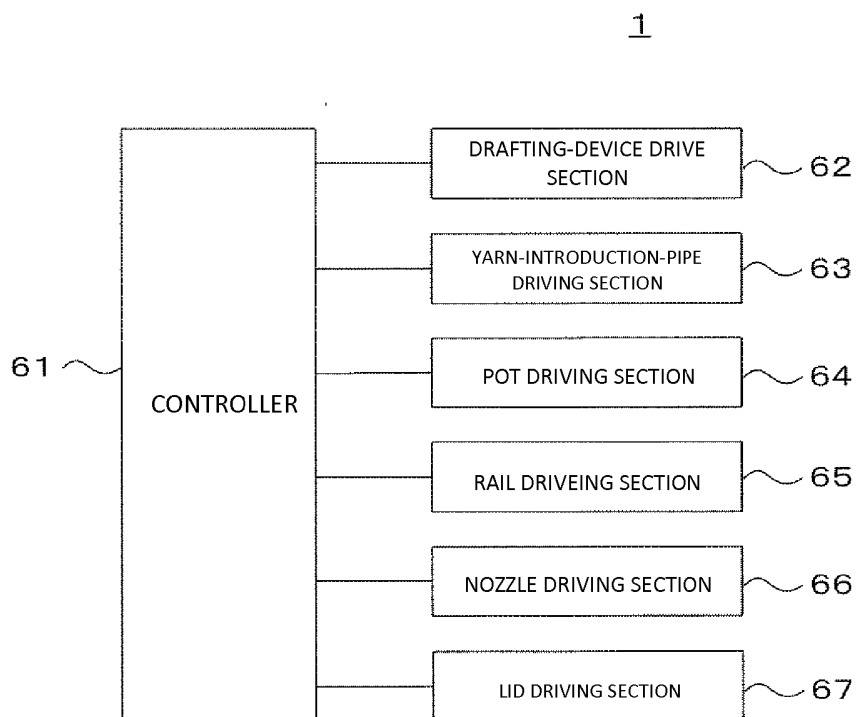


FIG. 6

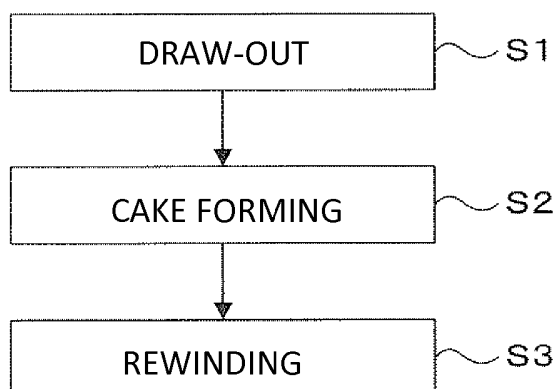


FIG. 7

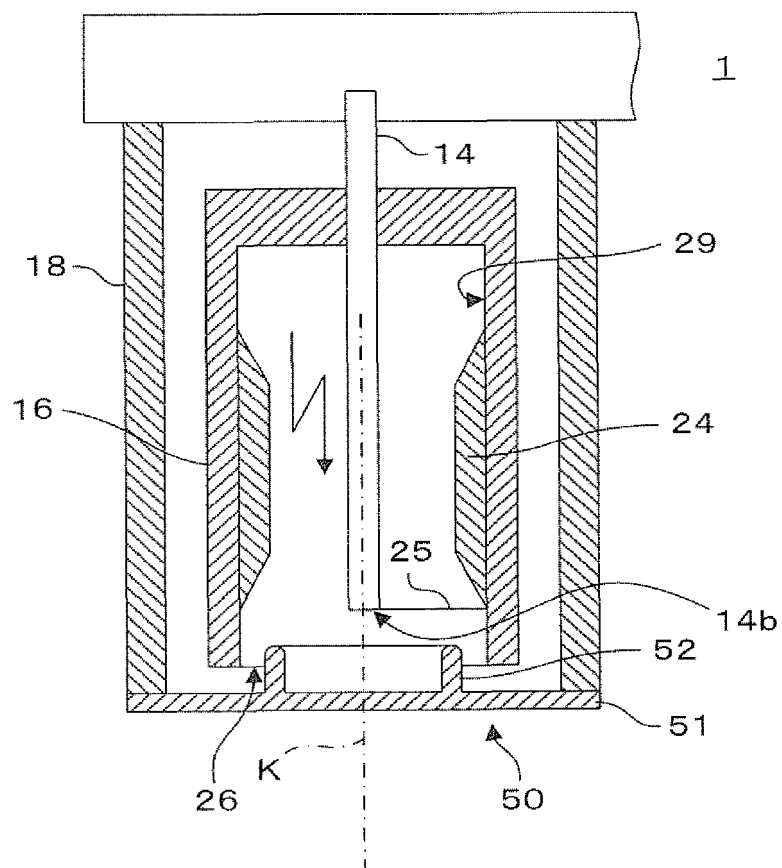


FIG. 8

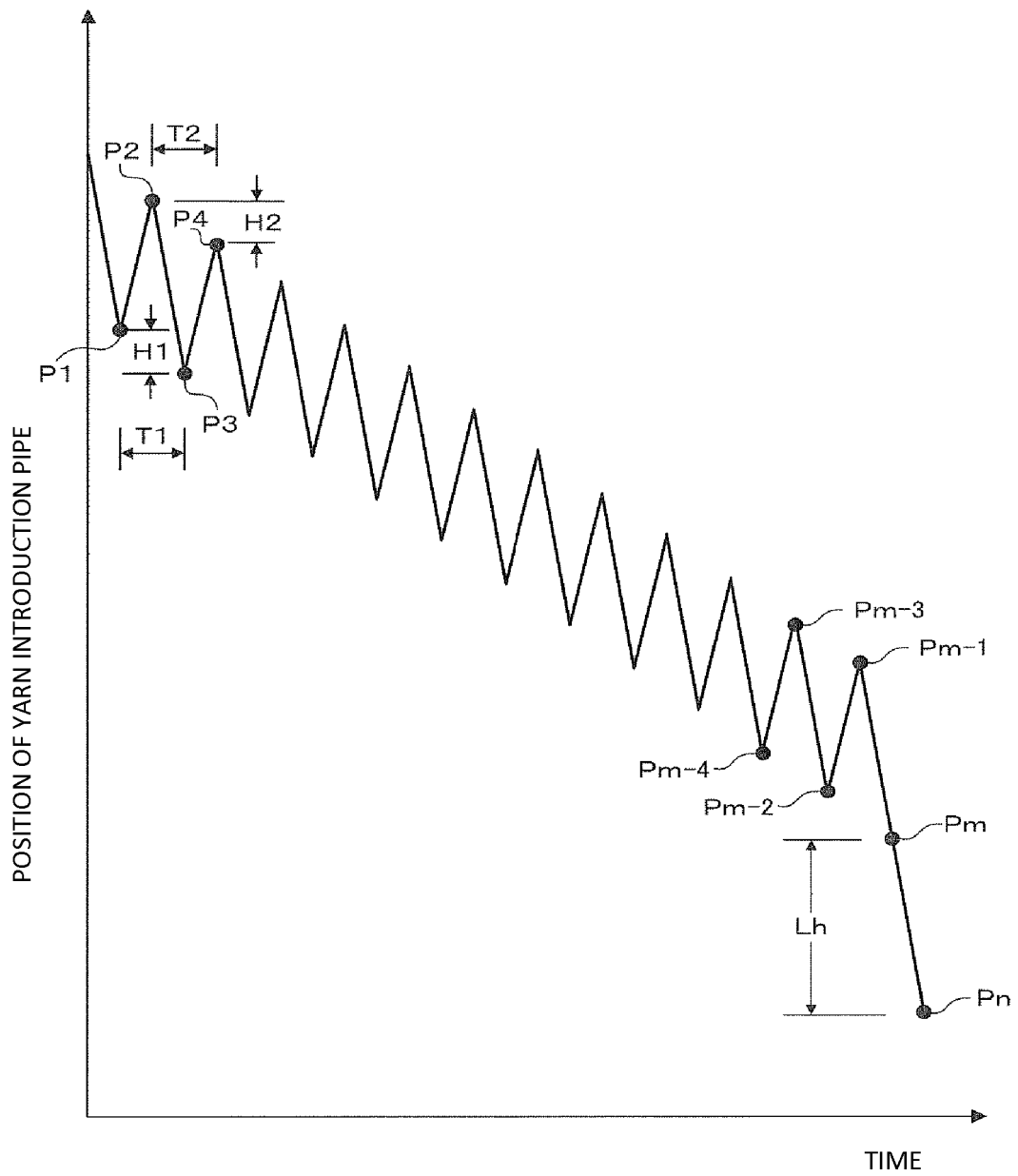


FIG. 9

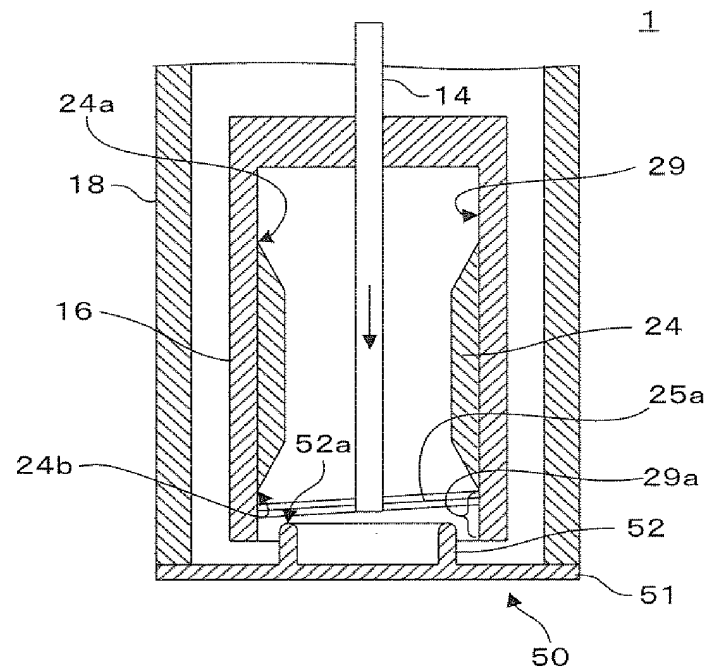


FIG. 10

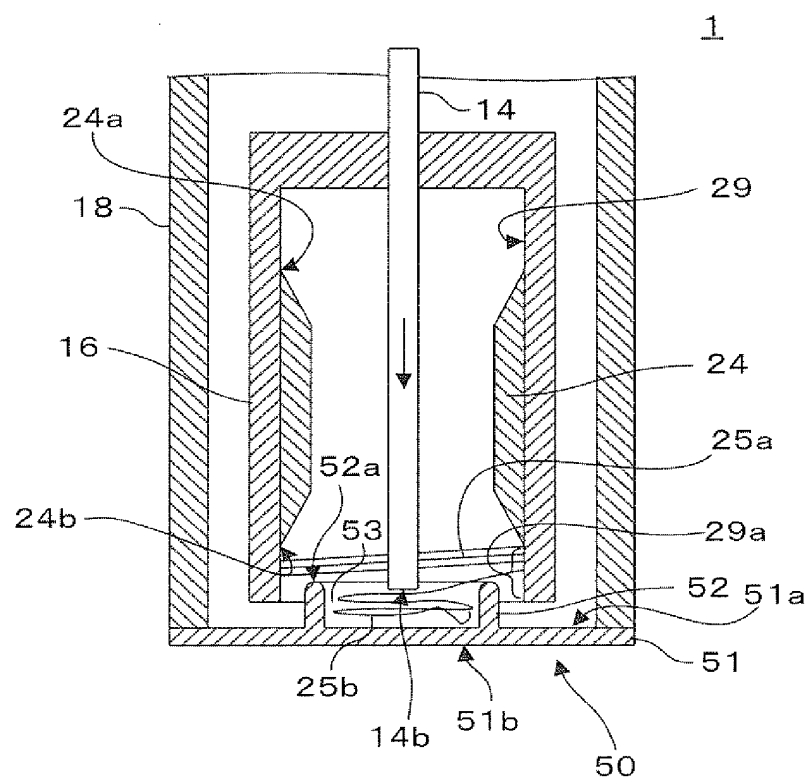


FIG. 11

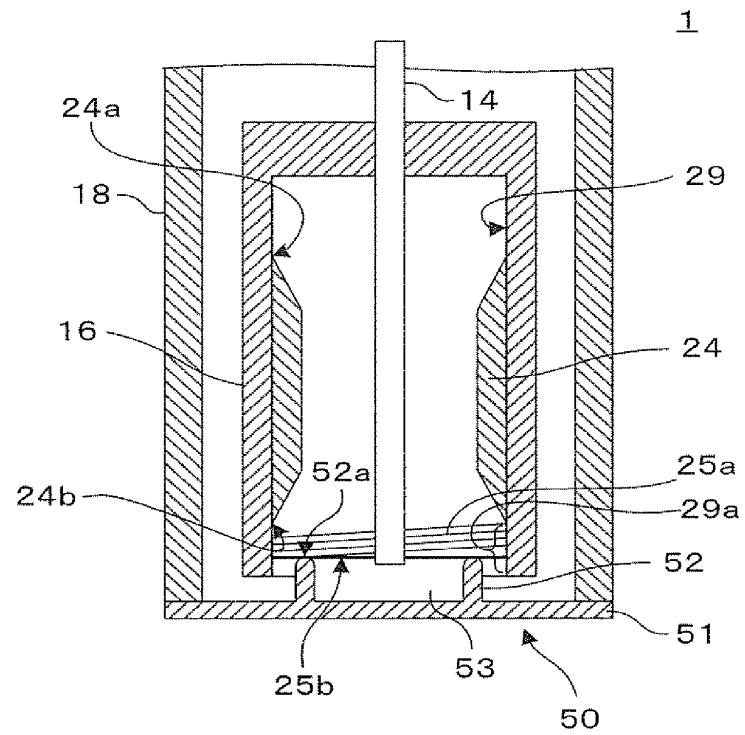


FIG. 12

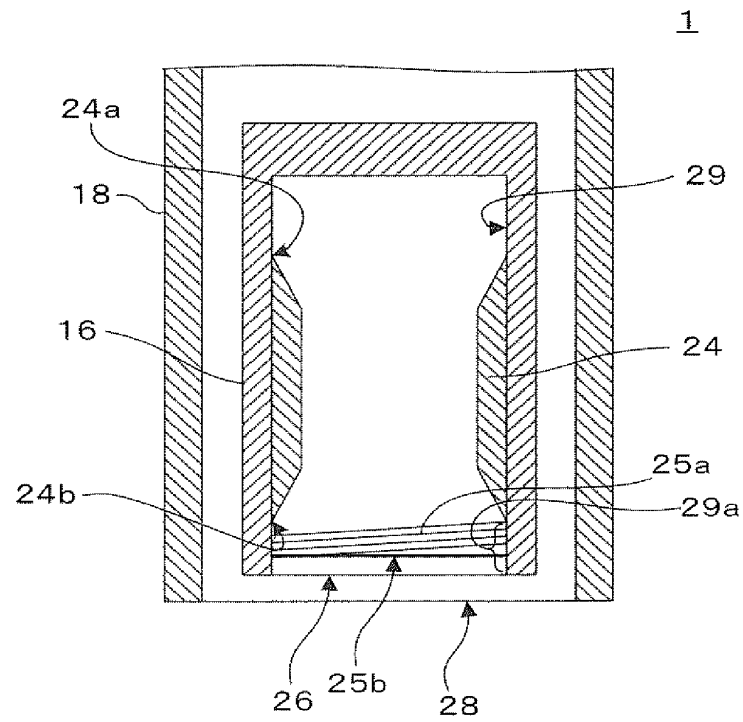


FIG. 13

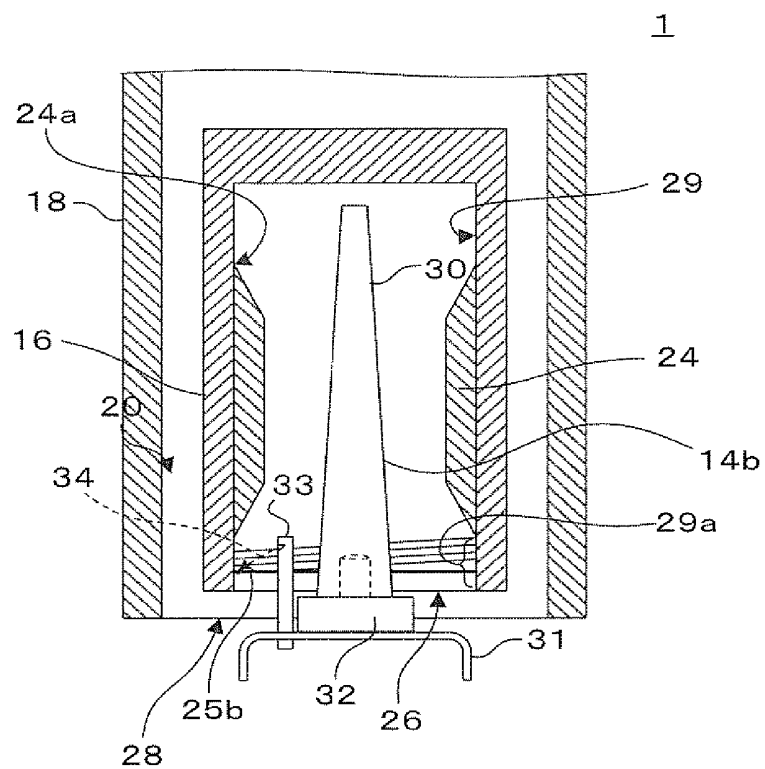


FIG. 14

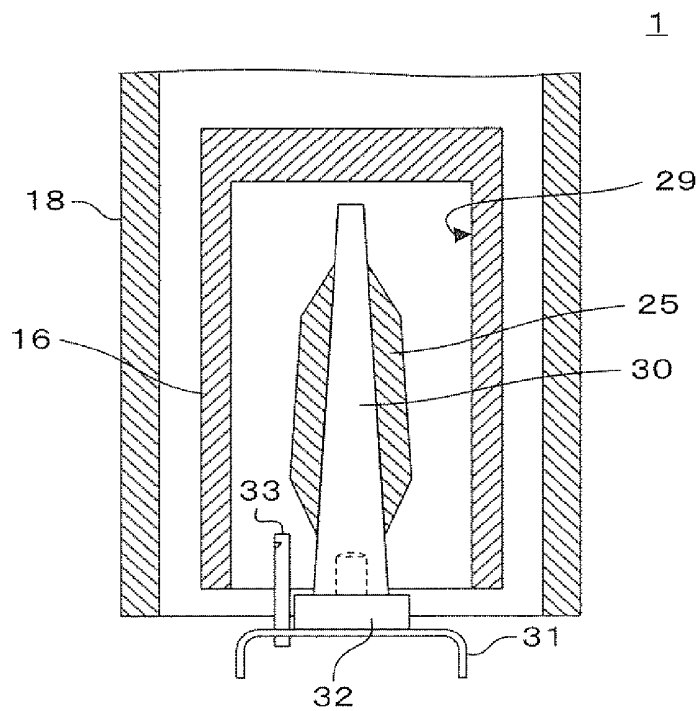


FIG. 15

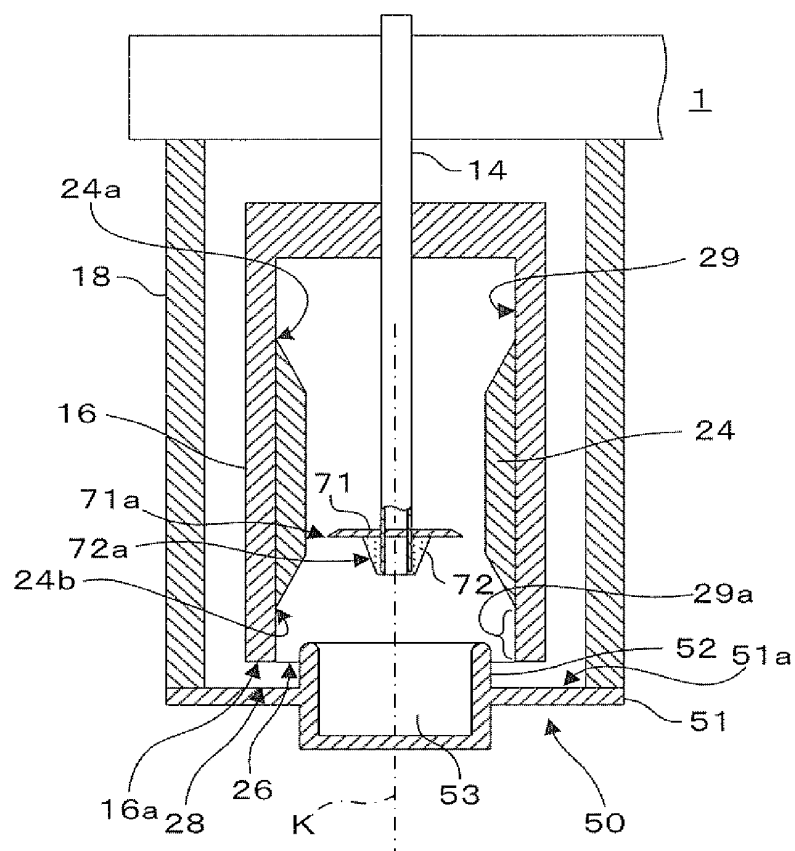


FIG. 16

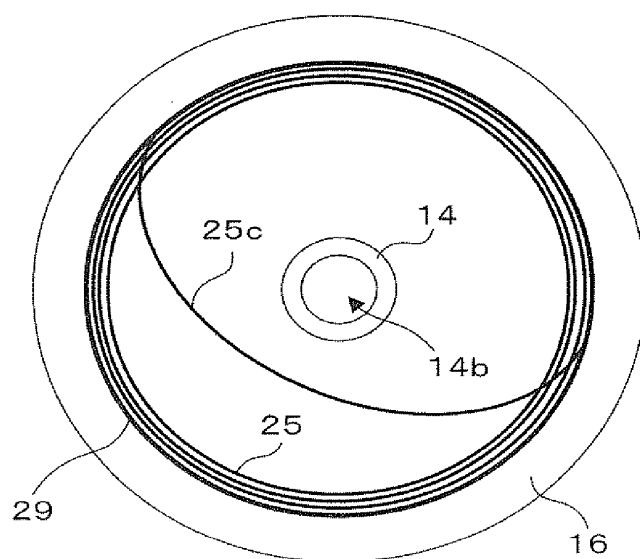


FIG. 17

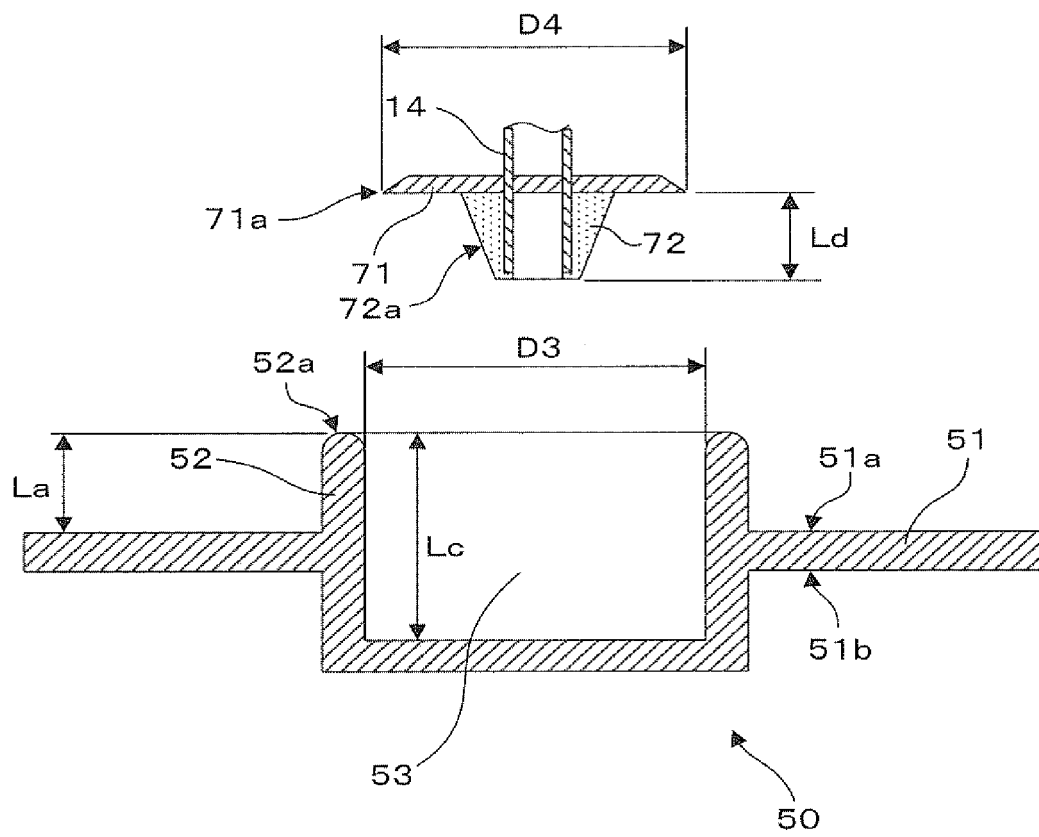


FIG. 18

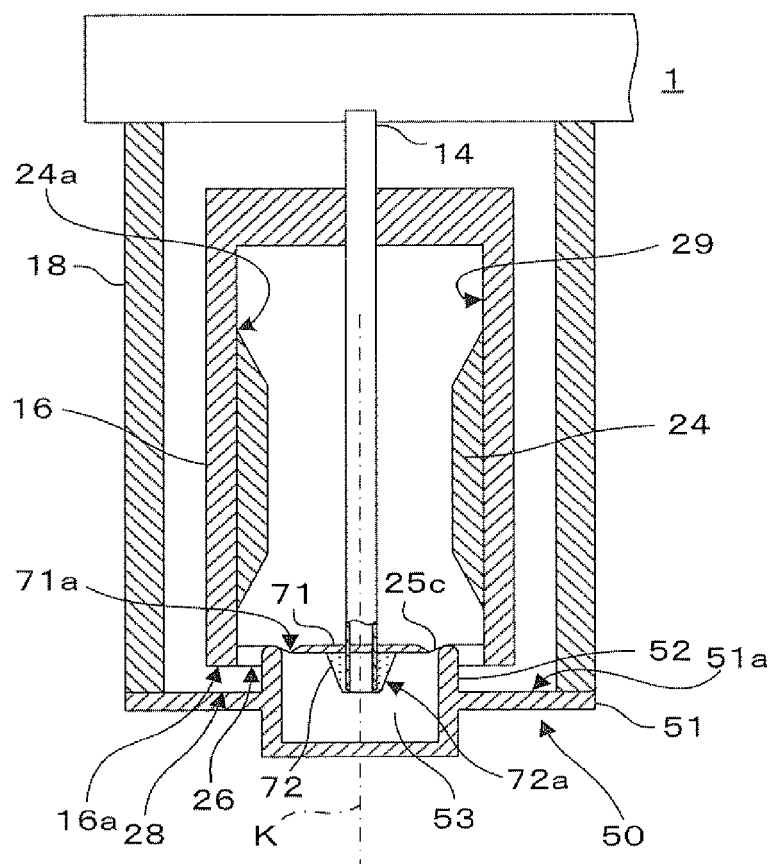


FIG. 19

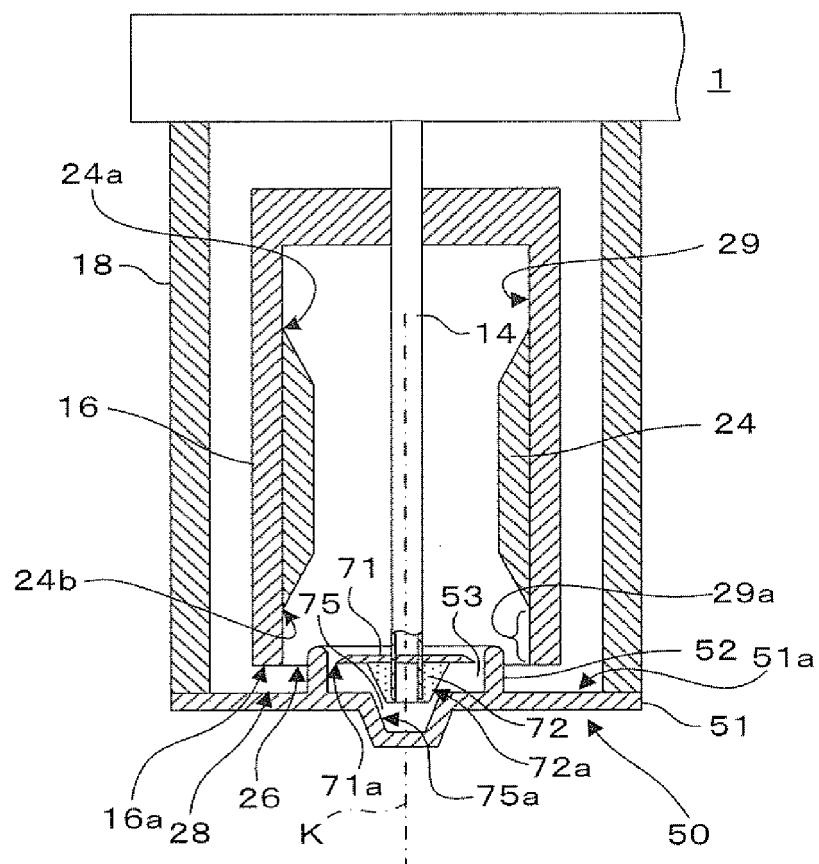
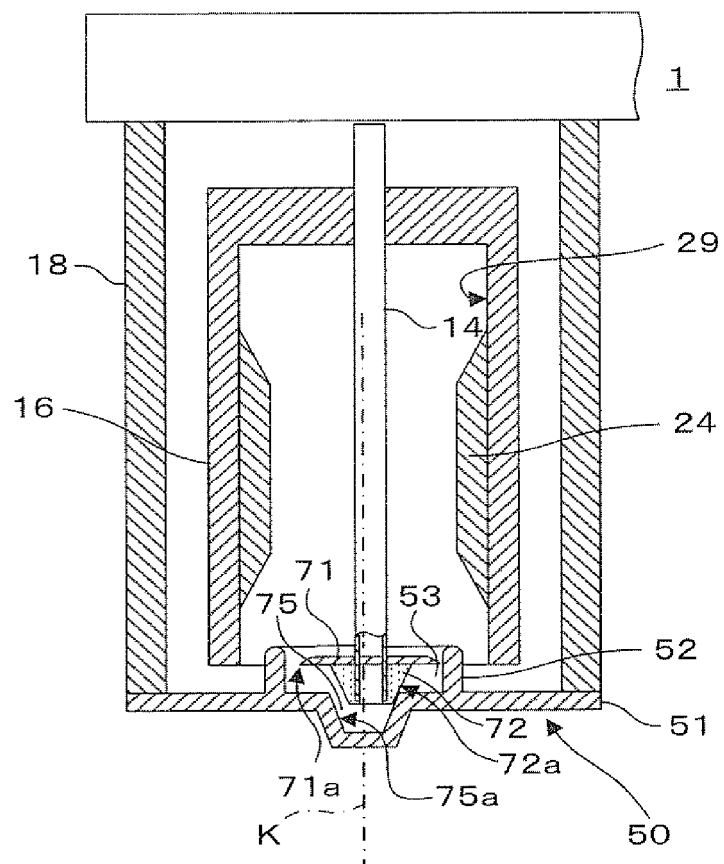


FIG. 20



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 8060430 A [0004] [0005]