(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 461 773 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.04.2019 Bulletin 2019/14

(51) Int Cl.:
B65H 67/06 *(2006.01)* ***B65H 67/08*** *(2006.01)*

(21) Application number: **18194733.4**

(22) Date of filing: **17.09.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **27.09.2017 JP 2017185989**

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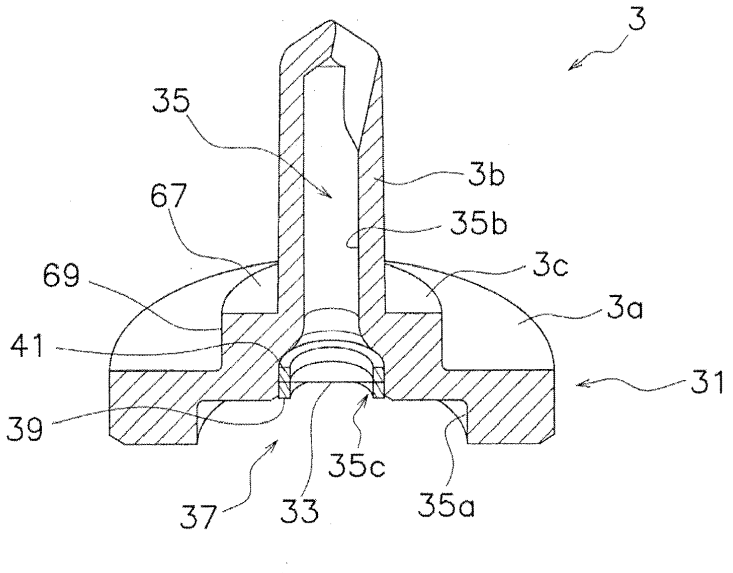
(54) **BOBBIN CONVEYING TRAY**

(57) A bobbin conveying tray suppresses a fly waste from being deposited at its mesh. The tray 3 is a member to where the threaded bobbin tube 5B with the spun yarn Y wound is attached, and includes a tray main body 31 and a metal net member 33. The tray main body (31) includes an attaching portion (3b) inserted into the threaded bobbin tube (5) to stand the threaded bobbin tube (5B), and is formed with the airflow passing hole (35) that passes through from the upper end to the lower surface. The metal net member (33) is fixed in the airflow passing hole (35), and allows passing of the air but limits passing of the spun yarn (Y). The metal wires configuring the net of the net member (33) are closely attached to each other so that shift between the metal wires does not occur.

FIG. 5



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a bobbin conveying tray on which a bobbin with a yarn wound is attached.

2. Description of the Related Art

[0002] A bobbin conveying system adapted to attach a bobbin with a yarn wound to a tray, and to convey the tray attached with the bobbin to a winder unit is conventionally known. A bobbin conveying system including a fine spinning machine arranged adjacent to an automatic winder and adapted to fine spin a yarn, and in which the fine spinning machine and the automatic winder are directly connected with a conveyance path is also known.

[0003] An airflow passing hole that passes through the tray in an up and down direction is formed in the bobbin conveying tray (see e.g., Japanese Unexamined Utility Model Publication No. 62-70186). According to such structure, a yarn end can be unwound from a yarn layer on a suction airflow generated in a winding tube and further suctioned into the bobbin (pick finding operation) with the bobbin inserted in a standing manner on the tray.

[0004] A tray 1 described in Japanese Unexamined Utility Model Publication No. 62-70186 includes a yarn passing inhibiting member 12. The yarn passing inhibiting member 12 is a member arranged in the middle of an airflow passing hole 7 and adapted to allow the flow of air but inhibit the passing of the yarn. The yarn passing inhibiting member 12 prevents the yarn end from passing through the tray 1 and hanging down when carrying out the pick finding operation mentioned earlier.

[0005] This is because in a yarn puling state in which the yarn end is hung down toward an outer side of a bobbin 10, the yarn end is brought into contact with a conveyor during the conveyance of the bobbin 10 and the yarn end is wound around a conveyance mechanism such as a pulley.

[0006] The yarn passing inhibiting member is a grid like metal gauze, a nylon gauze, or a plate board provided with a small hole. When a mesh is a grid like metal gauze, fly waste may get entangled at net portion of the mesh. In this case, a merely knitted wire is not fixed and thus moves, whereby the fly waste attaches during use causing shift in metal wires in which a warp and a woof shift in the mesh, and hence the fly waste deposition amount increases at such area thus reducing the flow of air.

BRIEF SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to suppress the fly waste from being deposited at the mesh of the bobbin conveying tray.

[0008] This object is achieved by a bobbin conveying tray according to claim 1.

[0009] Hereinafter, a plurality of modes will be described as means for solving the problem. Such modes can be arbitrarily combined as necessary.

[0010] A bobbin conveying tray according to one aspect of the present invention relates to a bobbin conveying tray onto which a bobbin with a yarn wound is attachable, and which includes a tray main body and a metal net member. The tray main body includes a protrusion adapted to be inserted to the bobbin to hold or stand the bobbin, and is formed with an airflow passing hole that passes through the tray main body from an upper end to a lower surface. The metal net member is fixed in the airflow passing hole. Metal wires forming or configuring the net of the net member are coupled to each other to regulate a movement of the metal wires at an intersecting position of the metal wires. In such a tray, the shift of the metal wires does not occur in the net member, and thus the fly waste is less likely to get entangled, and the deposition of fly waste is less likely to occur. As a result, the duration of use of the net member can be extended.

[0011] The metal wires may be welded to each other by sintering. In such a tray, the adhesive strength of the metal wires of the net member enhances. The sintering means maintaining a metal gauze at a temperature of around a melting point of the metal for a certain time so that crystals are formed and are completely integrated across contacting points of each wire in the metal structure. The shift of the metal wires of the mesh can be prevented without using a coupling member other than the metal mesh.

[0012] The metal wires may be coupled to each other by roll processing. The roll processing (calendar processing) means rolling the mesh with a roll device, and the like to deform the intersecting portion of the metal wires so as to bite into each other, which deformation enhances the coupling force between the metals. The shift of the metal wires of the mesh can be prevented without using a coupling member other than the metal mesh.

[0013] The tray main body may include a recess adapted to accommodate the net member. The bobbin conveying tray may further include a fixing bush adapted to fix the net member in the recess, the fixing bush being press fitted to the recess. In such a tray, the net member can be fixed to the recess by simply press fitting the fixing bush to the recess, and hence the fixing and detachment of the net member are facilitated.

[0014] The bobbin conveying tray may further include a positioning bush arranged on a far side than the net member in the recess. In such a tray, the location for attaching the net member can be configured by the positioning bush, and thus the precision of the shape of the recess does not need to be increased.

[0015] The mesh of the net member may allow the passing of the air but limit the passing of the yarn, and may have a roughness in a range of 50 to 100 meshes. The tray can effectively prevent the passing of the yarn

while allowing the passing of the air.

[0016] The wire diameter of the net member may be in a range of 0.05 to 0.2 mm. The tray can effectively prevent the passing of the yarn while allowing the passing of the air.

[0017] The opening rate of the net member may be in a range of 30 to 60%. The tray can effectively prevent the passing of the yarn while allowing the passing of the air.

[0018] In the bobbin conveying tray according to the present invention, the fly waste is less likely to deposit on the mesh.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic plan view of an automatic winder system in which a tray according to one aspect of the present invention is used.
FIG. 2 is a view illustrating an overall configuration of an automatic winder.
FIG. 3 is a side view of a tray attached with a bobbin.
FIG. 4 is a perspective view of the tray.
FIG. 5 is a cross-sectional view of the tray.
FIG. 6 is a side view illustrating a state of preparing a yarn end by a pick finding device.
FIG. 7 is a partially enlarged view of a net member.
FIG. 8 is a partial cross-sectional view of a tray illustrating an attaching operation of the net member.
FIG. 9 is a partial cross-sectional view of the tray illustrating the attaching operation of the net member.
FIG. 10 is a partial cross-sectional view of the tray illustrating the attaching operation of the net member.
FIG. 11 is a partial cross-sectional view of the tray illustrating the attaching operation of the net member.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

1. First Embodiment

(1) Automatic winder system

[0020] An automatic winder system 101 adopting one embodiment of the present invention will be described using FIGS. 1 and 2. FIG. 1 is a schematic plan view of an automatic winder system in which a tray according to one aspect of the present invention is used. FIG. 2 is a view illustrating an overall configuration of an automatic winder. The automatic winder system 101 includes an automatic winder 102, a bobbin processing device 103, and a bobbin supplying device 104. The automatic winder 102 is arranged on a left side in the figure of the bobbin processing device 103. The bobbin processing device 103 is arranged between the bobbin supplying device 104 and the automatic winder 102.

[0021] As illustrated in FIGS. 1 and 2, the automatic winder 102 includes a plurality of winding units 105. The winding unit 105 is a device adapted to rewind a spun yarn wound around a threaded bobbin tube 5B (to be described later) around a different bobbin to manufacture a product package of the spun yarn. As illustrated in FIG. 1, the automatic winder 102 includes a supplying path 106 adapted to convey the threaded bobbin tube 5B to each winding unit 105. Furthermore, a collecting path 107 adapted to convey an empty bobbin tube 5A discharged from each winding unit 105 is formed in the automatic winder 102. The supplying path 106 and the collecting path 107 are configured by a belt conveyor, and the like, and are adapted to convey the bobbin tube 5 using a tray (bobbin conveying tray) 3.

[0022] The bobbin processing device 103 is a device adapted to extract the empty bobbin tube 5A (to be described later) discharged by the automatic winder 102 from the tray 3, attach the threaded bobbin tube (yarn supplying bobbin) 5B around which a yarn fine spun with a fine spinning machine (not illustrated) configured by winding a spun yarn generated in the fine spinning machine (not illustrated) around a periphery of a bobbin main body to the tray 3, and supply the threaded bobbin tube 5B toward the automatic winder 102. The bobbin supplying device 104 is a device adapted to supply the threaded bobbin tube 5B to the bobbin processing device 103.

(2) Tray and bobbin

[0023] The tray 3 and the bobbin tube 5 will be described using FIGS. 3 to 5. FIG. 3 is a side view of a tray attached with a bobbin. FIG. 4 is a perspective view of the tray. FIG. 5 is a cross-sectional view of the tray. The tray 3 is a conveying body used to convey the bobbin tube 5. As illustrated in FIGS. 3 and 4, the tray 3 includes a circular disc shaped base portion 3a, and an attaching portion 3b serving as a circular column shaped bobbin inserting portion projecting upward from a middle of an upper surface of the base portion. The tray 3 includes an intermediate circular column portion 3c serving as a bobbin mounting portion between the base portion 3a and the attaching portion 3b. The intermediate circular column portion 3c includes a seating surface 67 where the bobbin tube 5 is seated, and an outer peripheral surface 69. The tray 3 conveys the bobbin tube 5 in an orientation state in which the bobbin tube 5 is inserted to the attaching portion 3b. The interior structure of the tray 3 will be described later.

[0024] The bobbin tube 5 is a cylindrical member around an outer peripheral surface of which a spun yarn Y is to be wound, and a pass-through shaft hole 5a is formed therein (FIG. 6). When a bottom portion of the bobbin tube 5 is inserted to the attaching portion 3b of the tray 3, the bobbin tube 5 is set in the tray 3 as illustrated in FIG. 3 and conveyed with the tray 3. In the fol-

lowing description, the bobbin tube itself around which the spun yarn Y is not wound is referred to as the empty bobbin tube 5A, and the bobbin tube and the spun yarn Y wound therearound are together referred to as the threaded bobbin tube 5B.

(3) Bobbin processing device

[0025] The bobbin processing device 103 will be described using FIG. 1. The bobbin processing device 103 includes a tray conveyance line 108 as a conveying means of the threaded bobbin and the empty bobbin adapted to convey the bobbins while being mounted on the tray 3. The tray conveyance line 108 is connected to the supplying path 106 and the collecting path 107 of the automatic winder 102. The tray 3 with the threaded bobbin tube 5B attached is supplied from the bobbin processing device 103 to the winding unit 105 by the tray conveyance line 108 and the supplying path 106. The tray 3 with the empty bobbin tube 5A attached is returned from the winding unit 105 to the bobbin processing device 103 by the collecting path 107 and the tray conveyance line 108.

[0026] The tray conveyance line 108 includes a main conveyance line 121 and a return conveyance line 122. The main conveyance line 121 is a path adapted to convey the empty bobbin tube 5A discharged from the automatic winder 102, replace the empty bobbin tube 5A with the threaded bobbin tube 5B in the middle, and convey the same toward the automatic winder 102. The main conveyance line 121 is schematically formed to a U-shape. A starting end of the main conveyance line 121 is connected to a terminating end of the collecting path 107, and a terminating end of the main conveyance line 121 is connected to a starting end of the supplying path 106. A bobbin extracting device 11 and a threaded bobbin supplying device 13 are arranged along the main conveyance line 121.

[0027] The bobbin extracting device 11 is a device adapted to extract and collect the empty bobbin tube 5A from the tray 3. The threaded bobbin supplying device 13 is a device adapted to attach the threaded bobbin tube 5B manufactured with the fine spinning machine to the tray 3 in a substantially standing state. The threaded bobbin tube 5B is supplied to the threaded bobbin supplying device 13 by the bobbin supplying device 104 such as a part feeder, and the like.

[0028] Although not illustrated, the threaded bobbin supplying device 13 includes a bobbin inserting device, a bobbin allocating device, and a pair of bobbin shoots. The threaded bobbin supplying device 13 can supply the empty bobbin tube 5A to the tray 3 simultaneously at two places with the bobbin allocating device and the pair of bobbin shoots. Each bobbin shoot sets the bobbin tube 5 so as to be inserted to the attaching portion 3b of the tray 3. The bobbin shoot includes, for example, each divided half of which a cone shaped cylindrical body is divided in half in the axial direction.

[0029] In the main conveyance line 121, a bunch unwinding device 15, a yarn end processing device 17, and a pick finding device 19 are arranged as a bobbin preparing system at a downstream in the conveying direction of the threaded bobbin supplying device 13. The bobbin preparing system carries out the following tasks with respect to the threaded bobbin tube 5B so as to obtain a state in which the yarn can be smoothly unwound with the automatic winder 102, and supplies the same to the automatic winder 102. The bunch unwinding device 15 is a device adapted to remove the bunch winding of the bottom bunch wound around the threaded bobbin tube 5B.

[0030] The yarn end processing device 17 is a device adapted to cut a back wind yarn wound around a yarn layer surface of the threaded bobbin tube 5B, and remove a tail yarn side thereof. The pick finding device 19 is a device adapted to separate and pick find the yarn end from the surface of the threaded bobbin tube 5B, wind the pick found yarn end around a top portion of the bobbin tube 5, and insert the same to the shaft hole 5a opening (top hole) of the bobbin tube 5. Thus, a state in which the relevant yarn end can be smoothly pulled out from the threaded bobbin tube 5B with the automatic winder 102 is obtained (to be described later).

[0031] The return conveyance line 122 is, for example, a path adapted to re-process the threaded bobbin tube 5B that failed in the pick finding process. The return conveyance line 122 is a bypass path connecting the terminating end and the starting end of the main conveyance line 121. In the present embodiment, a set of bunch unwinding device 15, yarn end processing device 17, and pick finding device 19 is also arranged on the return conveyance line 122. The description thereof will be omitted.

(4) Flow of tray

[0032] The flow of the tray 3 will be described below using FIG. 1. When an empty tray 3 reaches a position immediately below the bobbin shoot (not illustrated) of the threaded bobbin supplying device 13, the threaded bobbin tube 5B is mounted in a substantially standing state on the empty tray 3.

[0033] Next, the tray 3 is conveyed on the main conveyance line 121 toward the bunch unwinding device 15 on the downstream side. In the bunch unwinding device 15, the bottom bunch formed on the threaded bobbin tube 5B is removed. Then, the threaded bobbin tube 5B is conveyed on the main conveyance line 121 toward the yarn end processing device 17. In the yarn end processing device 17, the back wind yarn wound around the yarn layer surface of the threaded bobbin tube 5B is cut, and a distal end side winding portion is formed.

[0034] Next, the threaded bobbin tube 5B is conveyed on the main conveyance line 121 toward the pick finding device 19. In the pick finding device 19, the distal end side winding portion is sucked toward the upper side, and thereafter, inserted to the inner side of a tube body of the

threaded bobbin tube 5B. Then, the threaded bobbin tube 5B is conveyed further downstream on the main conveyance line 121, and supplied to the supplying path 106 of the automatic winder 102. The threaded bobbin tube 5B is conveyed on the supplying path 106, and supplied to one of the winding units 105.

[0035] In the winding unit 105, the unwinding of the yarn is carried out from the threaded bobbin tube 5B, and the unwound yarn is wound into a package. The tray 3 with the empty bobbin tube 5A mounted, all the yarn on the periphery of which is unwound, is discharged from the winding unit 105, and again returned to the main conveyance line 121 of the bobbin processing device 103 through the collecting path 107. In the main conveyance line 121, the bobbin extracting device 11 extracts the empty bobbin tube 5A mounted on the tray 3.

(5) Pick finding device (detailed description)

[0036] The pick finding device 19 will be described using FIG. 6. FIG. 6 is a side view illustrating a state of preparing a yarn end by a pick finding device. As illustrated in FIG. 6, the pick finding device 19 includes a yarn suction tube 91, a cutter 92, a yarn suctioning portion 93, and a yarn detection sensor 95. The yarn suction tube 91 includes an accordion portion that can be extended and contracted vertically, and is arranged to be placed over the distal end portion of the threaded bobbin tube 5B from the upper side by being extended. The yarn suction tube 91 is connected to a negative pressure supplying device 99 by way of a piping 97 so as to be able to suck the distal end side winding portion. The cutter 92 capable of cutting the spun yarn Y is arranged at a connecting portion of the yarn suction tube 91 and the piping 97. Furthermore, the yarn detection sensor 95 is arranged on the piping 97. The yarn detection sensor 95 can detect whether or not the catching of the spun yarn Y is successful by detecting the spun yarn Y.

[0037] The yarn suctioning portion 93 is configured as a pipe-shaped member connected to the negative pressure supplying device 99, the one end of which being formed with a suction port 93a opened upward to face the lower surface of the tray 3 supporting the threaded bobbin tube 5B. Since a vertical airflow passing hole 35 (to be described later) is formed in the tray 3, suction flow can be generated at an upper end portion of the shaft hole 5a of the threaded bobbin tube 5B by sucking the air from the yarn suctioning portion 93.

[0038] When the threaded bobbin tube 5B is conveyed, the pick finding device 19 extends the accordion portion of the yarn suction tube 91 to cover the yarn winding portion of the threaded bobbin tube 5B and generates the suction airflow in the tube of the yarn suction tube 91, thus sucking the distal end side winding portion of the threaded bobbin tube 5B and catching the yarn end.

[0039] When the success in the catching of the yarn end is detected by the yarn detection sensor 95, the pick finding device 19 contracts the accordion portion of the yarn suction tube 91, and then operates the cutter 92 to cut the spun yarn Y. Then, the suction airflow is generated at the airflow passing hole 35 of the tray 3 and the shaft hole 5a of the threaded bobbin tube 5B to suck and catch the yarn end from the upper end of the shaft hole 5a of the threaded bobbin tube 5B by the yarn suctioning portion 93. The preparation can be made so as to obtain a state in which the yarn end is inserted from the upper side to the interior of the threaded bobbin tube 5B.

[0040] Thereafter, the threaded bobbin tube 5B is supplied for the winding operation in the automatic winder 102. Thus, in the automatic winder 102, compressed air is introduced from a hole on the root portion side of the threaded bobbin tube 5B prepared by the pick finding device 19 to easily blow away the yarn end in the tube of the threaded bobbin tube 5B toward the upper side, catch the yarn end by a yarn catching section (not illustrated) on the upper side, and join the yarn end by a yarn joining device to be wound into a package. As a result, the winding operation of the spun yarn Y by the automatic winder 102 can be smoothly started.

(6) Interior structure of tray

[0041] An interior structure of the tray 3 will be described using FIG. 5. The tray 3 is a member to where the threaded bobbin tube 5B with the spun yarn Y wound is attached, and includes a tray main body 31 and a metal net member 33. As described earlier, the tray main body 31 includes the attaching portion 3b (one example of protrusion) inserted into the threaded bobbin tube 5B to stand the threaded bobbin tube 5B. The airflow passing hole 35 passing through from the upper end to the lower surface is formed in the tray main body 31. Specifically, the airflow passing hole 35 is passed through the base portion 3a and the attaching portion 3b.

[0042] The net member 33 is fixed in the airflow passing hole 35, and allows the passing of the air but limits the passing of the yarn. Specifically, the net member 33 is circular in plan view. In FIG. 7, the metal wires configuring the net of the net member 33 are coupled to each other to regulate the movement of the metal wires at an intersecting position of the metal wires. FIG. 7 is a partially enlarged view of a net member. When the yarn end pick found by the pick finding device 19 is inserted to the top hole of the bobbin tube 5, the yarn end will not pass through the tray 3 and run out to the lower side even if the yarn end is moved toward the lower side through the airflow passing hole 35 of the tray main body 31 by the net member 33.

[0043] In the tray 3, shift of the metal wires does not occur in the net member 33, and thus the fly waste is less likely to get entangled, and the deposition of fly waste is less likely to occur. As a result, the duration of use of the net member 33 can be extended.

[0044] Specifically, the metal wires are welded to each other by sintering. Therefore, the adhesive strength of the metal wires of the net member 33 enhances.

[0045] The tray main body 31 includes a recess 37 adapted to accommodate the net member 33. Specifically, the airflow passing hole 35 includes a larger diameter part 35a on the base portion 3a side and a smaller diameter part 35b on the attaching portion 3b side, where the larger diameter part 35a is the recess 37. A step part 35c is formed at the boundary of the larger diameter part 35a and the smaller diameter part 35b.

[0046] The tray 3 includes a fixing bush 39. The fixing bush 39 is a member adapted to fix the net member 33 to the recess 37 by being press fitted into the recess 37. The fixing bush 39 is made of an elastically deformable material, and includes a flat upper surface and lower surface. Specifically, the fixing bush 39 fixes the net member 33 supported at the step portion 35c to the step portion 35c. As the net member 33 can be fixed to the recess 37 by simply press fitting the fixing bush 39 to the recess 37, the fixing and detachment of the net member 33 are facilitated.

[0047] The tray 3 includes a positioning bush 41. The positioning bush 41 is arranged on the far side than the net member 33 in the recess 37. The positioning bush 41 is made of an elastically deformable material, and includes a flat upper surface and lower surface. Specifically, the positioning bush 41 is arranged so as to make contact with the step portion 35c, and realizes a plane for receiving the net member 33. As the location for attaching the net member 33 can be configured by the positioning bush 41, the precision of the shape of the recess 37 does not need to be increased.

[0048] The net member 33 is, for example, made of stainless steel. However, the type of metal is not limited. The mesh roughness of the net member 33 is in a range of 50 to 100 meshes, and allows the passing of the air but limits the passing of the yarn. The wire diameter of the net member 33 is in a range of 0.05 to 0.2 mm. The opening rate of the net member 33 is in a range of 30 to 50%. The tray 3 can effectively prevent the passing of the yarn while allowing the passing of the air.

(7) Attaching operation of net member

[0049] The operation of attaching the net member 33 to the tray main body 31 will be described using FIGS. 8 to 11. First, the tray main body 31 is prepared, as illustrated in FIG. 8. Next, the positioning bush 41 is attached in the recess 37, as illustrated in FIG. 9. Specifically, the positioning bush 41 is arranged on the step portion 35c of the recess 37.

[0050] Then, the net member 33 is mounted on the positioning bush 41 in the recess 37, as illustrated in FIG. 10. Specifically, an outer peripheral edge portion of the net member 33 is mounted on a circumferential plane of the positioning bush 41. Finally, as illustrated in FIG. 11, the fixing bush 39 is press fitted into the recess 37 to fix the net member 33 to the recess 37. Specifically, the fixing bush 39 is arranged on the step portion 35c of the recess 37. As a result, the fixing bush 39 sandwiches the outer peripheral edge portion of the net member 33 with the positioning bush 41. The operation of detaching the net member 33 is carried out in the reverse order.

2. Features of embodiment

[0051] The above described embodiment can be described as below. The bobbin conveying tray (e.g., tray 3) is a bobbin conveying tray (e.g., tray 3) to where the bobbin (e.g., threaded bobbin tube 5B) with the yarn wound (e.g., spun yarn Y) is attached, and includes the tray main body (e.g., tray main body 31) and the metal net member (e.g., metal net member 33). The tray main body includes a protrusion (e.g., attaching portion 3b) inserted into the bobbin to stand the bobbin, and is formed with the airflow passing hole (e.g., airflow passing hole 35) that passes through from the upper end to the lower surface. The metal net member is fixed in the airflow passing hole, and allows the passing of the air but limits the passing of the yarn. The metal wires configuring the net of the net member are closely attached to each other so that shift between the metal wires does not occur. In such tray, the shift of the metal wires does not occur in the net member, and thus the fly waste is less likely to get entangled, and the deposition of fly waste is less likely to occur. As a result, the duration of use of the net member can be extended.

3. Other embodiments

[0052] One embodiment of the present invention has been described above, but the present invention is not limited to such embodiment, and various modifications can be made within a scope not deviating from the gist of the invention. In particular, a plurality of embodiments and alternative embodiments described in the present specification can be arbitrarily combined, as necessary.

[0053] The position at which the net member is fixed to the airflow passing hole of the tray main body is not limited to that in the embodiment described above. The net member may be arranged at a tray distal end or a tray body portion. A means for fixing the net member to the tray main body is not limited to a ring-shaped bush. Other means such as adherence may be adopted. The positioning bush 41 may be omitted. Instead of welding the metal wires to each other by sintering, roll processing (calendar processing) may be carried out by a roll device, and the like to roll the metal wires and deform the metal wires so that the intersecting portion of the metal wires bite into each other. This deformation enhances the coupling force between the metals, and hence the shift of the metal wires of the mesh can be prevented without using a coupling member other than the metal mesh.

[0054] The present invention is widely applied to the bobbin conveying tray.

Claims

1. A bobbin conveying tray (3) onto which a bobbin (5, 5A, 5B) with a yarn wound is attachable, the bobbin conveying tray (3) comprising:

   a tray main body (31) including a protrusion (3b) adapted to be inserted to the bobbin (5, 5A, 5B) to hold the bobbin (5, 5A, 5B), and being formed with an airflow passing hole (35) that passes through the tray main body (31) from an upper end to a lower surface; and
   a net member (33) made of metal and fixed in the airflow passing hole (35); wherein
   metal wires forming the net of the net member (33) are coupled to each other to regulate a movement of the metal wires at an intersecting position of the metal wires.

2. The bobbin conveying tray (3) according to claim 1, wherein the metal wires are welded to each other by sintering.

3. The bobbin conveying tray (3) according to claim 1, wherein the metal wires are coupled to each other by roll processing.

4. The bobbin conveying tray (3) according to any one of claims 1 to 3, wherein
   the tray main body (31) includes a recess (37) adapted to accommodate the net member (33); and
   the bobbin conveying tray (3) further comprises a fixing bush (39) adapted to fix the net member (33) in the recess (37), the fixing bush (39) being press fitted to the recess (37).

5. The bobbin conveying tray (3) according to claim 4, further comprising a positioning bush (41) arranged in the recess (37) and adapted to determine a fixing position of the net member (33) and the fixing bush (39).

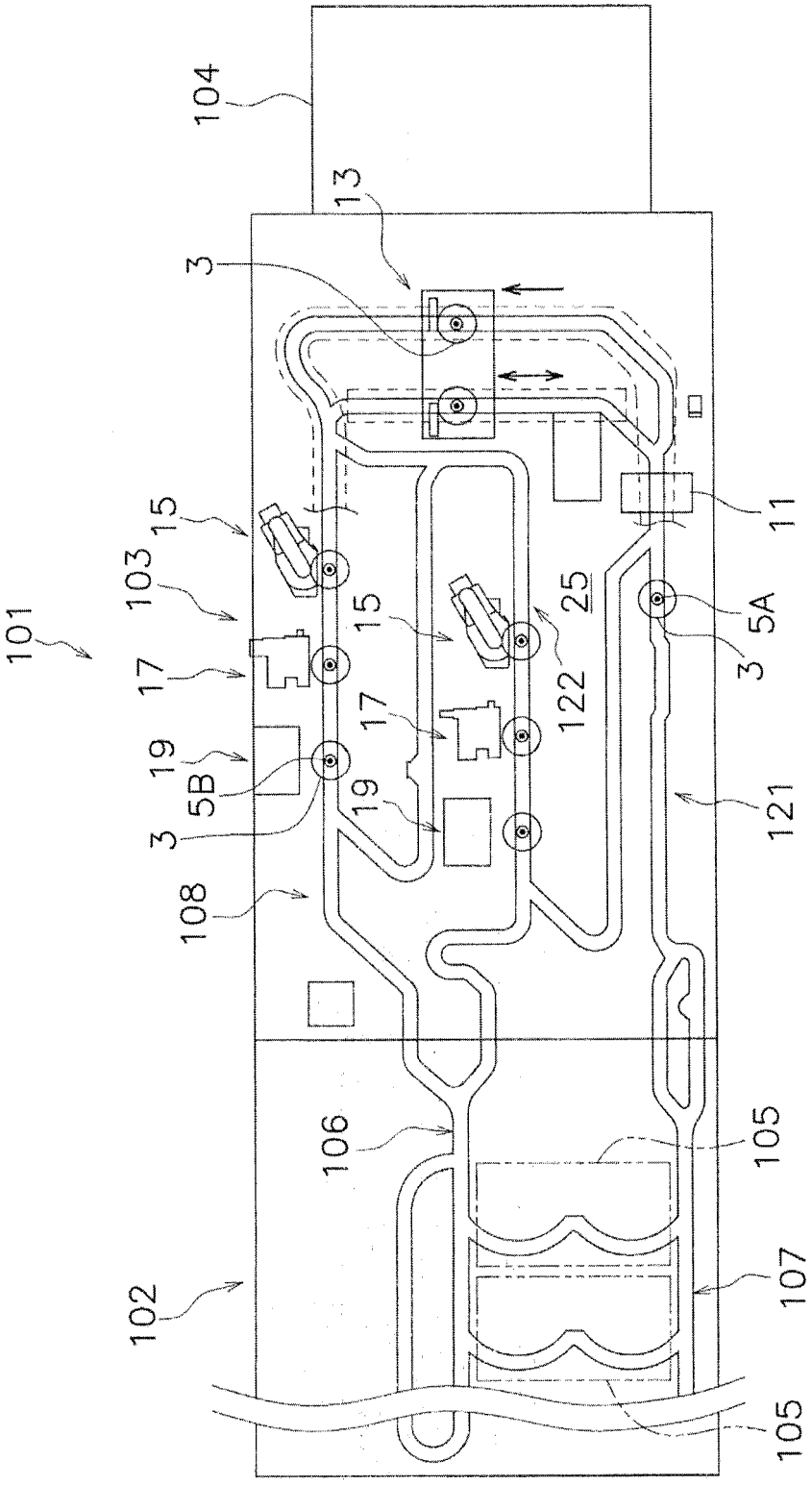
6. The bobbin conveying tray (3) according to any one of claims

   1 to 5, wherein the mesh of the net member (33) allows passing of the air but limits passing of the yarn, and has a roughness in a range of 50 to 100 meshes.

7. The bobbin conveying tray (3) according to any one of claims 1 to 6, wherein a wire diameter of the net member (33) is in a range of 0.05 to 0.2 mm.

8. The bobbin conveying tray (3) according to any one of claims 1 to 7, wherein an opening rate of the net member (33) is in a range of 30 to 60%.

FIG. 1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3
15
103
101
17
19
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102
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11
5A
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122
15
17
19

FIG. 2

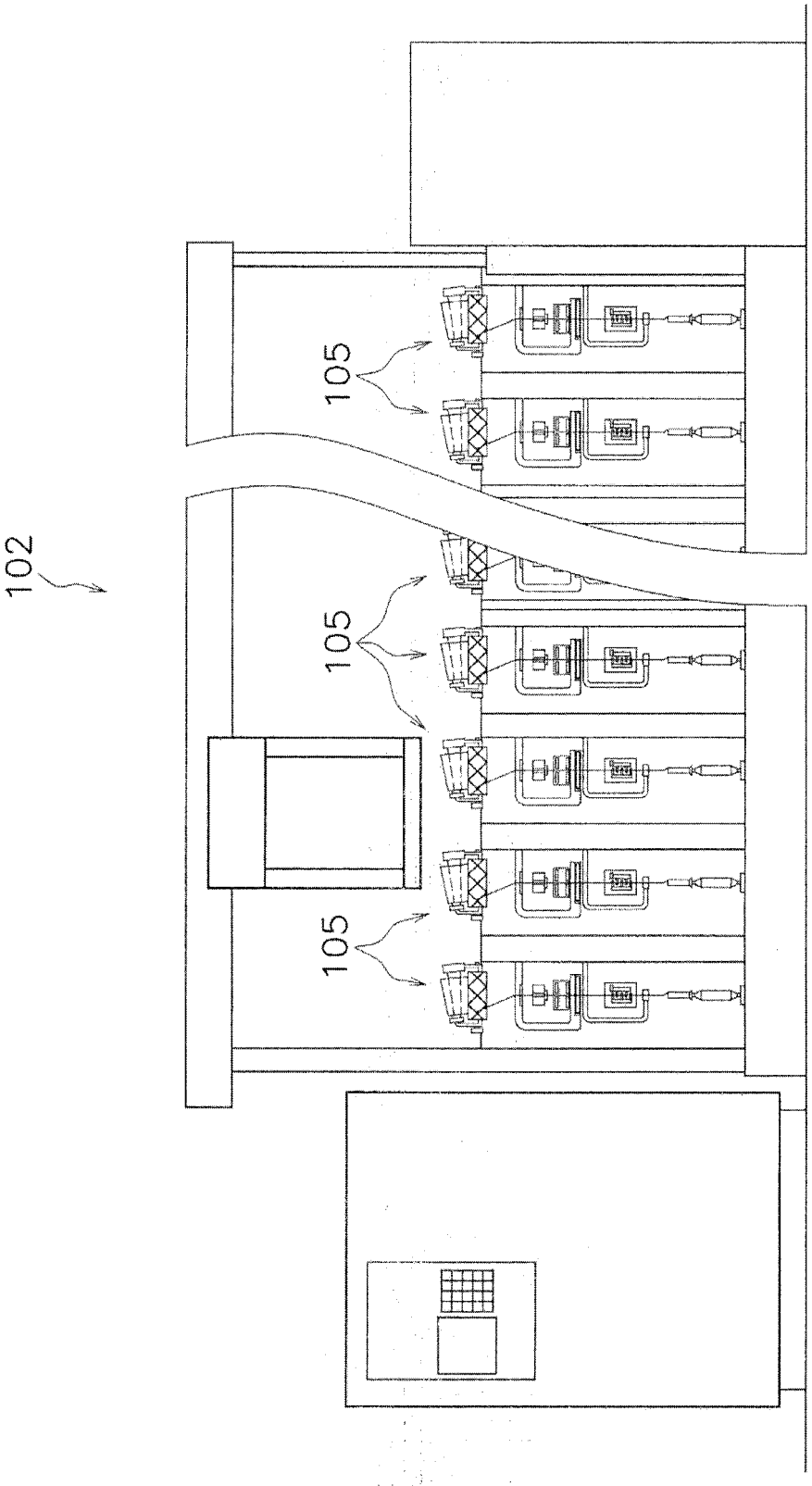


FIG. 3

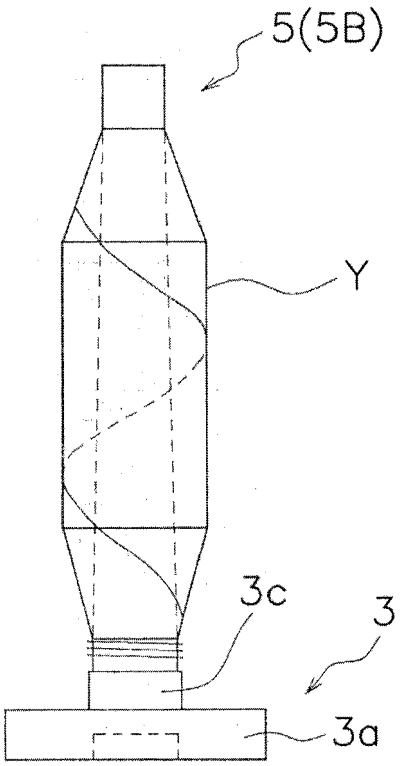


FIG. 4

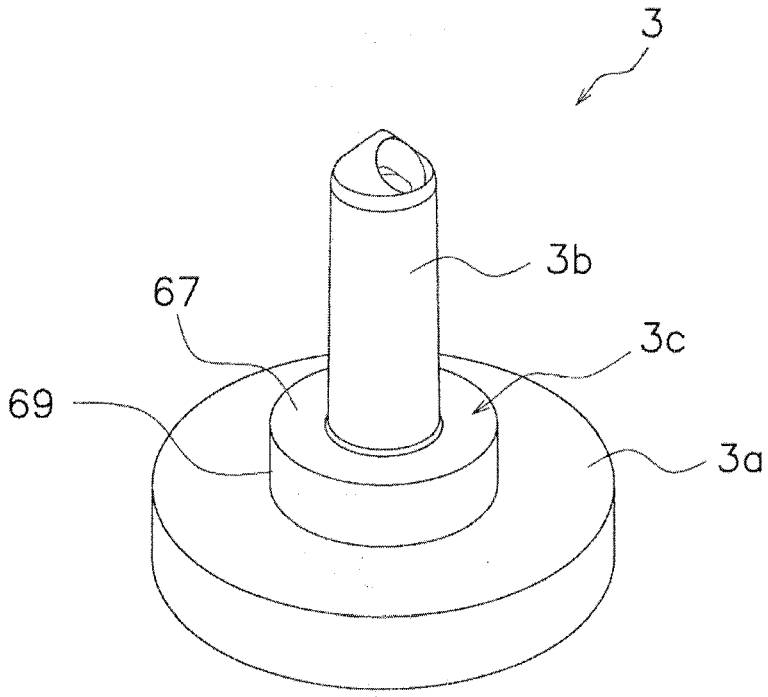


FIG. 5

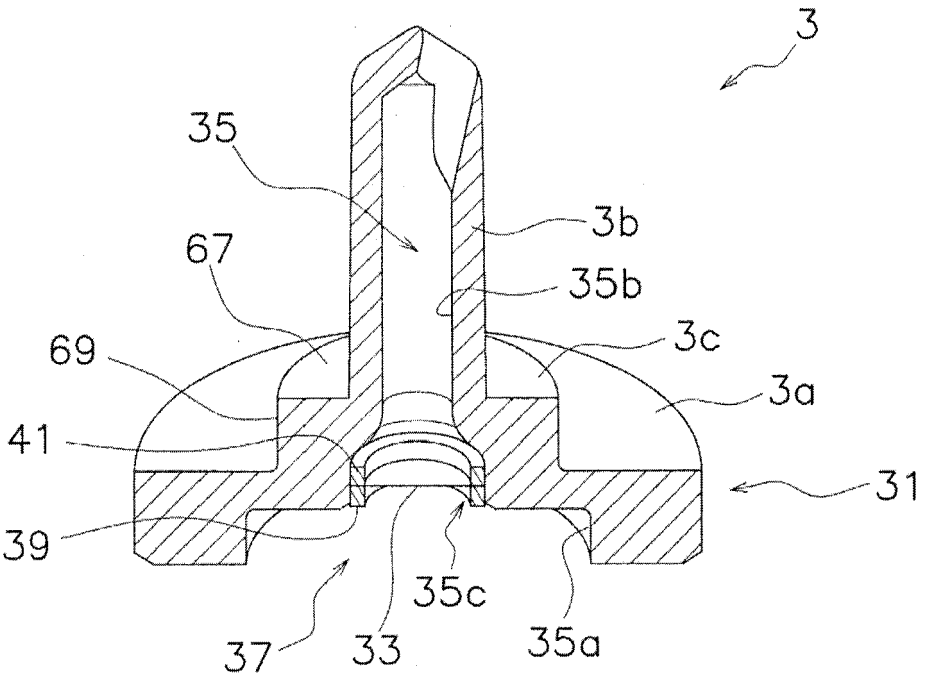


FIG. 6

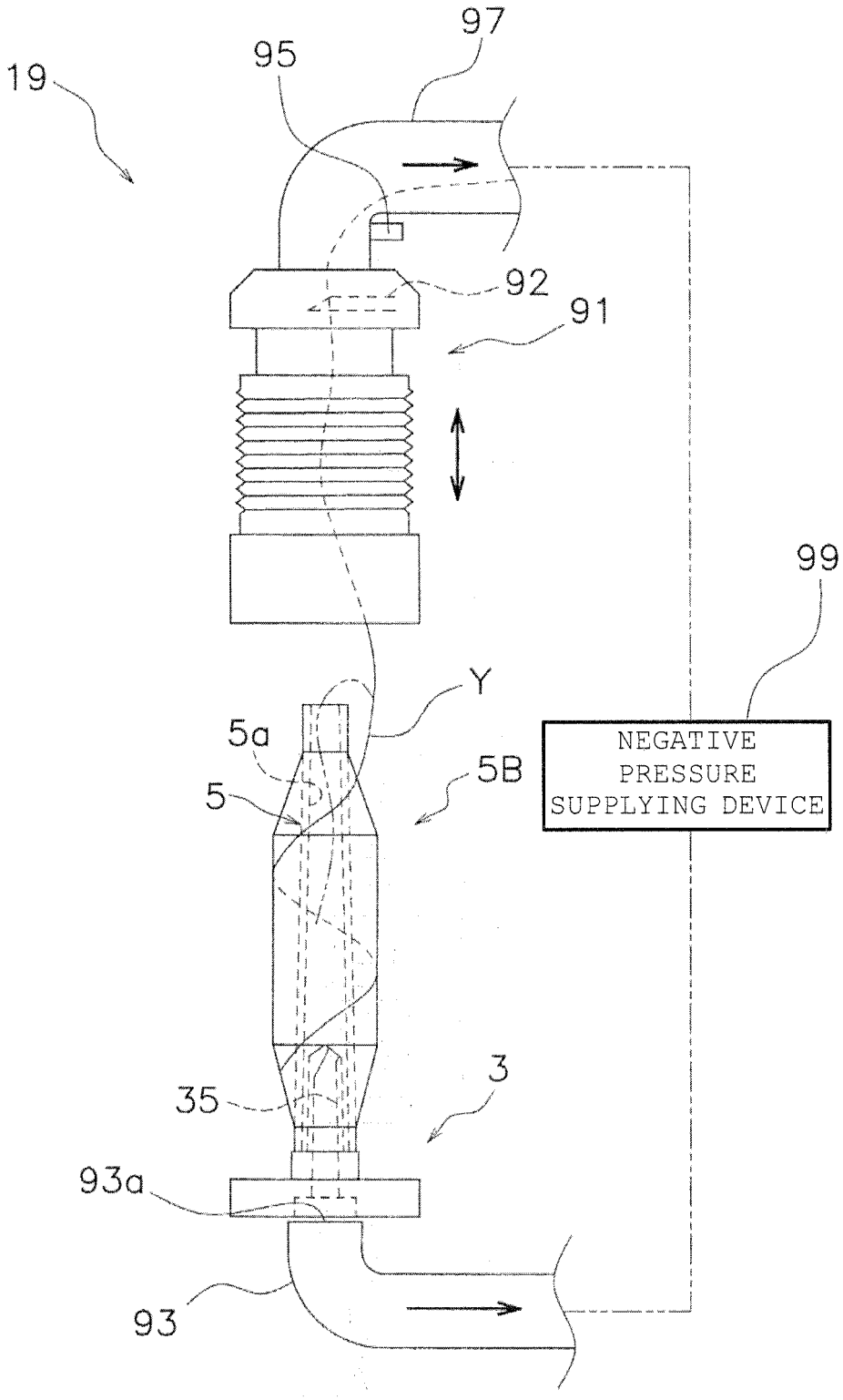

19
95
97
92
91
99
Y
5a
5
5B
NEGATIVE
PRESSURE
SUPPLYING DEVICE
35
3
93a
93

FIG. 7

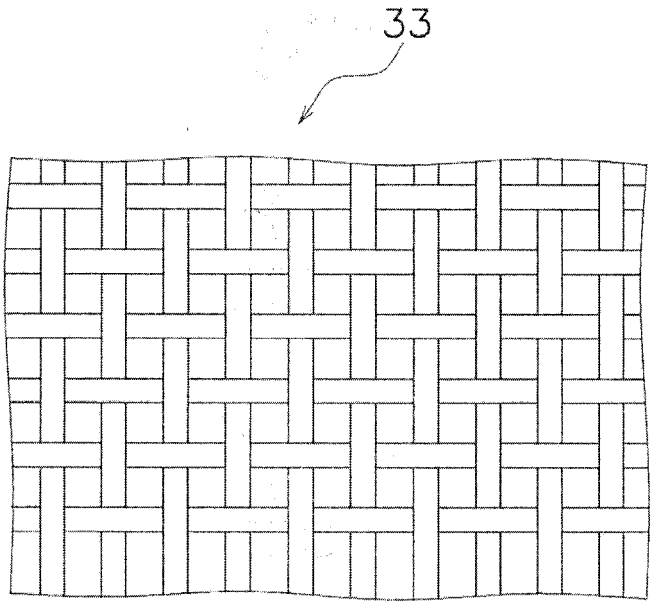


FIG. 8

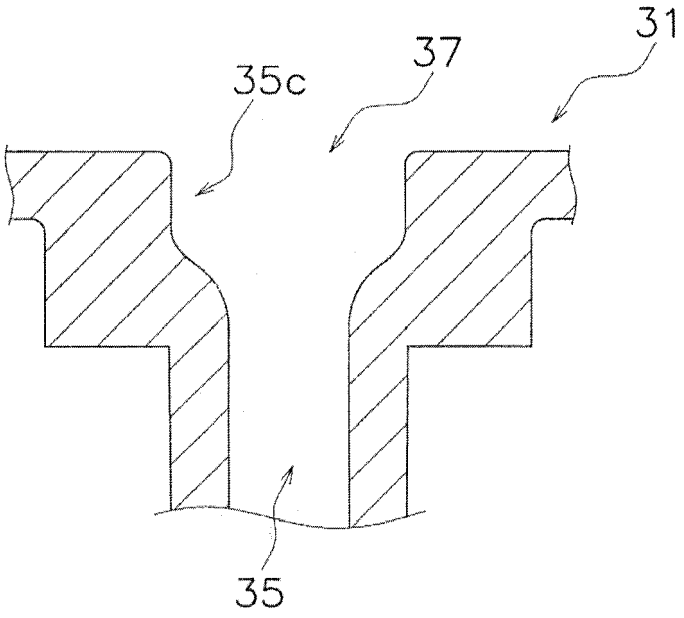


FIG. 9

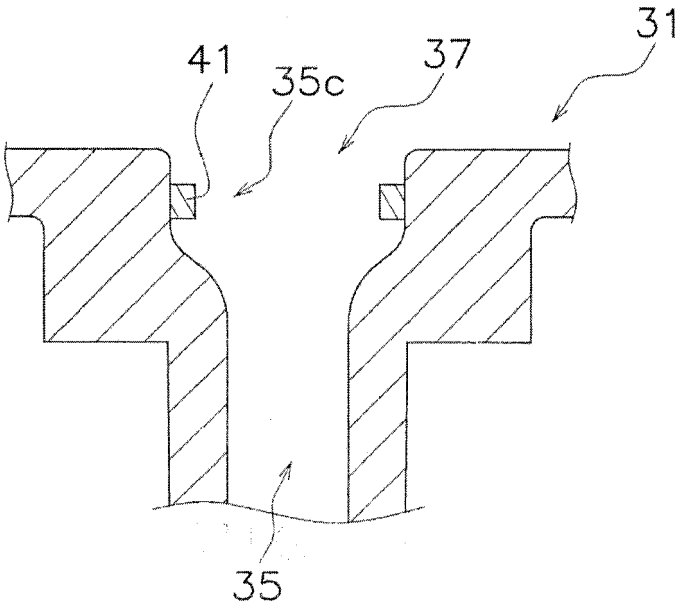


FIG. 10

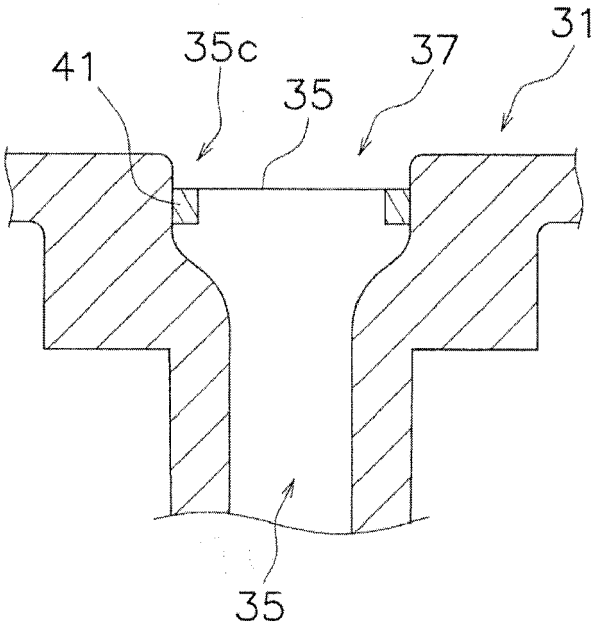
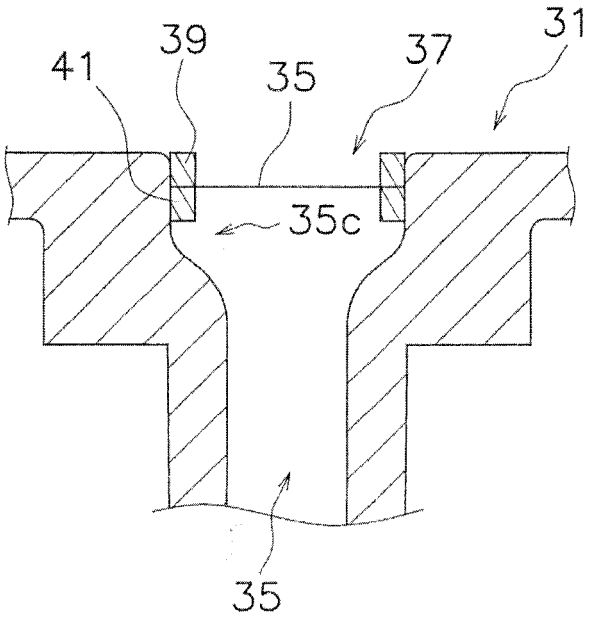


FIG. 11



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 January 2019	Pussemier, Bart

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