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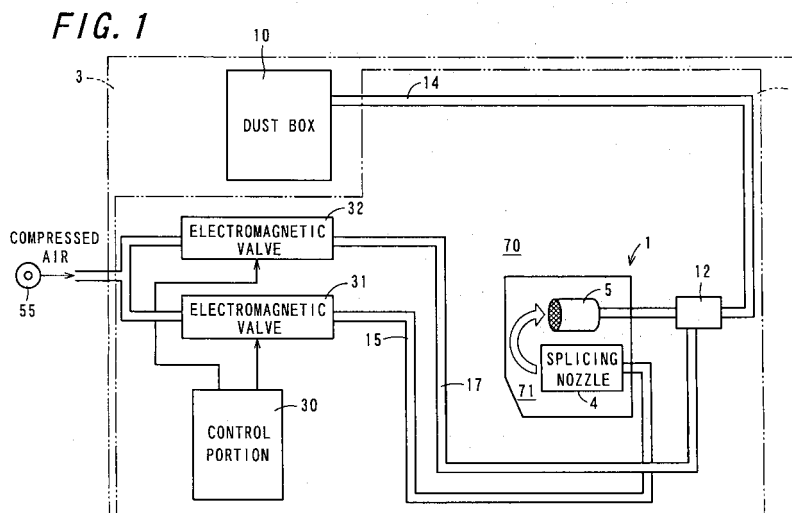
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(54) **CLEANER DEVICE OF SPLICER DEVICE**

(57) The invention relates to a cleaner device of a splicer apparatus which is disposed on the splicer apparatus and in which fibrous dust can be sucked and removed efficiently. A suction portion (5) is provided in a vicinity of a splicing nozzle (4) in which yarns are exposed to a compressed air flow that is a compressed fluid flow and pieced into each other, and they are covered with a cover member (70). Covering them with the cover mem-

ber (70) results in formation of a closed space (71) in which the splicing nozzle (4) and the suction portion (5) are disposed at least during piecing yarns with the splicing nozzle (4). Fibrous dust produced during piecing is prevented from being scattered in a wide space, and is kept in the closed space (71) covered by the cover member (70). The suction portion (5) sucks fibrous dust in this closed space.



Description

Technical Field

[0001] The present invention relates to a cleaner device included in a splicer apparatus that intertwines ends of different yarns.

Background Art

[0002] Conventionally, for piecing spun yarns and the like into each other, a splicer apparatus has been used in which, in a state where yarn ends of two yarns are overlaid, compressed fluid such as air is caused to act on the overlaid portion (see Japanese Unexamined Patent Publication JP-A 2004-27463, for example). During piecing with the splicer apparatus, fibrous dust is formed when piecing yarns into each other and cutting yarns at a head. In a textile machine that produces spun yarns, a large number of spinning units are arranged side by side and simultaneously perform spinning. A path is disposed along the arranged spinning units, and an operation vehicle that moves along the path and performs maintenance operations on the spinning units is also used. A piecing apparatus is disposed on the operation vehicle, and a cleaner is also disposed on the operation vehicle. A spinning unit that needs piecing due to yarn breaking or the like stops, and the operation vehicle moves along the path to the position of the spinning unit that has stopped and performs piecing. The cleaner sucks and removes both fibrous dust produced during piecing and fibrous dust produced during spinning. The operation vehicle is connected to a duct that is disposed for the entire spinning machine, at positions corresponding to the respective spinning units, and a suction force is used not only for sucking and catching a yarn end but also for sucking and removing fibrous dust. The cleaner performs a cleaning operation over the entire interior of the operation vehicle (see Japanese Unexamined Patent Publications JP-A 2004-338837 and JP-A 2005-171434, for example).

[0003] A configuration in which, in a case where a piecing apparatus is attached to a winding unit, a suction and removal mechanism is disposed near a portion that blows out air for piecing has been also disclosed (see Japanese Unexamined Patent Publication JP-A 2005-112551, for example). This piecing apparatus is an aqua splicer that performs piecing using compressed air that contains liquid, and the target that is to be sucked and removed is the liquid.

[0004] A textile machine such as a spinning machine that has a large number of spinning units is a comparatively large apparatus. Here, the frequency at which piecing becomes necessary is comparatively small. In a knitting machine, a fabric is knitted basically with one knitting yarn. Thus, in a case where knitting yarns can be switched with piecing, the variety of fabrics that are knitted can be increased. Here, in a case where the splicer

apparatus is used for piecing in the knitting machine, produced fibrous dust has to be effectively sucked and removed. In a case where the splicer apparatus is disposed on a yarn feed path in the knitting machine, the splicer apparatus and a cleaner that is used for cleaning the splicer apparatus are required to be compact.

[0005] It has been an object of the suction and removal mechanism as disclosed in JP-A 2005-112551 to remove liquid such as water to prevent scattering of liquid, thereby preventing a problem in electrical components or mechanical components. For this object, the suction and removal mechanism includes: a 'blocking mechanism that regulates a direction in which compressed air or liquid is scattered', and a 'suction mechanism that sucks compressed air and liquid and discharges the compressed air and liquid out of the apparatus', wherein 'a suction start timing is the same as or slightly behind a blocking start timing of the compressed air'.

[0006] However, as a cleaner device of a splicer apparatus that is to be attached to a knitting machine or the like, there is no device that can effectively suck fibrous dust. A preferable device is required as a cleaner device of a splicer apparatus.

Disclosure of Invention

[0007] It is an object of the invention to provide a cleaner device of a splicer apparatus, that is attached to the splicer apparatus and can effectively suck and remove fibrous dust.

[0008] The invention is directed to a cleaner device that sucks and removes fibrous dust produced during piecing and that is included in a splicer apparatus having a piecing head that performs piecing by exposing yarns to a compressed fluid flow, a base that supports the piecing head, and a yarn guide lever that guides a yarn that is to be used for piecing to the piecing head, comprising:

a suction head that is supported by the base of the splicer apparatus and disposed near the piecing head; and

a cover member for defining a closed space by covering the piecing head and the suction head at least when piecing is performed by the piecing head,

wherein the cover member defines the closed space in cooperation with the yarn guide lever of the splicer apparatus.

[0009] In the invention, it is preferable that the cover member defines the closed space in cooperation with the yarn guide lever and the base of the splicer apparatus.

[0010] In the invention, it is preferable that the splicer apparatus further has an opening and closing mechanism that closes a gap formed in the closed space that is defined by the cover member and the yarn guide lever of the splicer apparatus.

[0011] In the invention, it is preferable that the suction head starts suction before supply of compressed fluid to

the piecing head.

[0012] In the invention, it is preferable that the cover member has a hinge portion that enables angular displacement with respect to a remaining portion of the cover member, and the hinge portion is fixed to the base.

Brief description of Drawings

[0013] Other and further objects, features, and advantages of the invention will be more explicit from the following detailed description taken with reference to the drawings wherein:

Fig. 1 is a system diagram showing a schematic configuration of a cleaner 1 according to one embodiment of the invention;

Fig. 2 is a perspective view showing a splicer apparatus 2 from which the cover member 70 has been removed;

Fig. 3 is a perspective view showing the splicer apparatus 2 from which the cover member 70 has been removed;

Fig. 4 is a side view showing the splicer apparatus 2 from which the cover member 70 has been removed;

Fig. 5 is a front view showing the splicer apparatus 2 from which the cover member 70 has been removed;

Fig. 6 is a perspective view showing the splicer apparatus 2 including the cover member 70 obliquely from above;

Fig. 7 is a perspective view showing the splicer apparatus 2 including the cover member 70 obliquely from below;

Figs. 8A and 8B are side views showing the splicer apparatus 2;

Fig. 9 is a perspective view showing the splicer apparatus 2 obliquely from above;

Fig. 10 is a perspective view showing the splicer apparatus 2 obliquely from above;

Fig. 11 is an enlarged cross-sectional view showing part of a partition wall 80, the cover member 70, and a yarn guide lever 44, taken along a virtual plane that includes a section line A-A in Fig. 9 and is perpendicular to the vertical direction;

Fig. 12 is a view showing a schematic internal configuration of a suction nozzle 12;

Fig. 13 is a view showing a schematic configuration in which the splicer apparatus 2 including the cleaner 1 is attached to a weft knitting machine 60; and

Fig. 14 is a view showing a schematic configuration in which the splicer apparatus 2 including the cleaner 1 is attached to the weft knitting machine 60.

Best Mode for Carrying out the Invention

[0014] Now referring to the drawings, preferred em-

bodiments of the invention will be described in detail.

[0015] Fig. 1 is a system diagram showing a schematic configuration of a cleaner 1 according to one embodiment of the invention. The cleaner 1 functioning as a cleaner device is included in a splicer apparatus 2 that performs piecing. The splicer apparatus 2 is included in a weft knitting machine 3, and is used for piecing to partially switch knitting yarns that are used for knitting a fabric, while measuring the length of the knitting yarns. The splicer apparatus 2 includes a splicing nozzle 4 functioning as a piecing head. At the splicing nozzle 4, yarns are exposed to a compressed air flow that is a compressed fluid flow and pieced into each other. The cleaner 1 is used for sucking and removing fibrous dust produced during piecing in the splicer apparatus 2.

[0016] The cleaner 1 includes a suction portion 5 and a cover member 70. The suction portion 5 is a suction head that is disposed near the splicing nozzle 4. The suction portion 5 sucks fibrous dust together with surrounding air. The cover member 70 covers the splicing nozzle 4 and the suction portion 5, and defines a space 71 in which the splicing nozzle 4 and the suction portion 5 are arranged. The space 71 is a space that is closed at least when piecing is performed by the splicing nozzle 4. The closed state of the space 71 may be a sealed state, or may be a state in communication with the external space via a gap between constituent elements of the splicer apparatus 2, a hole formed through constituent elements, or the like, as in this embodiment. More specifically, the closed state refers to a state in which the space 71 is covered and a flow of air between the interior and exterior of the space 71 is suppressed. The suction portion 5 sucks air inside the space 71 as well as air discharged from the splicing nozzle 4, and thus fibrous dust inside the space 71 is sucked.

[0017] As shown in Figs. 9 and 10, the splicer apparatus includes an opening and closing mechanism 100 that can open and close a gap formed in the closed space. The state in which a gap in the closed space is closed by the opening and closing mechanism 100 refers to a sealed state, or may be a state in which a slight gap in communication with the external space is formed. Thus, in the state where the gap is closed, a flow of air between the interior and exterior of the internal space 71 of the cover member is suppressed more significantly than in the state before the gap is closed.

[0018] The suction portion 5 performs suction using compressed air supplied from a supply source 55 that supplies compressed air also to the splicing nozzle 4. The splicing nozzle 4 is connected via a first supply tube 15 to the supply source 55, and can be supplied with compressed air from the supply source 55. The suction portion 5 is connected via a discharge tube 14 to a dust box 10. A suction nozzle 12 functioning as a constituent element for forming a negative pressure is interposed in the discharge tube 14. The suction nozzle 12 is connected via a second supply tube 17 to the supply source 55, and can be supplied with compressed air from the supply

source 55. The suction nozzle 12 blows out compressed air in the discharge tube 14 toward the dust box 10, and forms an air flow in the discharge tube 14 from the suction portion 5 toward the dust box 10. Thus, a negative pressure is formed in the suction portion 5, and the suction portion 5 sucks fibrous dust using this negative pressure.

[0019] A first electromagnetic valve 31 is interposed in the first supply tube 15. The first electromagnetic valve 31 is controlled by a control portion 30 so as to open and close the first supply tube 15, and thus supply and supply stop of compressed air to the splicing nozzle 4 is controlled. A second electromagnetic valve 32 is interposed in the second supply tube 17. The second electromagnetic valve 32 is controlled by the control portion 30 so as to open and close the second supply tube 17, and thus supply and supply stop of compressed air to the suction nozzle 12 is controlled.

[0020] As shown in Figs. 9 and 10, the opening and closing mechanism 100 includes an air cylinder 101 that operates with compressed air supplied from the supply source 55, and an opening and closing plate 102 and a yarn pressing plate 103 that are displaced by being driven by the air cylinder 101. The air cylinder 101 is controlled by the control portion 30. When the air cylinder 101 drives the yarn pressing plate 103 for displacement, a state in which yarns are held and a state in which holding of yarns is cancelled can be switched. When the air cylinder 101 drives the opening and closing plate 102 for displacement, a closed state in which a gap between the cover member 70 and a yarn guide lever 44 is closed and an opened state in which the gap is opened can be switched. The air cylinder 101 drives the yarn pressing plate 103 and the opening and closing plate 102 for displacement in a thickness direction of a partition wall 80.

[0021] Thus, the control portion 30 can perform on and off control of piecing performed by the splicing nozzle 4 and suction performed by the suction portion 5. The cleaner 1 includes not only the suction portion 5 and the cover member 70, but also the discharge tube 14, the second supply tube 17, the suction nozzle 12, the second electromagnetic valve 32, and the control portion 30. Furthermore, the control portion 30 can control the opening and closing operation of the gap between the cover member 70 and the yarn guide lever 44 and the yarn pressing operation performed by the opening and closing mechanism 100.

[0022] Figs. 2 and 3 are perspective views showing the splicer apparatus 2 from which the cover member 70 has been removed. Fig. 2 shows a state before the start of a piecing operation. Fig. 3 shows a state close to the end of the piecing operation. In Figs. 2 and 3, some of yarns are indicated by dashed dotted lines, and the other yarns are not shown. In the splicer apparatus 2, at least one knitting yarn 90a is selected by a yarn selecting portion 41 from among a plurality of knitting yarns 90 that are fed from above, and the knitting yarn 90a can be switched into a currently used knitting yarn 90b. In this embodiment, a side on which yarns are fed is taken as

an upper side, and a side on which the yarns are used is taken as a lower side. However, the arrangement of the splicer apparatus is not limited to the above arrangement.

[0023] The splicer apparatus 2 includes a yarn holder 42, the yarn selecting portion 41, the splicing nozzle 4, the yarn guide lever 44, a first driving portion 11, a cutter 47, a yarn clamp 91, a second driving portion 13, the yarn pressing plate 103, the opening and closing mechanism 100, and a base 81. The yarn holder 42 and the yarn pressing plate 103 hold tip end portions of the knitting yarns other than the currently used knitting yarn 90b, among the plurality of yarns. The yarn selecting portion 41 selects the knitting yarn 90a that is to be used for piecing, from among the knitting yarns held by the yarn holder 42. The splicing nozzle 4 performs piecing by joining the knitting yarn 90a selected by the yarn selecting portion 41 and the currently used knitting yarn 90b, using a flow of compressed fluid in a groove that is formed from an inlet positioned on the opposite side of the yarn holder 42 to an outlet positioned on the side of the yarn holder. The yarn guide lever 44 catches the knitting yarn 90a selected by the yarn selecting portion 41 and guides the knitting yarn 90a to the inlet of the groove of the splicing nozzle 4. The first driving portion 11 drives the yarn guide lever 44. The cutter 47 cuts the currently used knitting yarn 90b and the selected knitting yarn 90a that are pieced into each other, at a position near the outlet of the groove of the splicing nozzle 4. The second driving portion 13 drives the cutter 47 and the yarn clamp 91 in conjunction with the yarn guide lever 44. The opening and closing mechanism 100 drives the yarn pressing plate 103 for displacement.

[0024] The base 81 directly or indirectly supports the yarn holder 42, the yarn pressing plate 103, the splicing nozzle 4, the yarn guide lever 44, the cutter 47, the yarn clamp 91, the first driving portion 11, and the second driving portion 13. The base 81 has the partition wall 80 formed in a plate-like shape. The partition wall 80 is a wall extending in the upper, lower, left and right directions and that partitions space into a front side and a back side. The base 81 supports the yarn holder 42, the splicing nozzle 4, the yarn guide lever 44, the cutter 47, and the yarn clamp 91, on the front side of the partition wall 80. Furthermore, the base 81 has the first driving portion 11 and the second driving portion 13 on the back side of the partition wall 80. Furthermore, the base 81 has a separator 43 that is formed in a substantially plate-like shape and disposed parallel to the partition wall 80, and that is spaced away from the partition wall 80 on the front side of the partition wall.

[0025] The yarn guide lever 44 is driven by the first driving portion 11 so as to be angularly displaced about an axis extending in the thickness direction of the partition wall 80. The yarn guide lever 44 is angularly displaced, and the angular displacement is performed at a position closer to the partition wall 80 than the separator 43. The yarn guide lever 44 is formed in a substantially U-like

shape, and can be angularly displaced about a proximal portion thereof. A tip end portion 44a of the yarn guide lever 44 catches the selected knitting yarn 90a. Furthermore, a side protrusion 44b formed on a side face closer to the proximal portion of the yarn guide lever 44 catches the currently used knitting yarn 90b.

[0026] The tip ends of the knitting yarns other than the currently used knitting yarn 90b, that is, the knitting yarns that are not used and have been put on standby are held by the yarn holder 42. The standby knitting yarns other than the currently used knitting yarn 90b are held on the front side of the separator 43, and the currently used knitting yarn 90b passes through an area on the back side of the separator 43 and is supplied downward.

[0027] As shown in Fig. 2, when switching the currently used knitting yarn 90b into the knitting yarn 90a selected by the yarn selecting portion 41, the knitting yarn 90a, selected by the yarn selecting portion 41 is pulled toward the back side of the separator 43. In this state, when the yarn guide lever 44 that is disposed on the back side of the separator 43 is angularly displaced, the selected knitting yarn 90a is caught on the tip end portion 44a of the yarn guide lever 44 and guided downward on the back side of the separator 43, as shown in Fig. 3. Furthermore, the currently used knitting yarn 90b can be caught on the side protrusion 44b of the yarn guide lever 44 and moved to the front side of the separator 43.

[0028] A groove is formed on the splicing nozzle 4 that is disposed below the separator 43 and the yarn holder 42. The selected knitting yarn 90a guided downward by the yarn guide lever 44 is guided to the splicing nozzle 4 and put in the groove. The currently used knitting yarn 90b is prevented by a yarn guide 46 from being guided to the splicing nozzle 4 during knitting. Before piecing, the suction portion 5 sucks the selected knitting yarn 90a and the currently used knitting yarn 90b. The currently used knitting yarn 90b and the selected knitting yarn 90a are guided by the yarn guide lever 44 to a predetermined yarn path, and thus the knitting yarns 90a and 90b are guided to the groove of the splicing nozzle 4 and put in the groove. When the yarns are sucked by the suction portion 5, the opening and closing mechanism 100 closes the gap between the cover member 70 and the yarn guide lever 44. Simultaneously, the yarn pressing plate 103 holds the currently used knitting yarn 90b and the standby yarns, at a position above the yarn holder 42. The tip ends of the yarns held by the yarn holder 42 and protruding downward from the yarn holder 42 are sucked by the suction portion 5.

[0029] The second driving portion 13 drives the yarn clamp 91 so that the selected knitting yarn 90a and the currently used knitting yarn 90b are clamped at a position below the splicing nozzle 4. The second driving portion 13 drives the cutter 47 so that the selected knitting yarn 90a and the currently used knitting yarn 90b are cut. Next, in a state where the selected knitting yarn 90a and the currently used knitting yarn 90b are put in the groove, compressed air is blown into the groove, and thus the

knitting yarns 90a and 90b are exposed to a compressed air flow flowing the groove and pieced into each other. When piecing is performed, the opening and closing mechanism 100 closes the gap between the cover member 70 and the yarn guide lever 44, and thus leakage of fibrous dust through the gap can be prevented.

[0030] After the selected knitting yarn 90a and the currently used knitting yarn 90b are pieced into each other, holding of the yarns performed by the yarn holder 42 is cancelled. An end portion of the selected knitting yarn 90a is released from the yarn holder 42 and sucked by the suction portion 5 as a yarn lint. At that time, the knitting yarns are held by the yarn pressing plate 103. Next, the yarn holder 42 holds the knitting yarns, and thus a portion of the cut knitting yarn 90a on the side of the supply source is held by the yarn holder 42 together with the other knitting yarns on standby, and holding of the knitting yarns performed by the yarn pressing plate 103 is canceled.

[0031] In a case where piecing is performed in this manner, the selected knitting yarn 90a is cut together with the currently used knitting yarn 90b, at a position between the splicing nozzle 4 and the yarn holder 42, and thus a yarn lint is formed. More specifically, when the end of the piecing portion of the knitting yarns that have been pieced into each other is cut, a yarn lint is formed. Furthermore, when the knitting yarns 90a and 90b are exposed to a compressed air flow in the groove of the splicing nozzle 4, fiber is separated from the yarns.

[0032] In order to suck fibrous dust including the fiber separated from the yarns and the yarn lint, the suction portion 5 is disposed between the splicing nozzle 4 and the yarn holder 42. The cutter 47 is disposed between the splicing nozzle 4 and the suction portion 5. The yarn pressing plate 103 is disposed closer to the yarn feeding side than the yarn holder 42. Furthermore, the splicing nozzle 4 is disposed between the cutter 47 and the yarn clamp 91.

[0033] The yarn selecting portion 41 is disposed at the uppermost portion of the base 81, and the partition wall 80 is disposed below the yarn selecting portion 41. The splicing nozzle 4, the suction portion 5, the yarn holder 42, the separator 43, the yarn guide lever 44, the yarn guide 46, the cutter 47, the yarn clamp 91, and the yarn pressing plate 103 are arranged on the front side, which is in front of the partition wall 80. The first and the second electromagnetic valves 31 and 32, a driving portion that drives the yarn guide lever 44, the cutter 47, and the yarn pressing plate 103, and an electromagnetic valve that controls supply of operation air for driving the yarn holder 42 are arranged on the back side, which is at the back of the partition wall 80.

[0034] Fig. 4 is a side view showing the splicer apparatus 2 from which the cover member 70 has been removed. Fig. 5 is a front view showing the splicer apparatus 2 from which the cover member 70 has been removed. Fig. 4 shows the external shape of the cover member 70 as a region 95 enclosed by a dashed double

dotted line. Fig. 6 is a perspective view showing the splicer apparatus 2 including the cover member 70 obliquely from above. Fig. 7 is a perspective view showing the splicer apparatus 2 including the cover member 70 obliquely from below. Figs. 4 to 7 show states before the start of a piecing operation.

[0035] The cover member 70 is disposed on the front side of the partition wall 80, and covers only the splicing nozzle 4, the suction portion 5, and constituent elements arranged near the splicing nozzle 4 and the suction portion 5. As shown in Fig. 4, the cover member 70 is spaced away from the partition wall 80 in the thickness direction of the partition wall 80. Furthermore, as shown in Fig. 5, the cover member 70 is formed in the shape of a box that is open on the side of the partition wall 80. The cover member 70 includes an upper face portion 74a, a bottom face portion 74b, a partition wall opposing portion 74c, a first side face portion 74d, and a second side face portion 74e.

[0036] The upper face portion 74a is disposed above the suction nozzle 12. The bottom face portion 74b is disposed below the yarn clamp 91. The partition wall opposing portion 74c is disposed to oppose the partition wall 80, in front of to-be-covered targets 4, 12 and 47 including at least the splicing nozzle 4, the suction nozzle 12, and the cutter 47 on the front side of the partition wall 80. The partition wall opposing portion 74c is continued to the upper face portion 74a at the uppermost portion and continued to the bottom face portion 74b at the lower end portion. The first side face portion 74d and the second side face portion 74e are spaced away from each other in the lateral direction that is perpendicular to the thickness direction of the partition wall 80 and the vertical direction. The to-be-covered targets 4, 12 and 47 are arranged between the first side face portion 74d and the second side face portion 74e. The side face portions 74d and 74e are continued to the partition wall opposing portion 74c on the front side of the partition wall 80. Holes through which part of the suction portion, the second driving portion 13, and the like are inserted are formed on the second side face portion 74e, and the second side face portion 74e is fixed to the partition wall 80.

[0037] The splicing nozzle 4, the suction nozzle 12 and the cutter 47 are partially covered with the cover member 70, and disposed in the space 71 of the cover member 70, while the yarn holder 42, the separator 43, and the like are arranged outside the cover member 70. In this manner, the cover member 70 covers the splicing nozzle 4 and the suction portion 5 so that the capacity of the internal space 71 is as small as possible.

[0038] As shown in Fig. 7, the cover member 70 has a hinge portion 73 that enables angular displacement with respect to the remaining portion of the cover member 70. In the cover member 70, the second side face portion 74e and the partition wall opposing portion 74c are connected via the hinge portion 73. The hinge portion 73 connects the partition wall opposing portion 74c in an angularly displaceable manner with respect to the sec-

ond side face portion 74c. When the partition wall opposing portion 74c of the cover member 70 is angularly displaced with respect to the second side face portion 74e, a state in which the to-be-covered targets 4, 12 and 47 are covered and a state in which the to-be-covered targets 4, 12 and 47 are not covered can be easily switched. In a state where the cover member 70 covers the to-be-covered targets 4, 12 and 47, the groove of the splicing nozzle 4 is open on the side of the first side face portion 74d, and the suction nozzle 12 is disposed with the suction opening oriented in the other side. Each of the hinge portion 73, the partition wall opposing portion 74c, and the like is formed by integral molding using a synthetic resin.

[0039] Figs. 8A and 8B are side views showing the splicer apparatus 2. Figs. 8A and 8B show states in which the cover member 70 is attached. Fig. 8A shows a state before piecing. Fig. 8B shows a state after piecing.

[0040] As described above, the cover member 70 partially covers the splicing nozzle 4 and the suction portion 5. As shown in Figs. 4 and 8A, the internal space 71 defined by the cover member 70 has a region on the side of the partition wall 80 with respect to the splicing nozzle 4 and the suction portion 5, and is open outward at an opening 77 in the shape of a groove extending from above to below. When piecing, the yarn guide lever 44 catches and guides a selected knitting yarn to the splicing nozzle 4. Thus, when piecing is performed by the splicing nozzle 4, the yarn guide lever 44 is put in the groove-shaped opening 77 and blocks the opening 77 as shown in Fig. 8B. The splicing nozzle 4 substantially blocks an upper region, a lower region, and a lateral region of the opening 77.

[0041] The cover member 70 may include a portion 73c that covers the splicing nozzle 4 and the suction portion 5 from the back, which corresponds to the back side of the apparatus, or may use part of the partition wall 80. That is to say, the splicing nozzle 4 and the suction portion 5 are covered from the back side by at least one of the cover member 70 and the partition wall 80. In this embodiment, when piecing is performed by the splicing nozzle 4, the cover member 70 defines the closed space 71 in cooperation with the yarn guide lever 44 and the partition wall 80. In a case where the portion 73c that covers the splicing nozzle 4 and the suction portion 5 from the back side is disposed at the base 81, the capacity of the space 71 can be reduced, and a gap or the like in communication with the outside can be made smaller. Furthermore, a plate-like blocking portion 78 is formed in the yarn guide lever 44. The blocking portion 78 extends parallel to the partition wall 80. The blocking portion 78 faces the opening of the cover member 70 from the back side. Thus, the capacity of the space 71 can be reduced, and a gap or the like in communication with the exterior environment can be made smaller. Accordingly, leakage of fibrous dust through the gap can be prevented. It should be noted that a similar effect can be obtained even with a configuration in which the portion 73c that covers the

splicing nozzle 4 and the suction portion 5 is not disposed and only the blocking portion 78 is formed.

[0042] The suction portion 5 is controlled by the control portion 30 so as to start suction before supply of compressed fluid to the splicing nozzle 4. Since suction performed by the suction portion 5 starts first, after an air flow toward the suction portion 5 is formed in the space 71, air is discharged from the splicing nozzle 4.

[0043] Figs. 9 and 10 are perspective views showing the splicer apparatus 2 obliquely from above. Fig. 9 shows a state in which the opening and closing plate 102 opens a gap of the cover member 70. Fig. 10 shows a state in which the opening and closing plate 102 closes the gap of the cover member 70. Fig. 11 is an enlarged cross-sectional view showing part of the partition wall 80, the cover member 70, and the yarn guide lever 44, taken along a virtual plane that includes a section line A-A in Fig. 9 and is perpendicular to the vertical direction. In Fig. 11, an opening and closing plate 102a closing the opening is indicated by a dashed double dotted line.

[0044] In this embodiment, the opening and closing mechanism 100 that drives the yarn pressing plate 103 performs drive to displace the yarn pressing plate 103 for piecing and drives the opening and closing plate 102. The opening and closing plate 102 and the yarn pressing plate 103 are integrally formed, and the air cylinder 101 simultaneously drives the opening and closing plate 102 and the yarn pressing plate 103.

[0045] As shown in Fig. 9, a gap is formed between the yarn pressing plate 103 and the separator 43. In a state where holding of yarns performed by the yarn pressing plate 103 is canceled, the opening and closing plate 102 opens the gap formed in the cover member 70. Furthermore, as shown in Fig. 10, when the yarn pressing plate 103 is driven for displacement and the gap between the yarn pressing plate 103 and the separator 43 is closed, the yarn pressing plate 103 holds yarns extending between the yarn holder 42 and the yarn selecting portion 41 in cooperation with the yarn pressing plate 103. At that time, the opening and closing plate 102 is displaced together with the yarn pressing plate 103, and closes the gap of the cover member 70. Here, as shown in Fig. 11, the gap of the cover member 70 refers to a gap that is surrounded by the partition wall 80, the cover member 70, and the yarn guide lever 44, and open upward. When the opening and closing plate 102 is displaced in the thickness direction of the partition wall 80, the gap is narrowed.

[0046] After the piecing operation starts, the currently used yarn that has been caught on the yarn guide lever 44 during angular displacement moves over the side edge of the separator 43 to the front side of the separator 43 and is placed between the separator 43 and the yarn pressing plate 103. The standby yarns are also placed between the yarn pressing plate 103 and the separator 43. When the opening and closing mechanism 100 is driven in this state, the yarns arranged between the yarn pressing plate 103 and the separator 43 are sandwiched

and temporarily held therebetween. At that time, the opening and closing plate 102 closes the gap of the cover member. In a case where the yarn pressing plate 103 and the opening and closing plate 102 that closes the gap of the cover member, which are necessary for piecing, are arranged as one opening and closing mechanism 100, the configuration is simplified, and the gap between the cover member 70 and the yarn guide lever 44 can be closed without an additional driving source.

[0047] Fig. 12 shows a schematic internal configuration of the suction nozzle 12. In the suction nozzle 12, a casing 50 formed in a substantially tube-like shape includes a suction port 51 on one side in the axial direction, a pressure port 52 at the middle, and a discharge port 53 on the other side in the axial direction. When compressed air is introduced to the pressure port, the air blows out toward the discharge port 53, and thus a negative pressure can be formed at the suction port 51. The pressure of compressed air supplied from the compressed air supply source is preferably, for example, approximately 490 kPa (5 kg per cubic centimeter). This sort of compressed air may be supplied in one batch to the entire plant. In this case, the compressed air may be used also for the cleaner 1. Furthermore, a compressed air source such as a compressor may be provided for each weft knitting machine 3 or each group of the weft knitting machines 3.

[0048] In a case where the compressed air source is included in this manner, the cleaner 1 of the splicer apparatus 2 includes the cover member 70, the electromagnetic valve 32, the compressed air source, and the control portion 30. The cover member 70 has the suction portion 5 as cleaning means and covers the surrounding space including at least part of the splicer apparatus 2. The electromagnetic valve 32 switches on and off of suction of an air flow performed by the cleaning means. The control portion 30 controls the electromagnetic valve 32. The compressed air source supplies compressed air. Thus, even when the splicer apparatus 2 is attached to an existing weft knitting machine 3 or the like, fibrous dust produced during piecing can be effectively removed.

[0049] Figs. 13 and 14 are views showing a schematic configuration in which the splicer apparatus 2 including the cleaner 1 is attached to a weft knitting machine 60. Fig. 13 shows a schematic configuration from the front. Fig. 14 shows a schematic configuration from the left side. In the weft knitting machine 60, a plurality of knitting yarns are fed via a side tension apparatus 61 disposed on one or both sides. The side tension apparatus 61 also has a function to suppress a change in a tensile force of knitting yarns within a predetermined range. Upper spring devices 62 are arranged in the upper portion of the weft knitting machine 60. The upper spring devices 62 detect broken points or knots of knitting yarns, and stop the apparatus upon the detection. In a state where the cleaner 1 is attached to the splicer apparatus 2, the splicer apparatus 2 is covered with a cover 63. A knitting yarn fixed amount feeding apparatus 64 that feeds a knitting yarn

by a necessary amount used for knitting a fabric is also disposed on the downstream side in the yarn feeding direction of the splicer apparatus 2. For example, in a case where an intarsia pattern or the like is knitted in a fabric that is being knitted, knitting yarns can be switched at a pattern interface by accurately measuring the supply length of the knitting yarns that have been pieced into each other by the splicer apparatus 2. Knitting yarns are pulled out from cones 65 and fed to the upper spring devices 62. The knitting yarn fixed amount feeding apparatus 64 is also accommodated in the cover 63, and the dust box 10 is disposed outside the cover 63. Not only fibrous dust sucked through a suction opening 8 from the splicer apparatus 2, but also a lint produced by cutting the piecing portion which lint is sucked by the suction portion 5 is collected in the dust box 10. A knitting yarn is fed from the side tension apparatus 61 or the knitting yarn fixed amount feeding apparatus 64 to a fabric that is being knitted on a needle bed 66. A yarn path rail 67 extends above the needle bed 66. A carriage 68 that travels along the needle bed 66 brings a yarn feeding member that travels along the yarn path rail 67, and thus a knitting yarn is fed to a knitting needle on the needle bed 66.

[0050] With the cleaner 1 as described above, the splicing nozzle 4 and the suction portion 5 that are arranged close to each other are covered by the cover member 70. When piecing is performed by the splicing nozzle 4, the closed space 71 whose capacity is as small as possible is defined by the cover member 70 and the yarn guide lever 44 in cooperation with each other. Fibrous dust produced during piecing is prevented from being scattered in a wide space, and is kept in the closed space 71 covered by the cover member 70. The suction portion 5 sucks fibrous dust in this closed space, and thus the fibrous dust can be effectively sucked and removed. Fibrous dust can be effectively sucked also with a configuration in which a negative pressure is formed with compressed air using the suction nozzle 12 shown in Fig. 12.

[0051] The yarn guide lever 44 that defines the space 71 is an essential constituent element for the splicer apparatus 2 in order to perform piecing, and thus the cover member 70 can be made smaller, and the cleaner 1 can be downsized. Downsizing of the cleaner 1 can contribute to downsizing of the splicer apparatus 2. Furthermore, since the suction portion 5 starts suction before discharge of air from the splicing nozzle 4, air discharged from the splicing nozzle 4 is guided to the suction portion 5 by the air flow that has been formed in advance. Thus, fibrous dust can be guided to the suction portion 5 by the air flow, to be effectively sucked and removed.

[0052] Furthermore, since a main unit portion 74 in the cover member 70 is angularly displaced with respect to the hinge portion 73 that is fixed to the partition wall 80, a large gap can be formed between the cover member 70 and the partition wall 80. Thus, an operation such as maintenance can be easily performed.

[0053] In another embodiment of the invention, the cover member 70 may not include a portion that covers the splicing nozzle 4 and the suction portion 5 from the back side. In this case, the splicing nozzle 4 and the suction portion 5 are covered by the partition wall 80 from the back side. In this configuration, when piecing is performed by the splicing nozzle 4, the cover member 70 defines the closed space 71 in cooperation with the yarn guide lever 44 and the partition wall 80. With the configuration using the partition wall 80 in this manner, the configuration of the cover member 70 can be simplified, and thus the cover member 70 can be made smaller.

[0054] With this configuration, the effect resulting from a configuration in which the cover member 70 includes a portion that covers the splicing nozzle 4 and the suction portion 5 from the back side cannot be obtained, but the other effects obtained in the foregoing embodiment of the invention can be obtained in a similar manner. Moreover, since the cover member 70 defines the closed space 71 in cooperation not only with the yarn guide lever 44 but also with the base 81, the number of constituent elements can be further reduced, and the cleaner 1 can be downsized.

[0055] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and a range of equivalency of the claims are therefore intended to be embraced therein.

Industrial Applicability

[0056] According to the invention, the suction head is disposed near the piecing head that performs piecing by exposing yarns to a compressed fluid flow, and the piecing head and the suction head are covered by the cover member. In a case where the piecing head and the suction head are covered by the cover member, a closed space in which the piecing head and the suction head are arranged is formed at least when piecing is performed by the piecing head. Fibrous dust produced during piecing is prevented from being scattered in a wide space, and is kept in the closed space covered by the cover member. The suction head sucks fibrous dust in this closed space, and thus the fibrous dust can be effectively sucked and removed. A preferable cleaner device of a splicer apparatus can be realized.

[0057] Furthermore, the cover member defines the closed space in cooperation with the yarn guide lever. Regardless of whether or not the cover member defines the closed space, the yarn guide lever is an essential constituent element for the splicer apparatus. Since the closed space is defined using this essential constituent element, the cover member can be made smaller, and thus the cleaner device can be downsized.

[0058] According to the invention, the cover member defines the closed space in cooperation not only with the yarn guide lever but also with the base. The base is also an essential constituent element for the splicer apparatus. Accordingly, the cover member can be made smaller, and thus the cleaner device can be downsized.

[0059] According to the invention, the opening and closing mechanism closes a gap formed in the closed space, and thus fibrous dust produced during piecing can be prevented from being scattered through the gap to the external space of the cover member. Thus, a preferable cleaner device of a splicer apparatus can be realized.

[0060] According to the invention, the suction head starts suction before supply of compressed fluid to the piecing head. Since suction performed by the suction head starts first, after a fluid flow flowing into the suction head is formed in the closed space, compressed fluid can be supplied to the piecing head, and the compressed fluid can be discharged from the piecing head. The fluid discharged from the piecing head is guided by the fluid flow that has been formed in advance. Thus, fibrous dust can be guided by the fluid flow to the suction head, and easily sucked and removed.

[0061] According to the invention, the hinge portion is fixed to the base. Thus, the remaining portion other than the hinge portion is also fixed to the base. When the remaining portion is angularly displaced with respect to the hinge portion, a large gap can be formed between the cover member and the base, and thus an operation such as maintenance can be easily performed.

the base of the splicer apparatus.

3. The cleaner device of the splicer apparatus of claim 1 or 2, wherein the splicer apparatus further has an opening and closing mechanism that closes a gap formed in the closed space that is defined by the cover member and the yarn guide lever of the splicer apparatus.
4. The cleaner device of the splicer apparatus of any one of claims 1 to 3, wherein the suction head starts suction before supply of compressed fluid to the piecing head.
5. The cleaner device of the splicer apparatus of any one of claims 1 to 4, wherein the cover member has a hinge portion that enables angular displacement with respect to a remaining portion of the cover member, and the hinge portion is fixed to the base.

Claims

1. A cleaner device that sucks and removes fibrous dust produced during piecing and that is included in a splicer apparatus having a piecing head that performs piecing by exposing yarns to a compressed fluid flow, a base that supports the piecing head, and a yarn guide lever that guides a yarn that is to be used for piecing to the piecing head, comprising:

a suction head that is supported by the base of the splicer apparatus and disposed near the piecing head; and

a cover member for defining a closed space by covering the piecing head and the suction head at least when piecing is performed by the piecing head,

wherein the cover member defines the closed space in cooperation with the yarn guide lever of the splicer apparatus.

2. The cleaner device of the splicer apparatus of claim 1, wherein the cover member defines the closed space in cooperation with the yarn guide lever and

FIG. 1

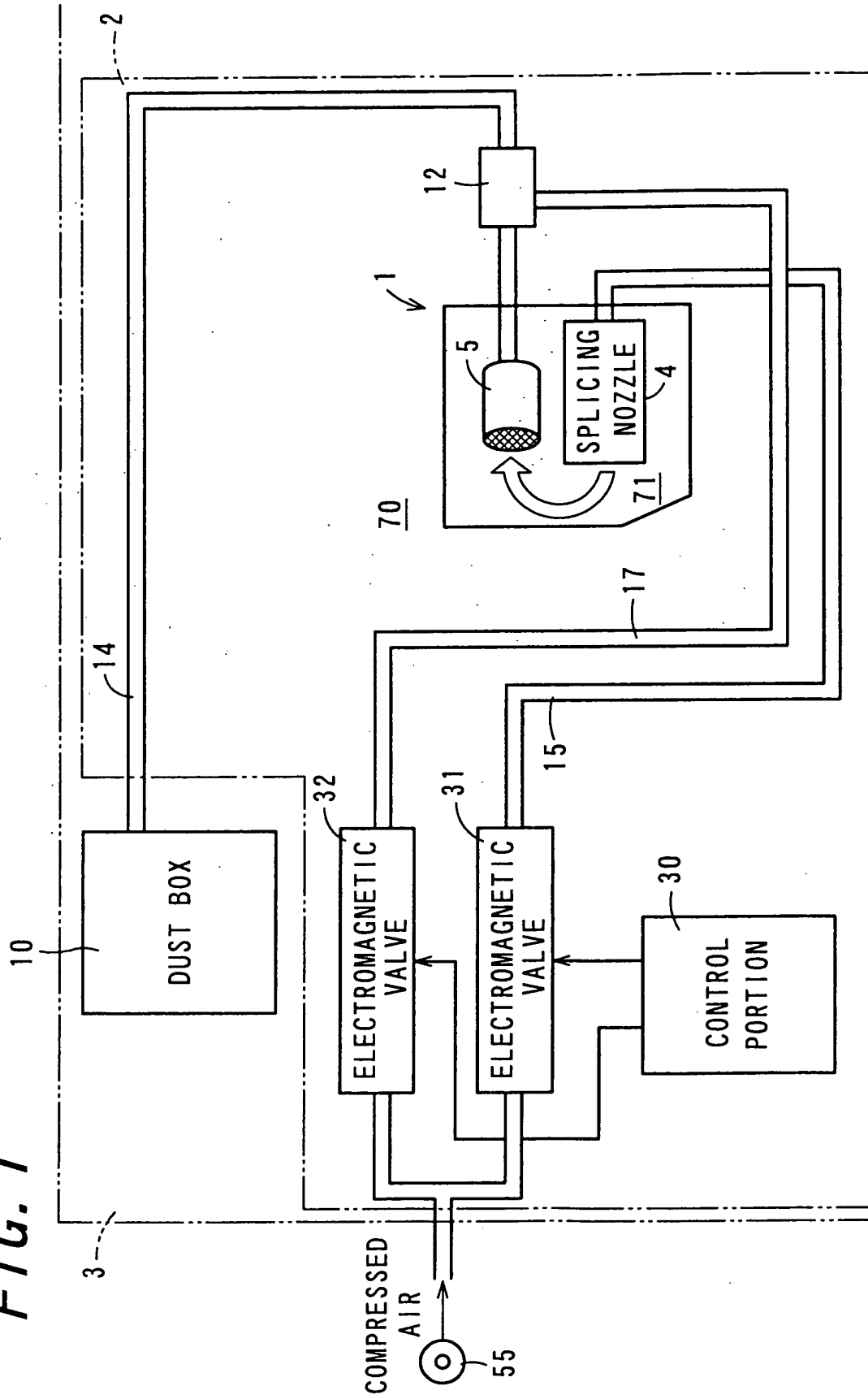
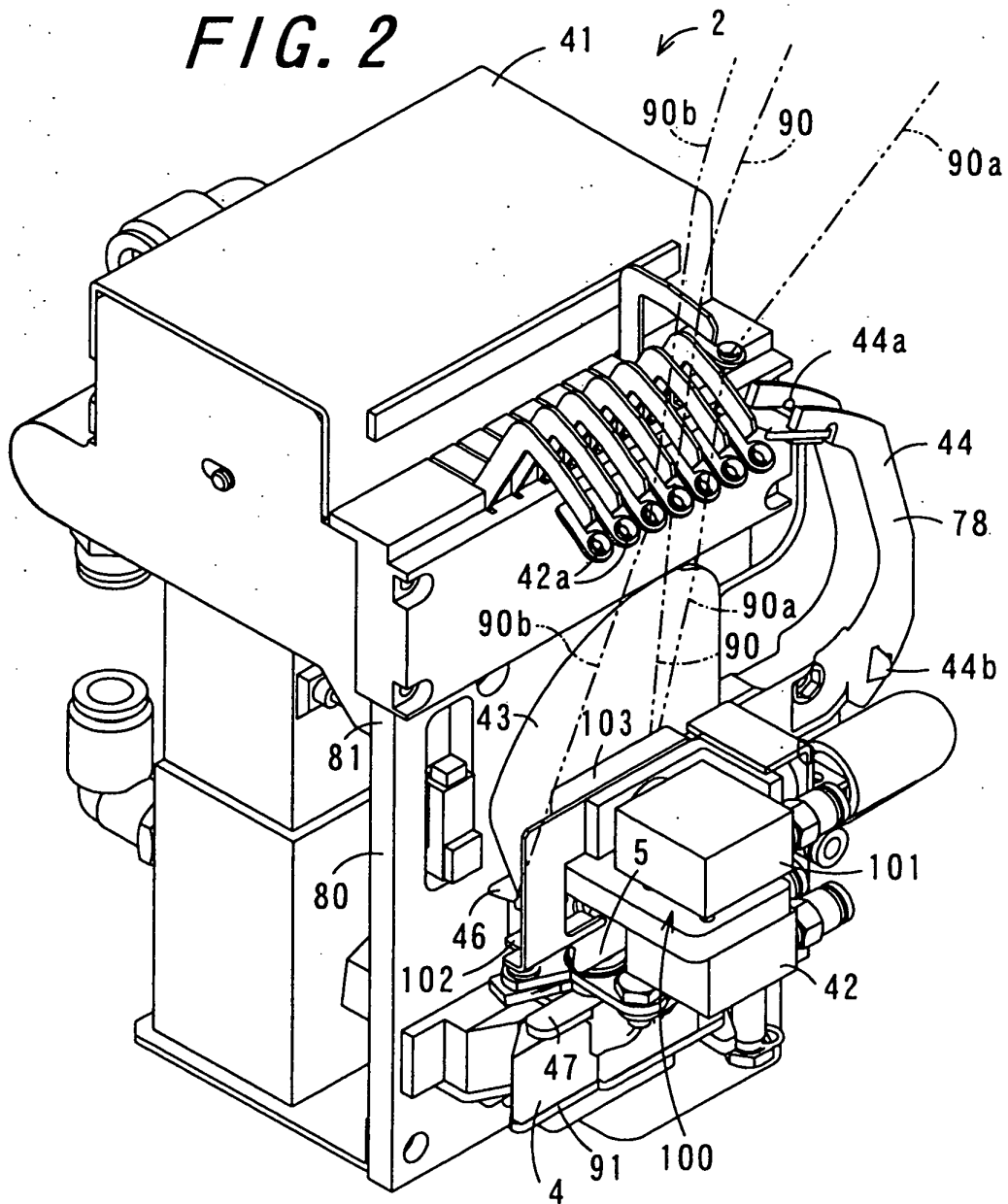
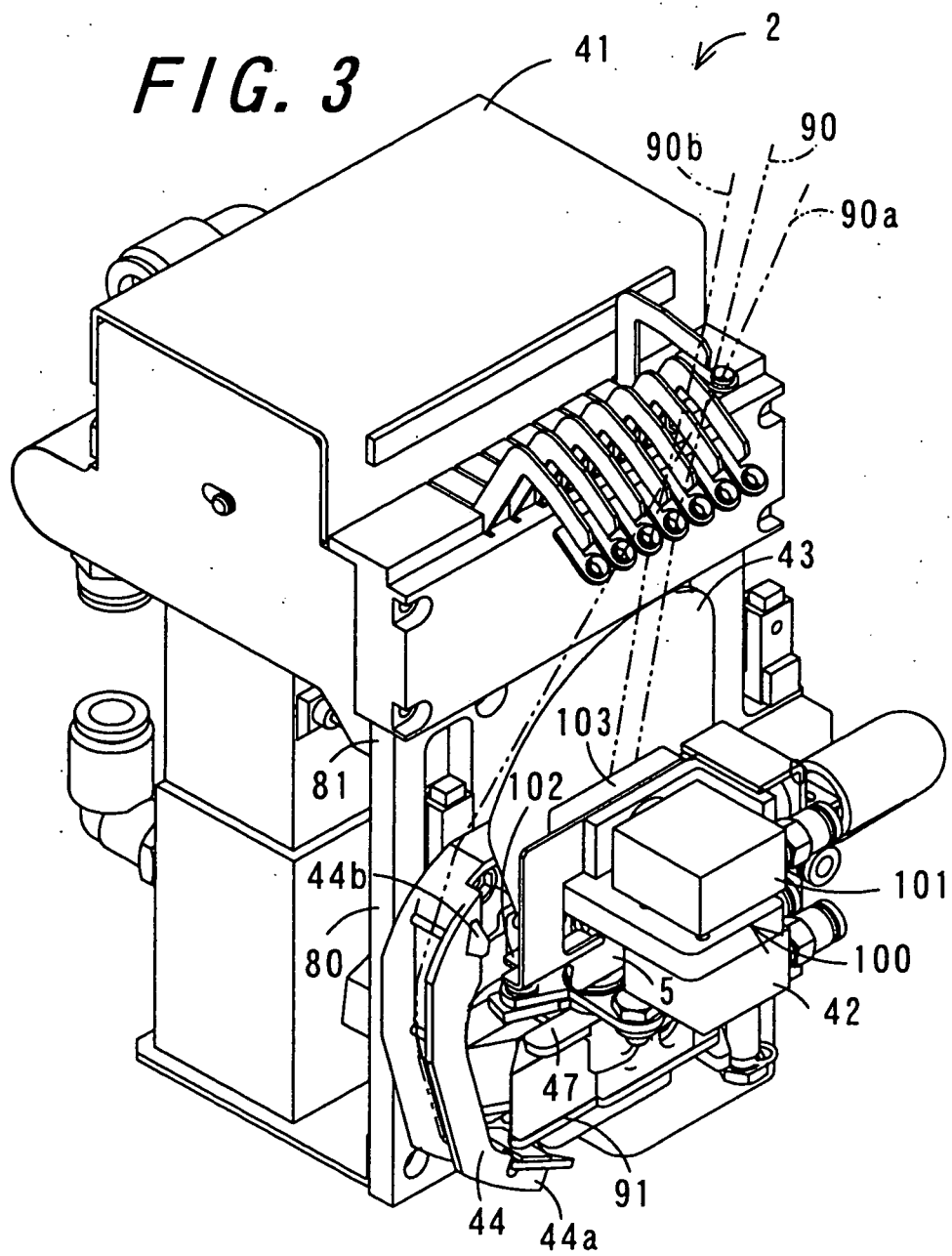
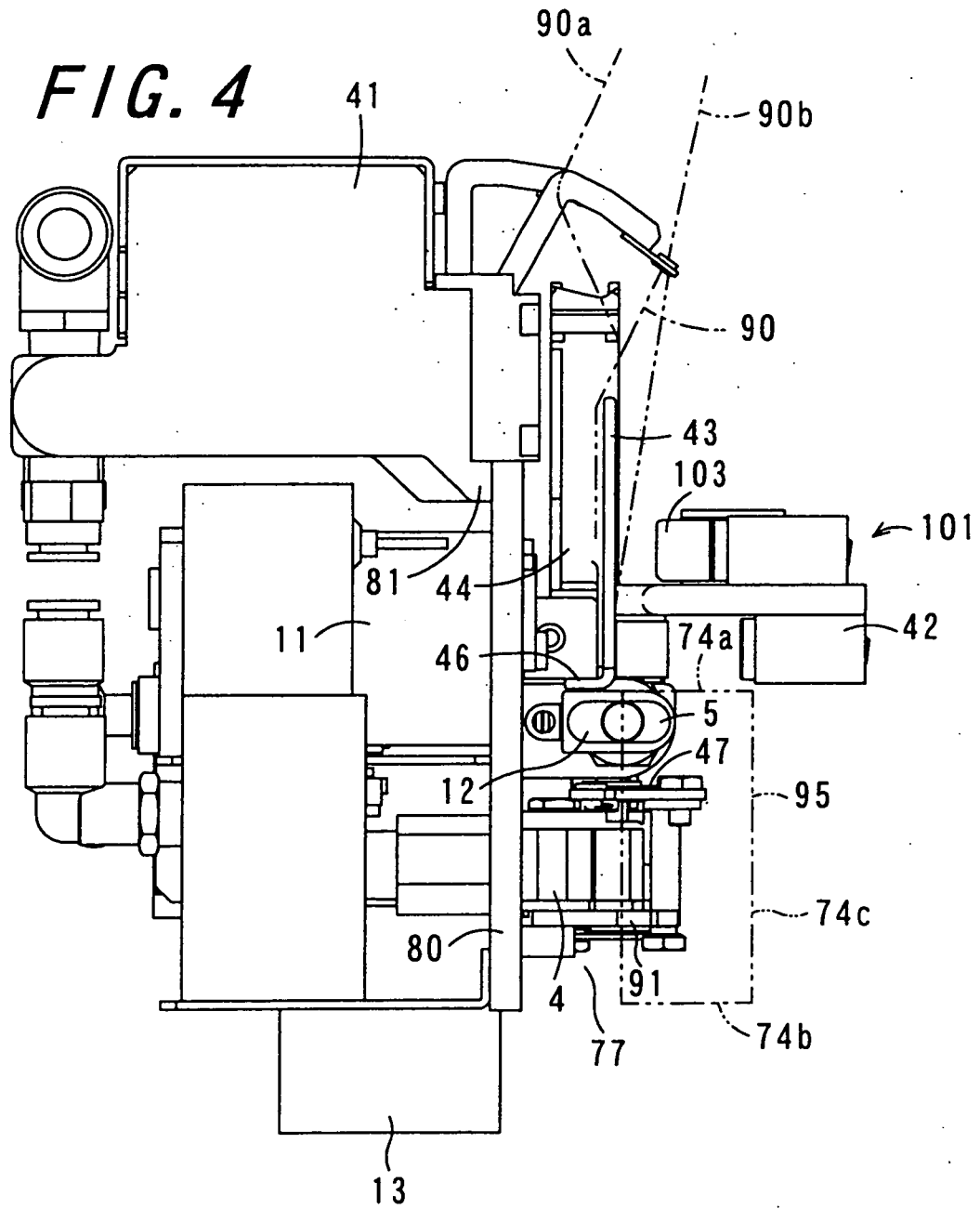
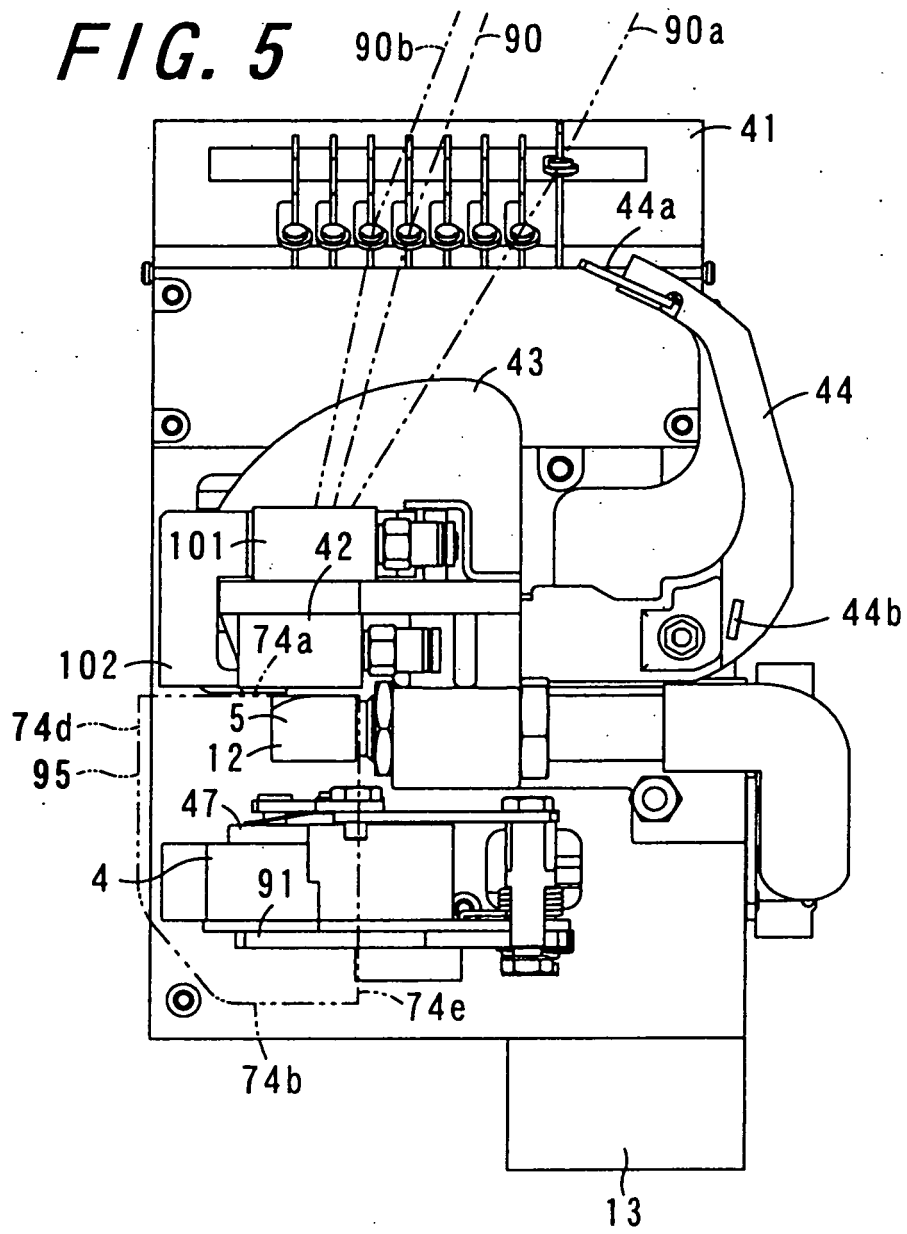


FIG. 2









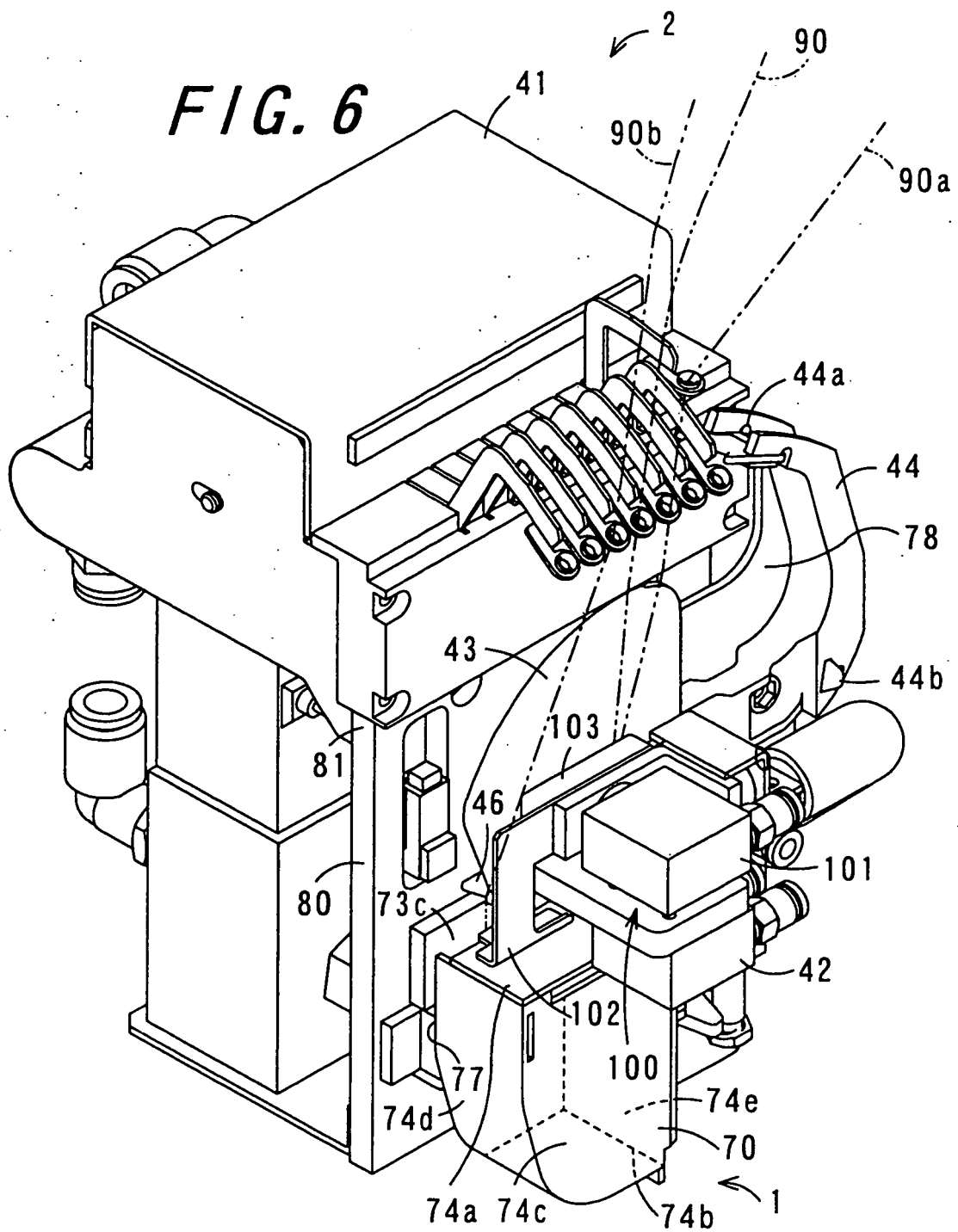


FIG. 7

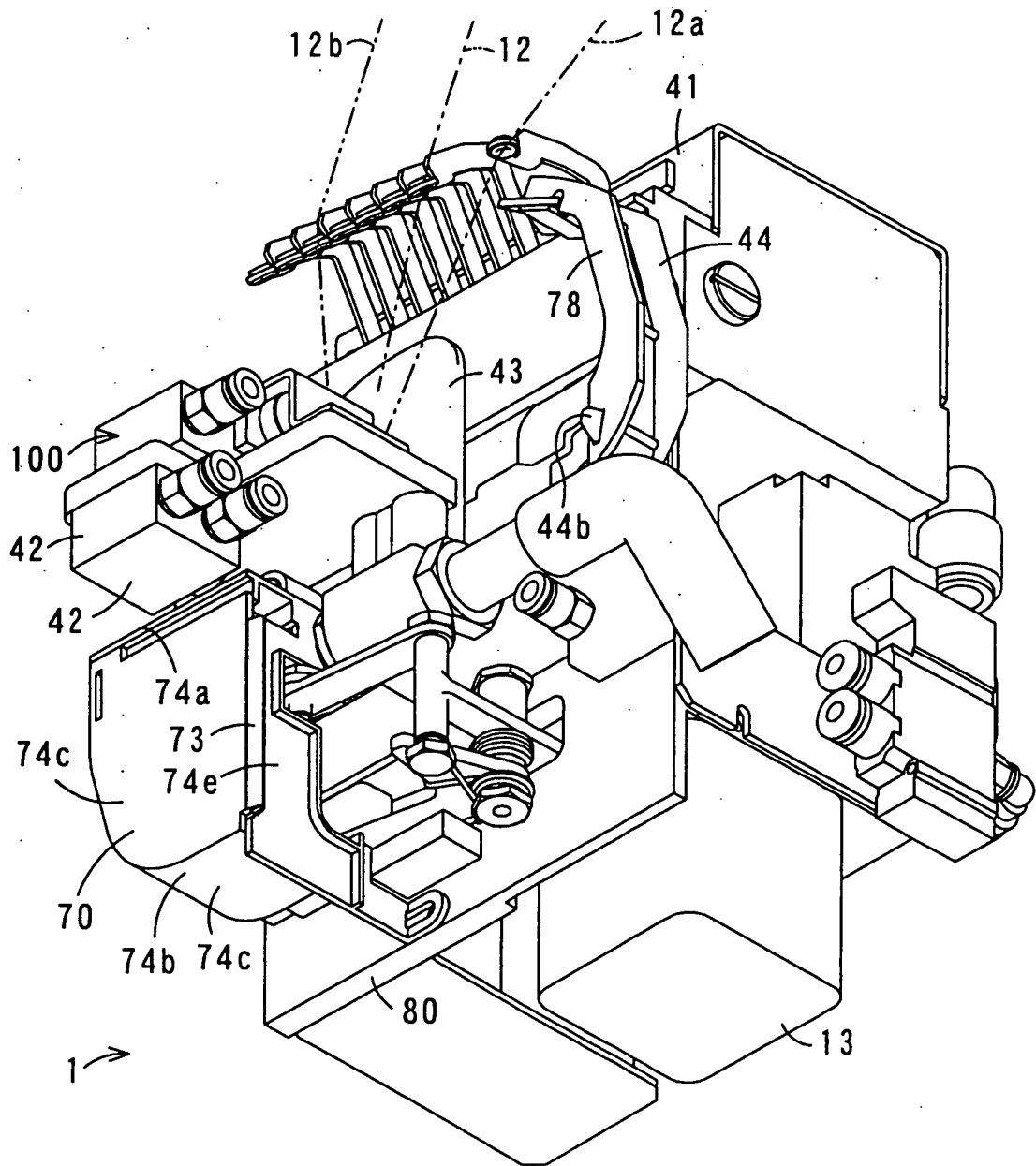


FIG. 8A

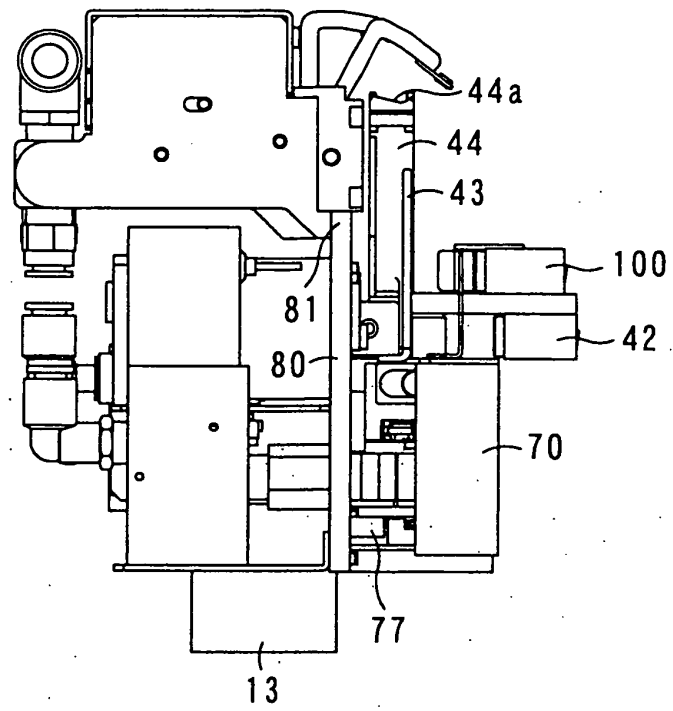


FIG. 8B

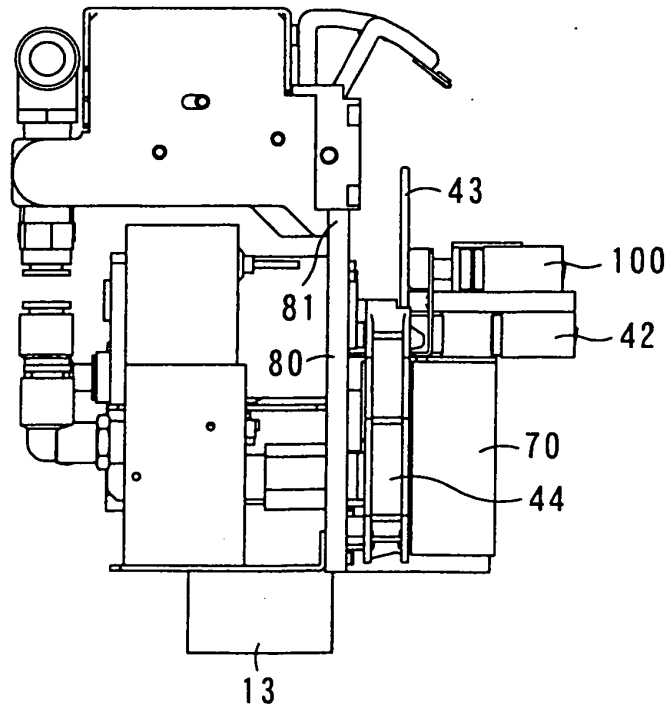
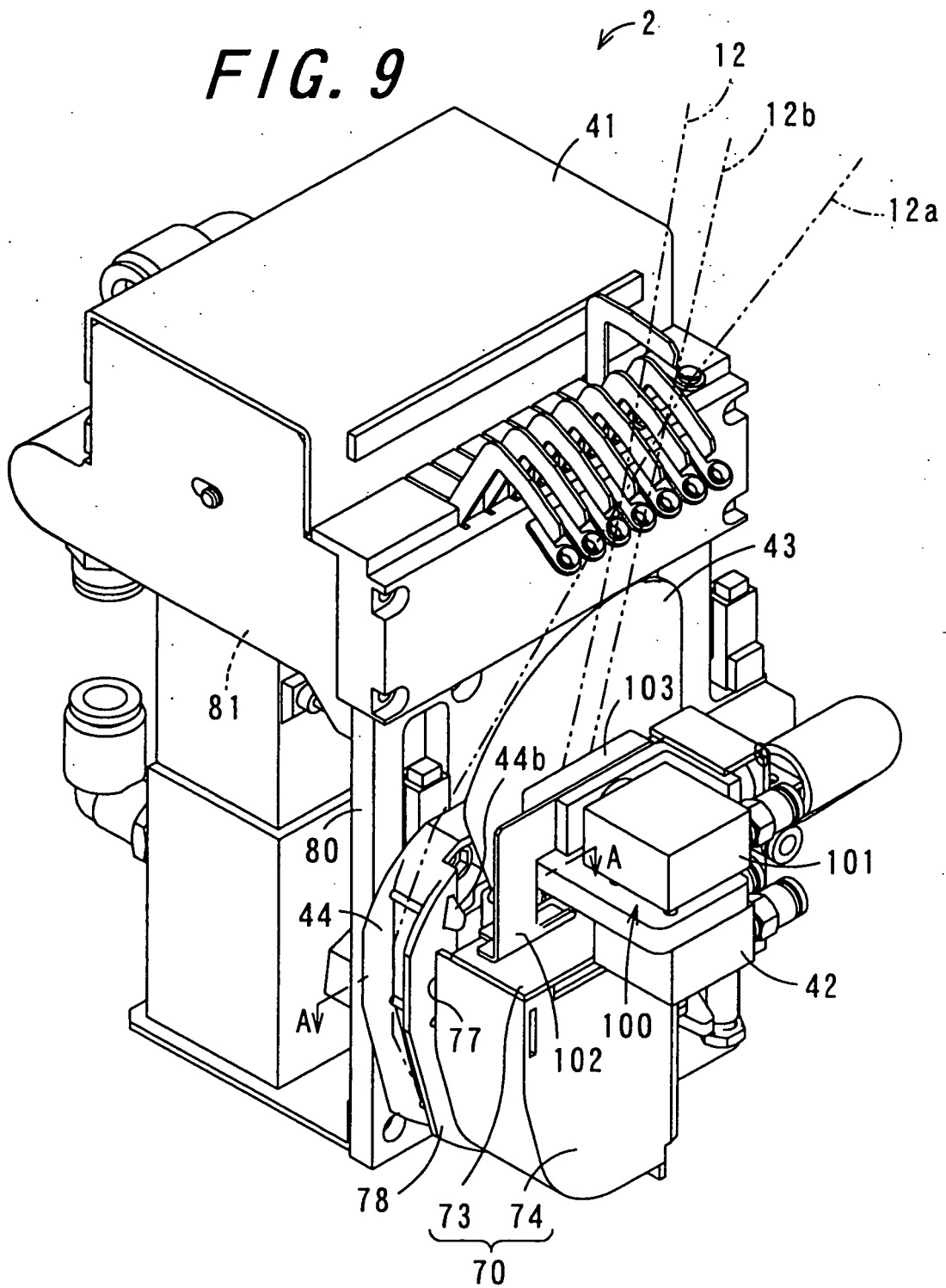


FIG. 9



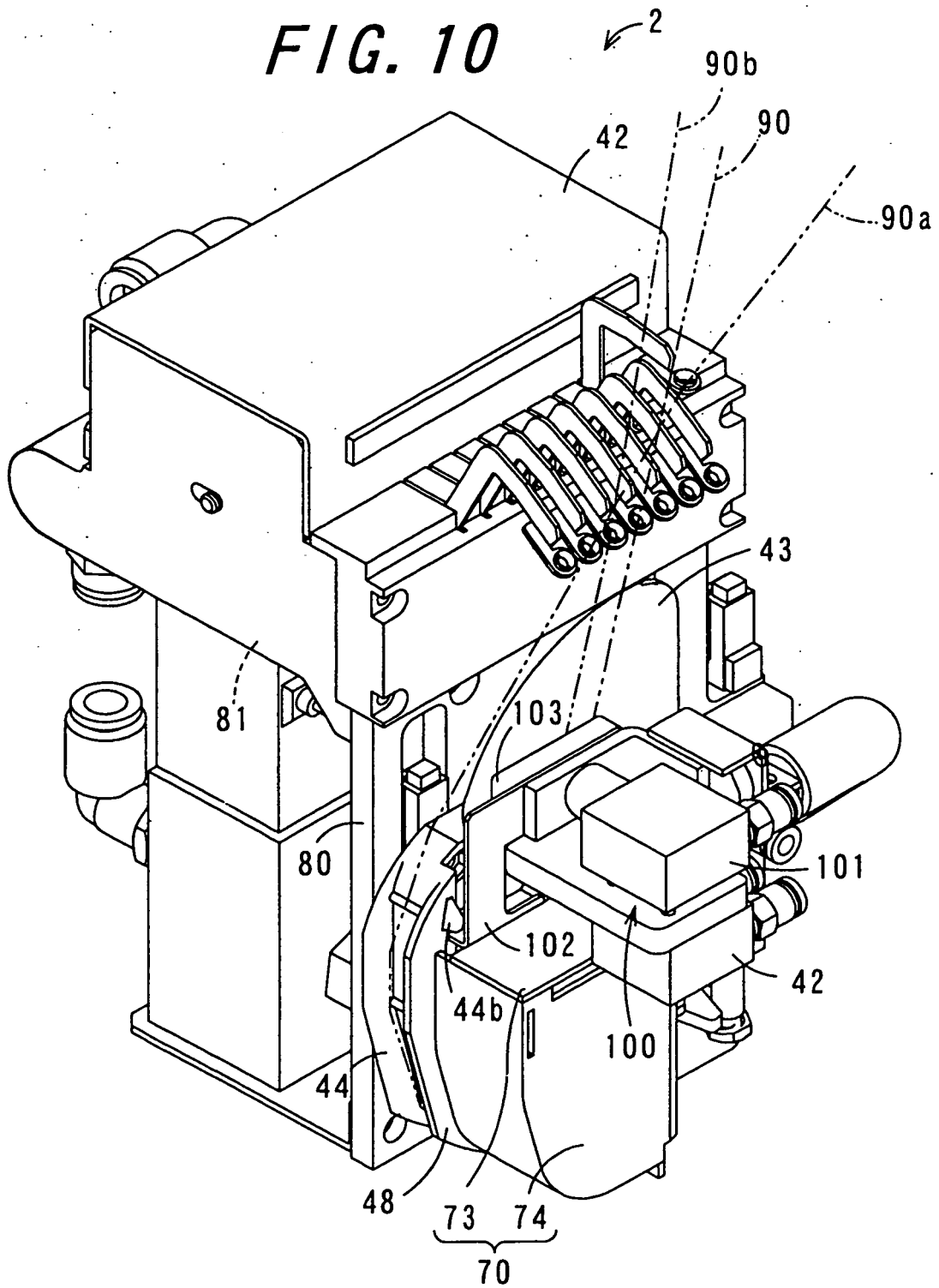
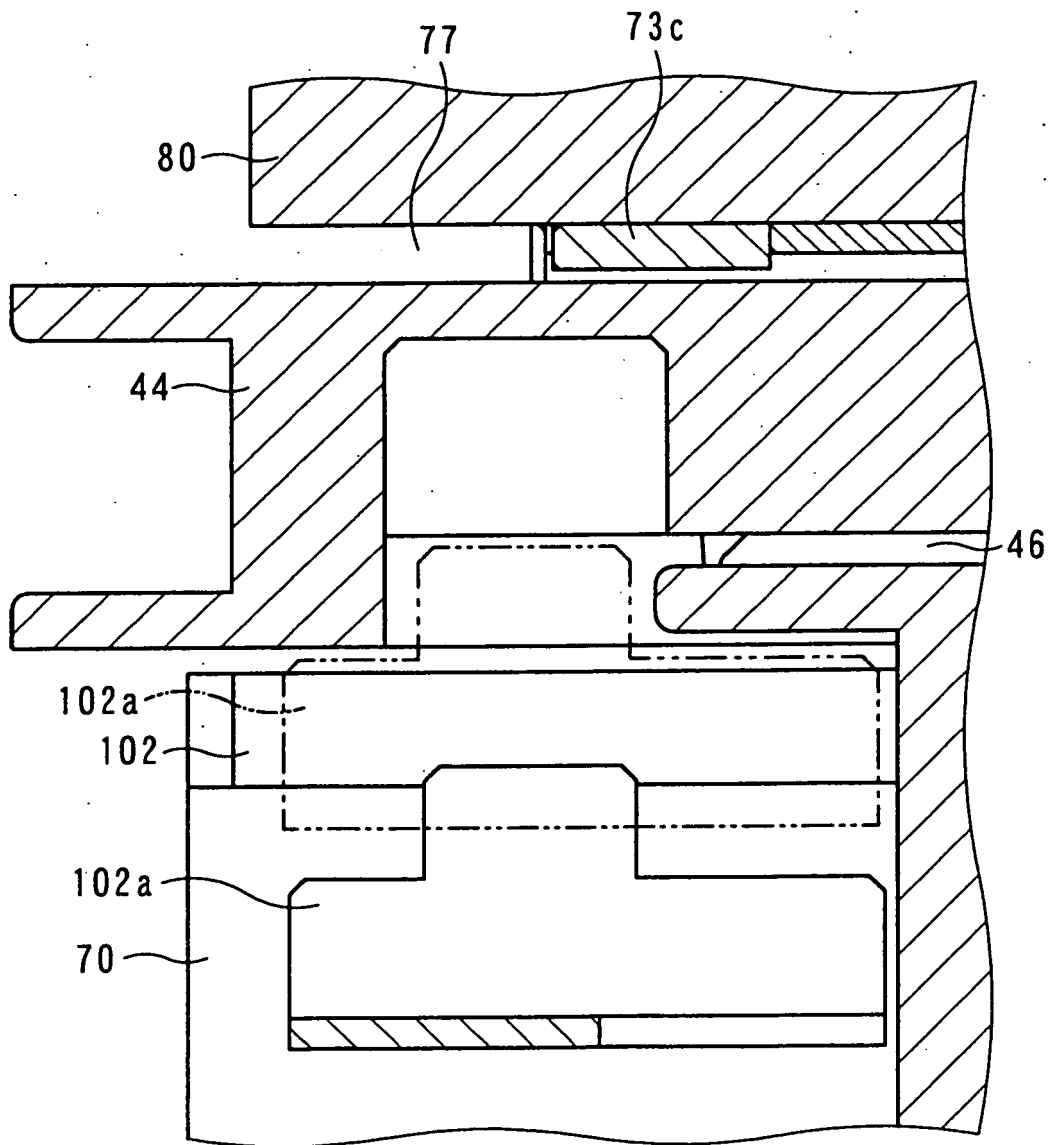
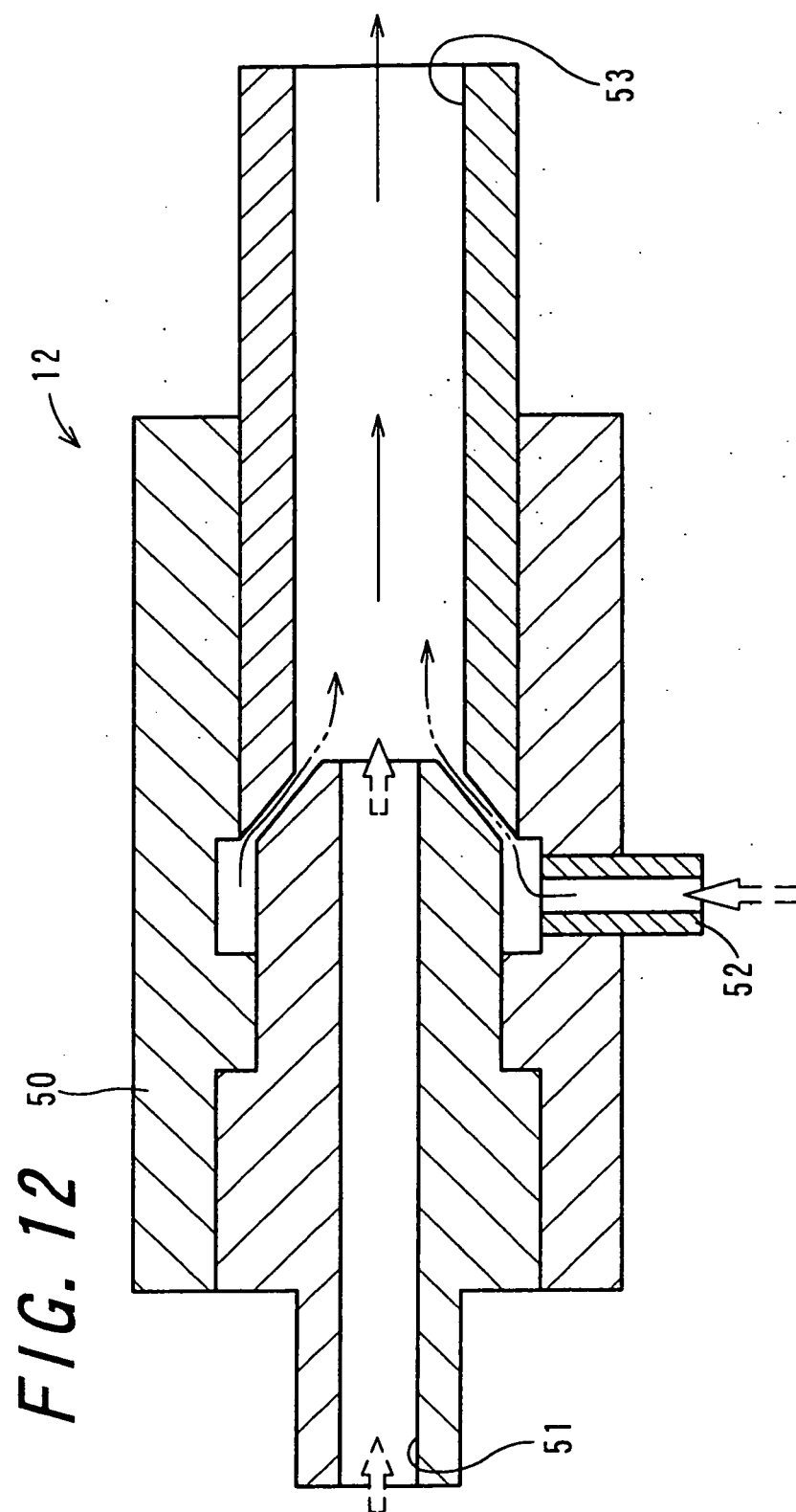


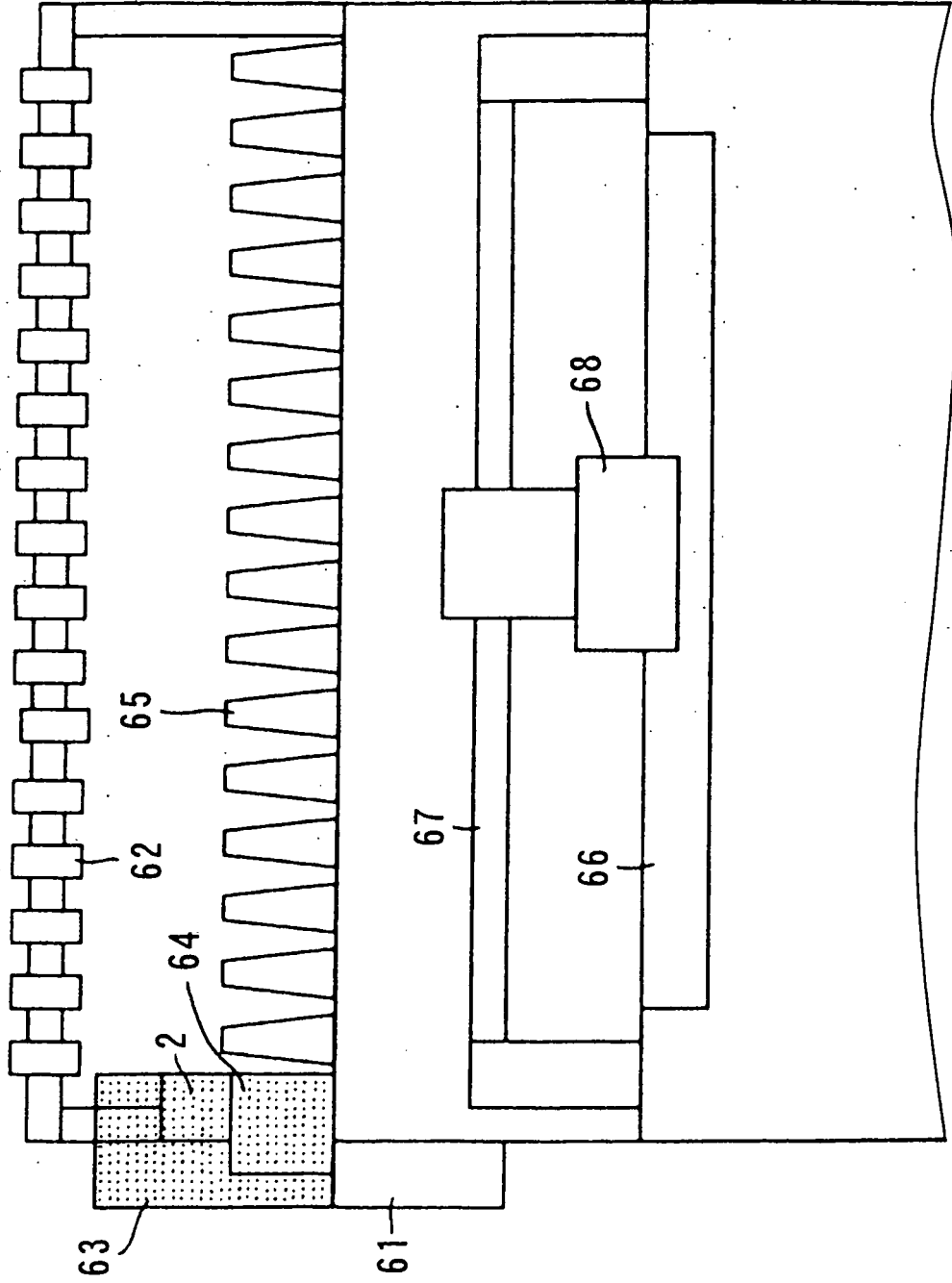
FIG. 11

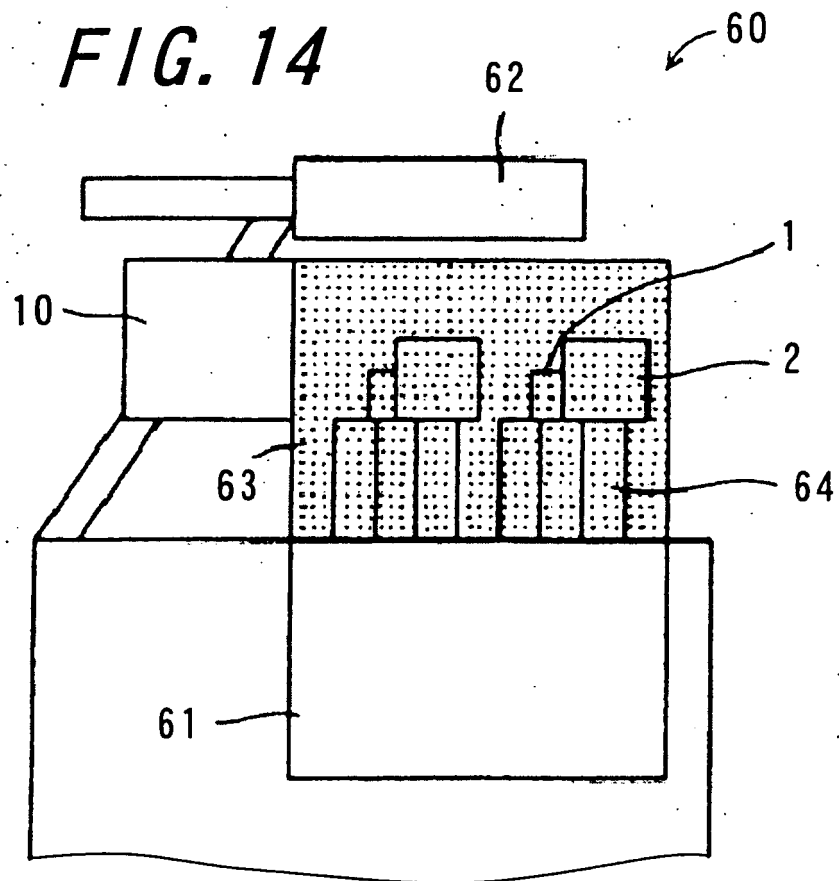




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FIG. 13





INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/061577

A. CLASSIFICATION OF SUBJECT MATTER

D01H15/00(2006.01)i, B65H69/06(2006.01)i, D01H11/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D01H15/00, B65H69/06, D01H11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2007
Kokai Jitsuyo Shinan Koho	1971-2007	Toroku Jitsuyo Shinan Koho	1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 83440/1990 (Laid-open No. 42166/1992) (Murata Machinery Ltd.), 09 April, 1992 (09.04.92), Full text; Fig. 6 (Family: none)	1-5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 194842/1986 (Laid-open No. 98383/1988) (Kanebo, Ltd.), 25 June, 1988 (25.06.88), Full text; Fig. 2 (Family: none)	1-5

☒ Further documents are listed in the continuation of Box C.
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Date of the actual completion of the international search
25 July, 2007 (25.07.07)Date of mailing of the international search report
07 August, 2007 (07.08.07)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/061577

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004-43184 A (Ve Shurafuhorusuto AG. & Co.), 12 February, 2004 (12.02.04), Fig. 2 & EP 1380529 A2 & DE 10230760 A1	1-5
A	JP 2001-310872 A (Murata Machinery Ltd.), 06 November, 2001 (06.11.01), Fig. 1 (Family: none)	1-5

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2005112551 A [0003] [0005]