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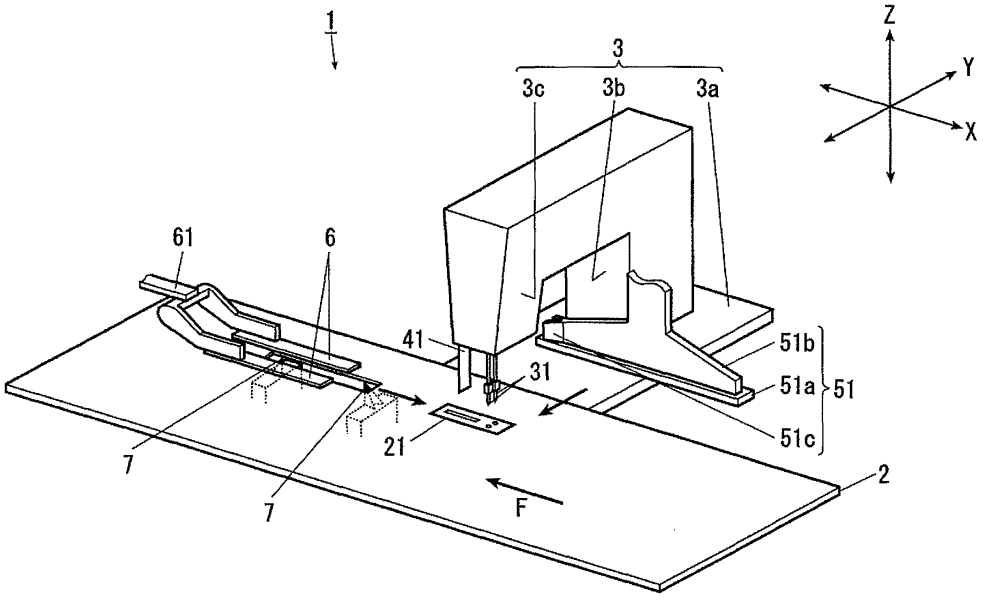
(54) Welting machine

(57) A welting machine includes binder moving means for moving a binder between a press down position a lifted position above the press down position, cover moving means for moving the knife cover between a covering position and a retracted position, and control means for controlling the binder moving means and the cover moving means in linkage with each other, such that the cover moving means moves the knife cover to the retracted position when the binder moving means moves the binder to the press down position, and such that the cover moving means moves the knife cover to the covering position when the binder moving means moves the binder to the lifted position. When the binder is in the press down position, the binder presses the welting patch onto the body cloth and the guide straddles the center knife. The knife cover in the covering position covers at least a distal end portion of the center knife, and the knife cover in the retracted position is placed away from the center knife toward a downstream side in a cloth feeding direction.

FIG. 1



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Description

FIELD OF INVENTION

[0001] The present invention relates to a welting machine.

BACKGROUND ART

[0002] A welting machine stitches a welting patch onto a body cloth of a garment, and forms a cut through the body cloth and the welting patch to form a pocket.

[0003] More specifically, for example, the body cloth and the welting patch disposed on the body cloth are firstly placed on an upper surface of a throat plate, and a binder is moved down onto the welting patch. The binder has a bottom plate portion and an upright plate portion which perpendicularly extends upward from an upper surface of the bottom plate portion. Thus, the binder has an inverted T-shaped cross section. In a state in which the welting patch is folded back on respective sides along the upper surface of the bottom plate portion and respective side surfaces of the upright plate portion, and the body cloth and the welting patch are fed in a cloth feeding direction by means of a feeding mechanism, and are sewn together by means of two needles at respective sides of the upright plate portion of the binder. In addition, a center knife is vertically moved synchronously with a vertical motion of the needles to form a linear center cut to form an opening of a pocket. Then, corner knives are vertically moved through an opening of a table to form V-shaped corner cuts continuing from respective ends of the center cut. Thereafter, the welting patch is folded into the center cut to form the pocket (see, e.g., JP 2006-263185 A).

[0004] The center knife is disposed near the needles. Therefore, in order to protect operator's fingers or a cloth from the center knife when replacing the needles or setting the cloth onto the table, welting machines have a knife cover, examples of which are shown in Figs. 12 and 13.

[0005] A knife cover 104 shown in Fig. 12 is fixed to a frame 106 such that the knife cover 104 extends downward from a location spaced away from a center knife 102 and on a downstream side in a cloth feeding direction, and such that a distal end of the knife cover 104 is oriented toward a distal end of the center knife 102 in a lifted position.

[0006] However, because a distal end portion of the center knife 102 having a blade edge is exposed, there has been a problem that the blade edge of the center knife 102 may damage a workpiece.

[0007] A knife cover 105 shown in Fig. 13 is fixed to the frame 106 in a vicinity of the center knife 102 and on the downstream side of the cloth feeding direction, and is downwardly extended along the center knife 102 to cover a side face of the distal end portion of the center knife 102.

[0008] However, because a binder 101 is moved down during a sewing operation such that an end portion of the binder 101 is positioned close to the distal end portion of the center knife 102 as shown in Fig. 14, the knife cover 105 cannot be configured to completely cover the side face of the distal end portion of the center knife 102. More specifically, as shown in Fig. 16, the end portion of the binder 101 has a guide 101A which guides a welting patch B away from the center knife 102. When seen in a top view, the guide 101A has a V shape, inside which the center knife 102 vertically moves during the sewing operation. Thus, the knife cover 105 cannot be configured to cover the center knife 102 along the entire width of the center knife 102 so as not to interfere with the guide 101A of the binder 101 during the sewing operation.

[0009] Therefore, in a non-sewing operation during which the binder 101 is retracted, there has been a problem that the uncovered part of the distal end portion of the center knife 102 may damage a workpiece.

[0010] Further, because the knife cover 105 is always disposed to cover the side face of the center knife 102, there has been another problem that, during the sewing operation, the workpiece that is being fed in the direction A as shown in Fig. 15 may be blocked by the knife cover 105 after passing through the guide 101A of the binder 101, so that the workpiece and/or the knife cover 105 may be damaged.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide a reliable protection from a center knife using a knife cover and to prevent a workpiece and the knife cover from being damaged.

[0012] According to a first aspect of the present invention, a welting machine comprises:

a main unit comprising two needles which are driven by means of a main shaft motor, wherein the two needles move up and down to form two linear seams on a body cloth and a welting patch which are placed on a table;

a center knife comprising a blade edge, wherein the center knife is vertically movable on a downstream side in a cloth feeding direction from a location between the two needles;

a knife cover disposed adjacent to the center knife on a downstream side in the cloth feeding direction to cover the center knife;

a binder comprising a bottom plate portion disposed to extend in the cloth feeding direction, an upright plate portion extending upward from the bottom plate portion and along the cloth feeding direction, and a guide which is forked from a downstream end of the upright plate portion in the cloth feeding direction;

binder moving means for moving the binder between a press down position and a lifted position above the press down position, wherein, in the press down po-

sition, the binder presses the welting patch onto the body cloth and the guide straddles the center knife; and

a pair of clamps which moves down on respective sides of the binder to hold the body cloth and the welting patch and to move in the cloth feeding direction.

The welting machine is **characterized in that** it further comprises:

cover moving means for moving the knife cover between a covering position and a retracted position, wherein the knife cover in the covering position covers at least the blade edge of the center knife, and the knife cover in the retracted position is placed away from the center knife toward a downstream side in the cloth feeding direction; and

control means for controlling the binder moving means and the cover moving means in linkage with each other, such that the cover moving means moves the knife cover to the retracted position when the binder moving means moves the binder to the press down position, and such that the cover moving means moves the knife cover to the covering position when the binder moving means moves the binder to the lifted position.

[0013] According to the first aspect of the invention, during the sewing operation, the control means controls the binder moving means to move the binder to the press down position and drives the cover moving means to move the knife cover to the retracted position.

[0014] On the other hand, when pulling out a workpiece or during a maintenance of the welting machine, it is advantageous to cover the center knife with the knife cover. Therefore, after the sewing operation, the control means controls the binder moving means to move the binder to the lifted position and drives the cover moving means to move the knife cover to the covering position.

[0015] Because the control means drives the binder moving means and the cover moving means in linkage with each other as described above, the knife cover and the binder can be prevented from approaching each other in the vicinity of the center knife. Therefore, even if the knife cover is enlarged so as to cover the entire width of the distal end portion of the center knife where the blade edge is formed, the knife cover and the binder can be prevented from interfering with each other during the sewing operation.

[0016] Consequently, it is possible to enlarge the knife cover, a size of which has conventionally been restricted due to space limitations, so that the uncovered portion of the center knife can be reduced. Thus, it is possible to provide a reliable protection from the center knife using the knife cover, thereby preventing the workpiece and the center knife from being damaged during a non-sewing operation.

[0017] Moreover, because an operator does not always has to pay attention to the position of the center knife in the non-sewing operation and in the sewing operation, it is possible to improve operator's work in the vicinity of the center knife.

[0018] According to a second aspect of the present invention, the binder moving means and the cover moving means comprise a single common driving source. In other words, the binder and the knife cover are moved using the single driving source. Therefore, a synchronization control of different driving sources is not necessary. Accordingly, it is possible to easily and inexpensively control the linked movement of the binder and the knife cover.

[0019] According to a third aspect of the present invention, the knife cover is configured to cover, when the knife cover is in the covering position, the center knife along the entire width of the blade edge in the cloth feeding direction.

[0020] According to the third aspect of the invention, the center knife is covered over the entire width of the blade edge. That is, the blade edge of the center knife is fully covered by the knife cover in the cloth feeding direction. Accordingly, it is possible to prevent the workpiece, the knife cover and the center knife from being damaged. In addition, the operator can, for example prepare for the sewing operation, without paying attention to the presence of the center knife. Thus, it is possible to further improve efficiency of operator's work in the vicinity of the center knife.

[0021] According to a fourth aspect of the present invention, the knife cover is configured to cover both sides of the center knife when the knife cover is in the covering position.

[0022] A fifth aspect of the present invention, the knife cover is configured in a forked shape to straddle the center knife when the knife cover is in the coving position.

[0023] According to the fourth and fifth aspects of the present invention, the knife cover covers both of the side faces of the center knife. Therefore, it is possible to provide a more reliable protection from the center knife. Thus, it is possible to prevent the workpiece, the knife cover and the center knife from being damaged, and the operator can, for example prepare for a sewing operation, without paying attention to the presence of the center knife. Thus, it is possible to further improve efficiency of operator's work in the vicinity of the center knife.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Fig. 1 is a perspective view showing a schematic structure of a welting machine.

[0025] Fig. 2 is a left side view showing the schematic structure of the welting machine.

[0026] Fig. 3 is a perspective view showing a center knife mechanism.

[0027] Fig. 4 is a perspective view showing the vicinity of a center knife and a knife cover.

[0028] Fig. 5 is a cross-sectional view showing the center knife and the knife cover.

[0029] Fig. 6 is an explanatory view showing binder moving means and cover moving means.

[0030] Fig. 7 is a perspective view showing a binder mechanism.

[0031] Fig. 8 is a block diagram showing a control system of the welting machine.

[0032] Fig. 9 is a flowchart for explaining operations of a binder and the knife cover.

[0033] Fig. 10 is a left side view showing the welting machine, illustrating a state in which the binder is placed in a press down position and the knife cover is placed in a retracted position in the case in which a sewing operation is carried out.

[0034] Fig. 11 is a left side view showing the welting machine, illustrating a state in which the binder is placed in a lifted position and the knife cover is placed in a covering position in the case in which the sewing operation is not carried out.

[0035] Fig. 12 is a left side view showing the welting machine, explaining a conventional knife cover.

[0036] Fig. 13 is a left side view showing the welting machine, explaining the conventional knife cover.

[0037] Fig. 14 is an explanatory view showing a problem in a mechanism of Fig. 13.

[0038] Fig. 15 is an explanatory view showing a problem in the mechanism of Fig. 13.

[0039] Fig. 16 is an enlarged perspective view showing a periphery of a end portion of the binder.

DETAILED DESCRIPTION

[0040] With reference to the drawings, the best mode of a welting machine according to the invention will be described below in detail. In the embodiment, it is assumed that respective directions are determined based on X, Y and Z axes shown in the drawings, and a Z-axis direction is coincident with a vertical moving direction of a center knife which will be described below, a plane for carrying out a sewing operation is orthogonal to the Z-axis direction, a direction which is parallel with the working plane and in which a cloth is fed is set to be an X-axis direction, and a direction which is parallel with the working plane and is orthogonal to the X-axis direction is set to be a Y-axis direction

[0041] Overall Configuration of Welting Machine

[0042] As shown in Fig. 1, a welting machine 1 (which will be hereinafter referred to as a sewing machine 1) serves to form two parallel seams on a cloth (a workpiece) constituted by a body cloth and a welting patch by means of two needles 31 moved vertically and to sew the welting patch onto the body cloth, and furthermore, to form a straight cut in a cloth feeding direction F of the cloths and an V-shaped cut on both ends of the cut.

[0043] As shown in Figs. 1 to 8, the sewing machine 1 includes a table 2 on which the body cloth is placed to perform a sewing operation, and a main unit 3 which is disposed on the table 2, has the two needles 31 held on a needle bar 33 (see Fig. 3) to be driven by means of a main shaft motor 32 (see Fig. 8) and vertically moves the two needles 31, thereby forming two straight seams on the body cloth and the welting patch which are put on the table 2.

[0044] The sewing machine 1 includes a center knife mechanism 4 having a center knife 41 provided in the main unit 3 and a knife cover 42 for covering the center knife 41, and moved upward and downward at a downstream side in the cloth feeding direction F of the needles 31 to form a straight cut between the two straight seams on the respective cloths.

[0045] The sewing machine 1 includes a binder mechanism 5 having a binder 51 for pressing the welting patch from above at an upper side of the body cloth, binder moving means 52 (see Fig. 7) for driving the binder 51, and a guiding mechanism 53 (see Fig. 7) which guides a movement of the binder 51.

[0046] The sewing machine 1 includes a cloth feeding mechanism (not shown) having a pair of clamps 6 for being moved downward to both sides of the binder 51 to press and hold the cloth constituted by the body cloth and the welting patch and serving to feed the cloth constituted by the body cloth and the welting patch through the movement of the clamps 6 in the cloth feeding direction F.

[0047] The sewing machine 1 includes a corner knife 7 for forming an V-shaped cut in positions to be both ends of the straight cut.

[0048] The sewing machine 1 includes a control device 8 serving as control means for controlling the vertical motion of the center knife 41, the vertical motion of the needle 31, the movement of the binder 51, and other driving operations related to a sewing operation.

[0049] In other words, the sewing machine 1 can carry out a so-called welting work for operating each mechanism to superpose the welting patch on the body cloth and to sew them through the control of each driving source by the control device 8.

[0050] Table and Main Unit

[0051] The table 2 has an upper surface which is parallel with an X-Y plane and is used in a horizontal state. The upper surface of the table 2 is formed to take a long and rectangular shape in the cloth feeding direction F, that is, the X-axis direction. The clamps 6 and the binder 51 are disposed on the table 2, and the corner knife 7 is disposed on a lower side of the table 2.

[0052] Moreover, a throat plate 21 is provided in a lower position of the two needles 31 (the so-called twin needles 31) in the table 2. Needle holes corresponding to the two needles 31 respectively are provided on the throat plate 21, and horizontal shuttles (not shown) are provided on a lower side of the needle holes, respectively. In other words, a thread inserted through each of the needles 31 is caught by each of the horizontal shuttles corresponding at a lower side of the throat plate 21 and is entangled with a bobbin thread reeled out of the horizontal shuttle

to carry out a sewing operation.

[0053] Furthermore, a slit for inserting the center knife 41 therein is formed at the downstream side in the cloth feeding direction F in an almost intermediate part of the two needle holes of the throat plate 21, and there is disposed a fixed knife (not shown) for cutting the cloth in cooperation with the center knife 41.

[0054] The main unit 3 serves to sew the welting patch onto the body cloth put on the table 2, and has a bed portion 3a disposed on just a side of an intermediate position in a longitudinal direction of the table 2, a vertical drum portion 3b provided upright from the bed portion 3a, and an arm portion 3c extended in the Y-axis direction from an upper end of the vertical drum portion 3b. The two needles 31 to be vertically moved by inserting the thread therethrough, a needle bar driving mechanism (not shown) for vertically moving the two needles 31, and the center knife mechanism 4 are provided in the arm portion 3c. Moreover, the two needles 31 and the center knife 41 are downwardly extended and supported on a lower end (a so-called jaw portion) at a tip side of the arm portion 3c.

[0055] Center Knife Mechanism

[0056] As shown in Figs. 1 to 5, the center knife mechanism 4 serves to form a straight cut between two straight seams through upward and downward movements of the center knife 41.

[0057] The center knife mechanism 4 includes the center knife 41 disposed on the downstream side in the cloth feeding direction from needle locations of the two needles 31 and having a blade edge 41a (Fig. 3) formed on a lower end (a tip) to form a straight cut by a vertical motion, the knife cover 42 which will be described below, a knife bar 43 having the center knife 41 at a lower end and supported slidably in the Z-axis direction in the arm portion 3c, a knife motor 44 serving as a stepping motor for giving the center knife 41 a driving force for carrying out a vertical motion, a plurality of link members 46 for transmitting a vertical movement driving force to the knife bar 43 through an eccentric cam 45 attached eccentrically to an output shaft 44a of the knife motor 44, an air cylinder 47 to be an actuator serving as a driving source for a switching operation into a cut enabling state (a downward moving position) and a cut regulating state (a lifted position) of the center knife 41, a stopper 48 for stopping a plunger in a protrusion of the air cylinder 47 in a predetermined position, and cover moving means 10 for moving the knife cover 42.

[0058] The center knife mechanism 4 can carry out switching into the cut enabling state in which a rotating and driving force of the knife motor 44 is converted into a vertical reciprocating operation to the center knife 41 and the vertical reciprocating operation is transmitted when the air cylinder 47 is placed in a backward moving position (a state in Fig. 3) and the cut regulating state in which the rotating and driving force of the knife motor 44 is not transmitted to the center knife 41 when the air cylinder 47 is placed in a forward moving position (not shown).

[0059] When the knife motor 44 carries out a rotating and driving operation in a state in which the air cylinder 47 is moved backward, the knife bar 43 and the center knife 41 are moved vertically through the link members 46 by means of the eccentric cam 45 provided on the output shaft 44a turned in the Y-axis direction so that a cutting operation is carried out.

[0060] On the other hand, when the air cylinder 47 is brought into a forward moving state, the link members 46 are set into an arrangement in which a power of the knife motor 44 is not transmitted to the knife bar 43 and there is maintained a state in which the center knife 41 waits above the throat plate 21.

[0061] Accordingly, the cut enabling state and the cut regulating state in the center knife 41 are switched by the driving operation of the air cylinder 47.

[0062] As shown in Figs. 2, 6 and 8, the cover moving means 10 includes an air cylinder 11 and an electromagnetic valve 12. As shown in Fig. 6, the electromagnetic valve 12 is also used for an air cylinder 54 of the binder moving means 52. That is, the air cylinders 11, 54 share the electromagnetic valve 12 as a single driving source.

[0063] A driving operation of the electromagnetic valve 12 is controlled by the control device 8, and a rod 11a of the air cylinder 11 is moved by the driving operation of the electromagnetic valve 12 so that the knife cover 42 can be moved.

[0064] The air cylinder 11 is attached to the main unit 3, and the rod 11a is provided in such a manner that a tip thereof can expand and contract toward the center knife 41.

[0065] The knife cover 42 is attached to the tip of the rod 11a, and the air cylinder 11 moves the knife cover 42 between a covering position in which the center knife 41 is covered adjacently at the downstream side in the cloth feeding direction of the center knife 41 (a position shown in Fig. 11) and a retracted position in which the knife cover 42 is retracted away from the center knife 41 at the downstream side in the cloth feeding direction (a position shown in Fig. 10).

[0066] As shown in Figs. 2, 4 and 5, the knife cover 42 is formed to cover the center knife 41 from both sides (front and back sides) over a entire width of a tip portion including the blade edge 41 a of the center knife 41 in the covering position.

[0067] More specifically, the knife cover 42 has a larger width than the entire width in the cloth feeding direction of the tip portion of the center knife 41, that is, at least the entire width in the cloth feeding direction of the blade edge 41a, and furthermore, has a tip formed to be forked, and at least all of both side portions of the blade edge 41a of the center knife 41 are covered with the knife cover 42 in a space formed by forking the tip in the covering position. In the case in which the knife cover 42 is placed in the covering position, accordingly, the whole blade edge 41 a of the center knife 41 is accommodated. Therefore, it is impossible to directly touch the blade edge 41a.

[0068] The knife cover 42 may take such a shape as to cover a entire width and both sides over a full length in addition to the tip portion of the center knife 41 in the covering position.

[0069] Binder Mechanism

[0070] As shown in Figs. 2 and 7, the binder mechanism 5 includes the binder 51 having a bottom plate portion 51a which is formed with a single direction set to be long and is disposed with a longitudinal direction set along the cloth feeding direction in the sewing operation, an upright plate portion 51b provided upright from the bottom plate portion 51a and serving to support the welting patch along the bottom plate portion 51a, and a guide 51c formed to be forked from a tip portion of the upright plate portion 51b at the downstream side in the cloth feeding direction, the binder moving means 52 for supporting the binder 51 to press the welting patch onto the body cloth and reciprocating the binder 51 between a press down position in which the guide 51c is placed on both sides of the center knife 41 and a lifted position placed above the press down position, and the guiding mechanism 53 for guiding the reciprocated binder 51 with a movement in the cloth feeding direction in such a manner that the guide 51c passes through a portion between the two needles 31 when reciprocating the binder 51 between the press down position and the lifted position.

[0071] The binder moving means 52 includes the air cylinder 54 and the electromagnetic valve 12 which supplies/discharges air to/from the air cylinder 54 as shown in Figs. 6 and 8. As described above, the air cylinder 11 and the air cylinder 54 shares the electromagnetic valve 12 as a single common driving source .

[0072] The driving operation of the electromagnetic valve 12 is controlled by the control device 8. By the driving operation of the electromagnetic valve 12, it is possible to move a rod 54a of the air cylinder 54, thereby moving the binder 51.

[0073] Moreover, the binder mechanism 5 includes a support member 56 fixed to a front surface of the arm portion 3c of the main unit 3, and the air cylinder 54 is provided on the support member 56.

[0074] A coupling arm portion 57 for coupling the binder 51 to the air cylinder 54 is connected to the rod 54a of the air cylinder 54. The coupling arm portion 57 includes a first arm portion 57a coupled to the rod 54a and a second arm portion 57b coupled to the first arm portion 57a. The first arm portion 57a and the second arm portion 57b are coupled to each other through a bending portion 57c. The first arm portion 57a and the second arm portion 57b are coupled and fixed to be bent in an almost L shape.

[0075] The bending portion 57c is pivotally supported on the support member 56 and the coupling arm portion 57 is rotatably supported on the support member 56 with the bending portion 57c set to be a shaft center.

[0076] Moreover, a rotating position sensor (not shown) for detecting a height of the binder 51 is provided in a place in which the bending portion 57c of the coupling arm portion 57 is rotatably supported on the support member 56.

[0077] A binder shaft 58 is coupled to the second arm portion 57b of the coupling arm portion 57, and a coupling member 59 is provided on the binder shaft 58. The upright plate portion 51b of the binder 51 is coupled to the coupling member 59.

[0078] The guiding mechanism 53 includes an arcuate groove 56a formed on the support member 56 and taking an arcuate shape, a guide pin 53a fitted in the arcuate groove 56a and capable of being moved along the arcuate groove 56a, and a coupling plate 53b having one of ends to which the guide pin 53a is attached and having the other end through which the binder shaft 58 is inserted.

[0079] The coupling plate 53b is also coupled to an end of the second arm portion 57b of the coupling arm portion 57 through the binder shaft 58 at the other end, and the coupling plate 53b is rotatably coupled to the coupling arm portion 57.

[0080] The air cylinder 54 pushes the rod 54a out so that the coupling arm portion 57 is rotated to bring the second arm portion 57b downward, and furthermore, the binder shaft 58 is moved downward along the arcuate groove 56a so that the binder 51 is moved to the press down position. Moreover, the air cylinder 54 pulls the rod 54a in so that the coupling arm portion 57 is rotated to bring the second arm portion 57b upward, and furthermore, the binder shaft 58 is moved upward along the arcuate groove 56a so that the binder 51 is moved to the lifted position.

[0081] Moreover, the guide pin 53a is disposed in a position placed apart from the shaft center of the binder shaft 58 through the coupling plate 53b, and furthermore, is fitted in the arcuate groove 56a. Therefore, the binder 51 carries out a vertical motion synchronously with a behavior of the guide pin 53a, and furthermore, the binder shaft 58 is rotated more greatly with the vertical motion of the guide pin 53a so that the binder 51 can also be moved in a longitudinal direction thereof.

[0082] Consequently, the guiding mechanism 53 can convert the reciprocation of the rod 54a of the air cylinder 54 into a movement in both the vertical and longitudinal directions of the binder 51.

[0083] Cloth Feeding Mechanism

[0084] As shown in Fig. 1, the clamps 6 of the cloth feeding mechanism press outsides of both ends in a transverse direction of each of the body cloth and the welting patch set onto the binder 51 from above, respectively. The clamps 6 are constituted to be vertically movable to the lifted position and the downward moving position, and serve to press and hold the body cloth and the welting patch which are guided along the binder 51 at both sides of the two needles 31, thereby delivering them in the cloth feeding direction F in the downward moving position, and make a pair opposite to each other with the binder 51 interposed therebetween.

[0085] The cloth feeding mechanism further includes a support member 61 for supporting the clamps 6, an air

cylinder (not shown) for vertically moving the clamps 6 through the support member 61, and a pressing motor (not shown) for moving the welting patch and the body cloth which are pressed by the clamps 6 through the support member 61 in the cloth feeding direction F.

[0086] The clamps 6 are rectangular plates respectively and are supported on the support member 61 with longitudinal directions thereof set along the X-axis direction. Moreover, each of the clamps 6 is supported in such a manner that a plate surface thereof is parallel with an X-Y plane. The clamps 6 can be switched into two positions, that is, upper and lower positions by the driving operation of the air cylinder, and are separated from the upper surface of the table 2 in the upper position and are on the level with the upper surface of the table 2 in the lower position. Furthermore, the two clamps 6 are supported in a separating state in the Y-axis direction in such a manner that at least the upright plate portion 51b of the binder 51 can be inserted therebetween.

[0087] The support member 61 is supported movably in the X-axis direction over the table 2, and the two clamps 6 to be supported are disposed to pass through outsides of vertical moving paths for the two needles 31. Moreover, the support member 61 is driven by means of the pressing motor through a ball screw mechanism (not shown).

[0088] Corner Knives

[0089] As shown in Fig. 1, the corner knives 7 are disposed along a path of the clamps 6 and below the table 2. The corner knives 7 penetrate through the welting patch and the body cloth which are delivered by means of the clamps 6 from below, thereby forming V-shaped cuts in positions to be both ends of the straight cut.

[0090] Each of the corner knives 7 includes a pair of triangular knife parts arranged to take a V shape seen from a tip side thereof and is supported in a state in which the tip portion is turned upward. The corner knife 7 is moved in an upward direction from the upper surface of the table 2 by means of a corner knife motor (not shown) so that a V-shaped cut can be formed on the cloth. Moreover, each of the corner knives 7 can regulate an angle between the pair of triangular knife parts and can correspond to an interval between two seams formed by the two needles 31.

[0091] Control Device

[0092] As shown in Fig. 8, the main shaft motor 32 to be a control target, the knife motor 44, and the electromagnetic valve 12 of the air cylinders 11, 54 are connected to the control device 8.

[0093] Moreover, an electromagnetic valve 49 of the air cylinder 47 for switching an operating state and a non-operating state of the center knife 41 is connected to the control device 8. In addition, an air cylinder (not shown) for moving the clamps 6 upward and downward and a vertical moving motor (not shown) for moving each of the corner knives 7 upward and downward are connected to the control device 8.

[0094] The control device 8 includes a CPU 81 for carrying out various calculation processings, an ROM 82 for writing control programs, control data or various sewing data for executing various functions and operations of the welting machine 1, and an RAM 83 for storing various data on the processing of the CPU 81 in a work area.

[0095] The ROM 82 stores a control program for driving the cover moving means 10 and the binder moving 52 in linkage with each other in order to move the knife cover 42 to the retracted position by the cover moving means 10 when moving the binder 51 to the press down position by the binder moving means 52 and to move the knife cover 42 to the covering position by the cover moving means 10 when moving the binder 51 to the lifted position by the binder moving means 52.

[0096] More specifically, the CPU 81 executes the control program so that the control device 8 functions as control means.

[0097] Operations of Binder and Knife Cover

[0098] Description will be given to operations of the binder 51 and the knife cover 42.

[0099] Start of Sewing Operation

[0100] As shown in Fig. 9, if the CPU 81 of the control device 8 recognizes a sewing start signal (Step S1 : YES), it is not necessary to cover the center knife 41 with the knife cover 42. Therefore, the CPU 81 reads the control program stored in the ROM 82 and controls the driving operation of the electromagnetic valve 12, thereby driving the air cylinder 54 of the binder moving means 52 (Step S2).

[0101] The air cylinder 54 is driven to move the binder 51 from the lifted position toward the press down position. In other words, the rod 54a of the air cylinder 54 is advanced from an inner part of the cylinder. Consequently, the coupling arm portion 57 is rotated around the bending portion 57c so that the guide pin 53a of the guiding mechanism 53 provided on a tip of the second arm portion 57b is moved downward along the arcuate groove 56a. By the downward movement of the guide pin 53a, the binder shaft 58 is also moved downward so that the binder 51 is moved downward in the same manner. As a result, the binder 51 can be moved from the lifted position to the press down position as shown in Fig. 10.

[0102] Moreover, the control device 8 controls the driving operation of the electromagnetic valve 12 to drive the air cylinder 11 of the cover moving means 10 by an execution of the control program through the CPU 81 in linkage with the driving operation of the binder moving means 52 (Step S2).

[0103] The air cylinder 11 is driven to move the knife cover 42 from the covering position toward the retracted position. In other words, the rod 11a of the air cylinder 11 is drawn into the cylinder. Consequently, the knife cover 42 is also retracted away from the center knife 41 together with the rod 11a. As a result, the knife cover 42 can be moved from the covering position to the retracted position as shown in Fig. 10.

[0104] End of Sewing Operation

[0105] If the CPU 81 recognizes a sewing end signal (Step S3 : YES), next, it is necessary to cover the center

knife 41 with the knife cover 42 when pulling or maintaining a workpiece. Therefore, the CPU 81 reads the control program stored in the ROM 82 and controls the driving operation of the electromagnetic valve 12, thereby driving the air cylinder 11 of the cover moving means 10 (Step S4).

[0106] The air cylinder 11 is driven to move the knife cover 42 from the retracted position toward the covering position. In other words, the rod 11a of the air cylinder 11 is advanced from the inner part of the cylinder. Consequently, the knife cover 42 is also moved to approach the center knife 41 together with the rod 11a. As a result, the knife cover 42 can be moved from the retracted position to the covering position and the center knife 41 can be thus covered with the knife cover 42 as shown in Fig. 11.

[0107] Moreover, the control device 8 controls the driving operation of the electromagnetic valve 12 to drive the air cylinder 54 of the binder moving means 52 by the execution of the control program through the CPU 81 in linkage with the driving operation of the cover moving means 10 (Step S4).

[0108] The air cylinder 54 is driven to move the binder 51 from the press down position toward the lifted position. In other words, the rod 54a of the air cylinder 54 is drawn into the cylinder. Consequently, the coupling arm portion 57 is rotated around the bending portion 57c so that the guide pin 53a of the guiding mechanism 53 provided on the tip of the second arm portion 57b is moved upward along the arcuate groove 56a. By the upward movement of the guide pin 53a, the binder shaft 58 is also moved upward so that the binder 51 is moved upward in the same manner. As a result, the binder 51 can be moved from the press down position to the lifted position as shown in Fig. 11.

[0109] The knife cover 42 is protruded to an upstream side in the cloth feeding direction from an outer edge on the upstream side in the cloth feeding direction of the center knife 41 in the covering position. Therefore, the knife cover 42 is present up to a position in which it interferes with the guide 51c of the binder 51. In the case in which the binder 51 is moved to the press down position, however, the knife cover 42 is moved to the retracted position. Therefore, the knife cover 42 and the binder 51 can be prevented from colliding with each other.

[0110] Thus, the control device 8 drives the cover moving means 10 and the binder moving 52 in linkage with each other. Therefore, the knife cover 42 and the binder 51 can be prevented from approaching each other in the vicinity of the center knife 41. Even if the knife cover 42 is enlarged to cover the whole area of the knife cover 42, consequently, the knife cover 42 and the binder 51 can be prevented from colliding with each other.

[0111] Accordingly, it is possible to enlarge the knife cover 42, a size of which has conventionally been restricted due to space limitations. Thus, it is possible to intensify the protection of the center knife 41 through the knife cover 42.

[0112] Moreover, the center knife 41 has the upstream and downstream sides in the cloth feeding direction F which are covered with the knife cover 42, and furthermore, the front and back sides which are also covered with the knife cover 42. More specifically, in the case in which the knife cover 42 is placed in the covering position, the center knife 41 is perfectly covered with the knife cover 42. Therefore, it is possible to prevent the center knife 41 from being directly touched. As a result, an operator does not need to always pay attention to the position of the center knife 41 so as to be prevented from being hurt at a touch with the center knife 41.

[0113] Accordingly, it is possible to strengthen the protection from the center knife 41, thereby enhancing a working efficiency in the vicinity of the center knife 41.

[0114] Moreover, the air cylinders 11, 54 are driven by means of the single electromagnetic valve 12 serving as the driving source. Therefore, it is possible to move the binder 51 and the knife cover 42 in linkage with each other. Thus, it is not necessary to carry out a control for synchronizing the operation timings of the air cylinders 11, 54.

[0115] Therefore, it is possible to easily and inexpensively control the linked movement of the binder 51 and the knife cover 42.

Claims

1. A welting machine (1) comprising:

a main unit (3) comprising two needles (31) which are driven by means of a main shaft motor (32), wherein the two needles (31) move up and down to form two linear seams on a body cloth and a welting patch which are placed on a table (2);

a center knife (41) comprising a blade edge (41a), wherein the center knife (41) is vertically movable on a downstream side in a cloth feeding direction (F) from a location between the two needles (31);

a knife cover (42) disposed adjacent to the center knife (41) on a downstream side in the cloth feeding direction (F) to cover the center knife (41);

a binder (51) comprising a bottom plate portion (51a) disposed to extend in the cloth feeding direction (F), an upright plate portion (51b) extending upward from the bottom plate portion (51a) and along the cloth feeding direction (F), and a guide (51c) which is forked from a downstream end of the upright plate portion (51b) in the cloth feeding direction (F);

binder moving means (12, 54) for moving the binder (51) between a press down position and a lifted position above the press down position, wherein, in the press down position, the binder

(51) presses the welting patch onto the body cloth and the guide (51c) straddles the center knife (41); and

a pair of clamps (6) which moves down on respective sides of the binder (51) to hold the body cloth and the welting patch and to move in the cloth feeding direction (F),

characterized in that the welting machine further comprises:

cover moving means (11, 12) for moving the knife cover (42) between a covering position and a retracted position, wherein the knife cover (42) in the covering position covers at least the blade edge (41a) of the center knife (41), and the knife cover (42) in the retracted position is placed away from the center knife (41) toward a downstream side in the cloth feeding direction (F); and control means (8) for controlling the binder moving means (12, 54) and the cover moving means (11, 12) in linkage with each other, such that the cover moving means (11, 12) moves the knife cover (42) to the retracted position when the binder moving means (12, 54) moves the binder (51) to the press down position, and such that the cover moving means (11, 12) moves the knife cover (42) to the covering position when the binder moving means (12, 54) moves the binder (51) to the lifted position.

2. The welting machine (1) according to claim 1, wherein the binder moving means (12, 54) and the cover moving means (11, 12) comprise a single common driving source (12).

3. The welting machine (1) according to claim 1 or 2, wherein the knife cover (42) is configured to cover, when the knife cover (42) is in the covering position, the center knife (41) along the entire width of the blade edge (41a) in the cloth feeding direction (F).

4. The welting machine (1) according to any one of the preceding claims, wherein the knife cover (42) is configured to cover both sides of the center knife (41) when the knife cover (42) is in the covering position.

5. The welting machine (1) according to any one of the preceding claims, wherein the knife cover (42) is configured in a forked shape to straddle the center knife (41) when the knife cover (42) is in the coving position.

FIG. 1

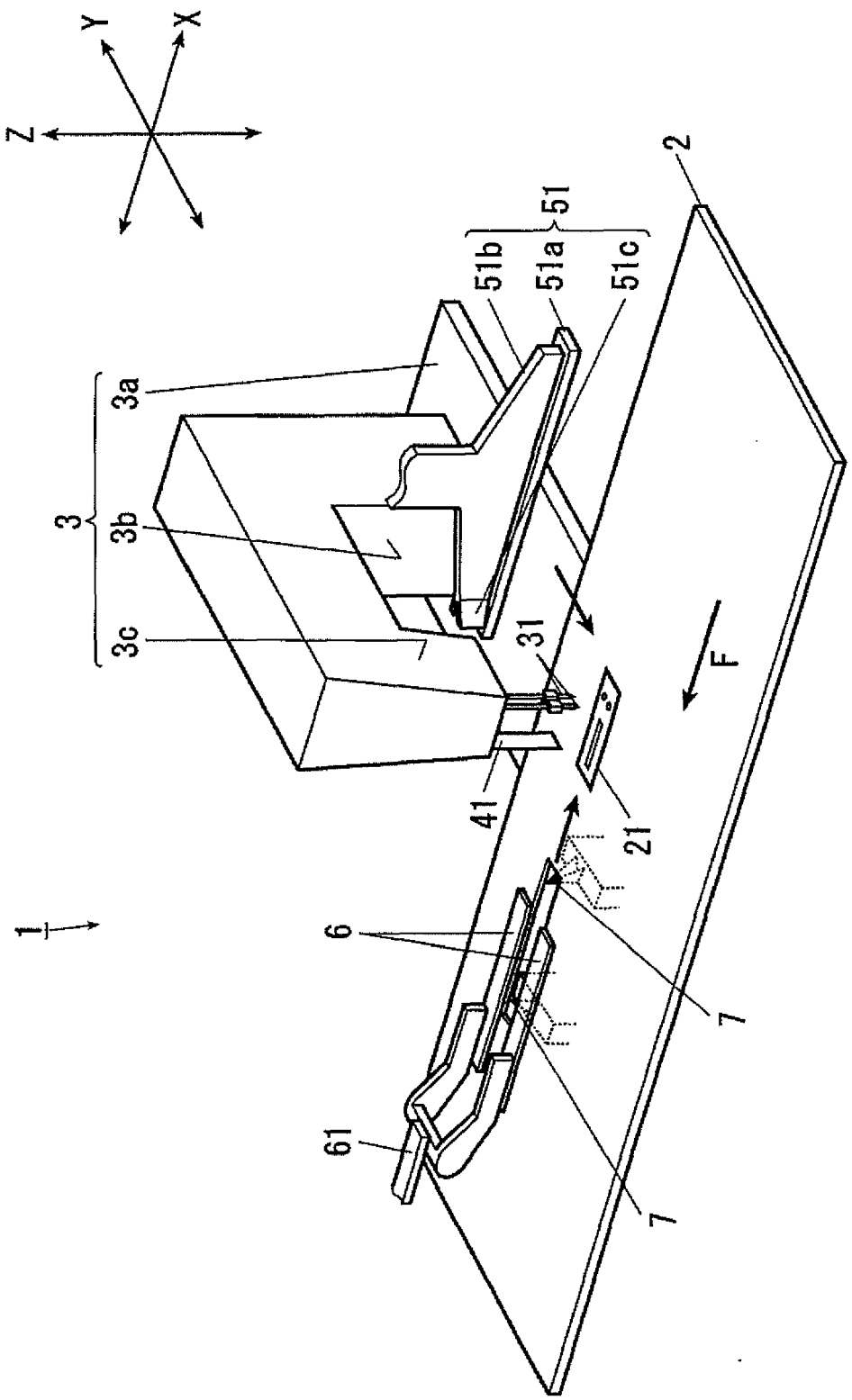
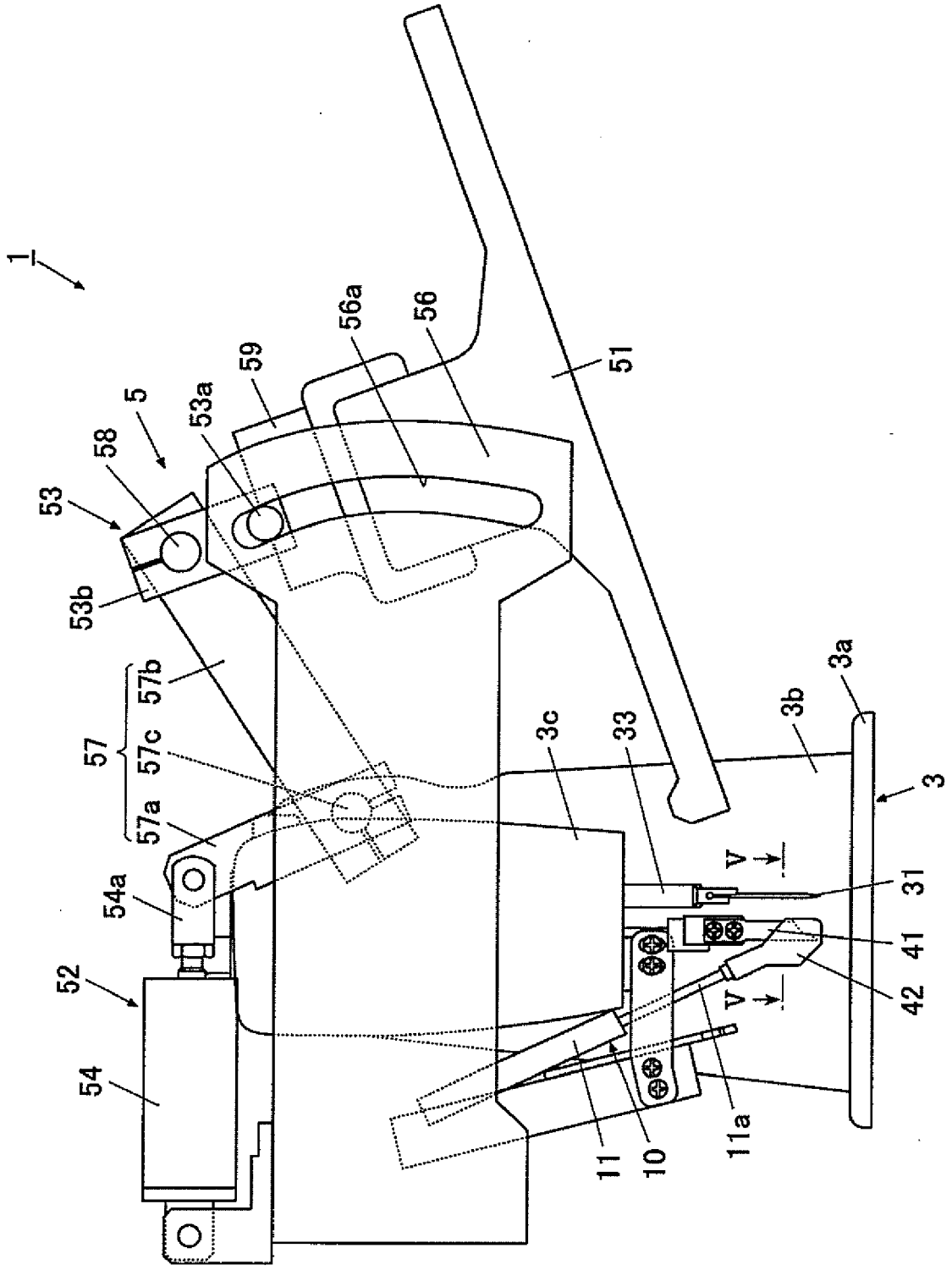


FIG. 2


1
5
51
52
53
53a
53b
54
54a
56
56a
57
57a
57b
57c
58
59
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3c
31
33
41
42
10
11
11a
V
V

FIG. 3

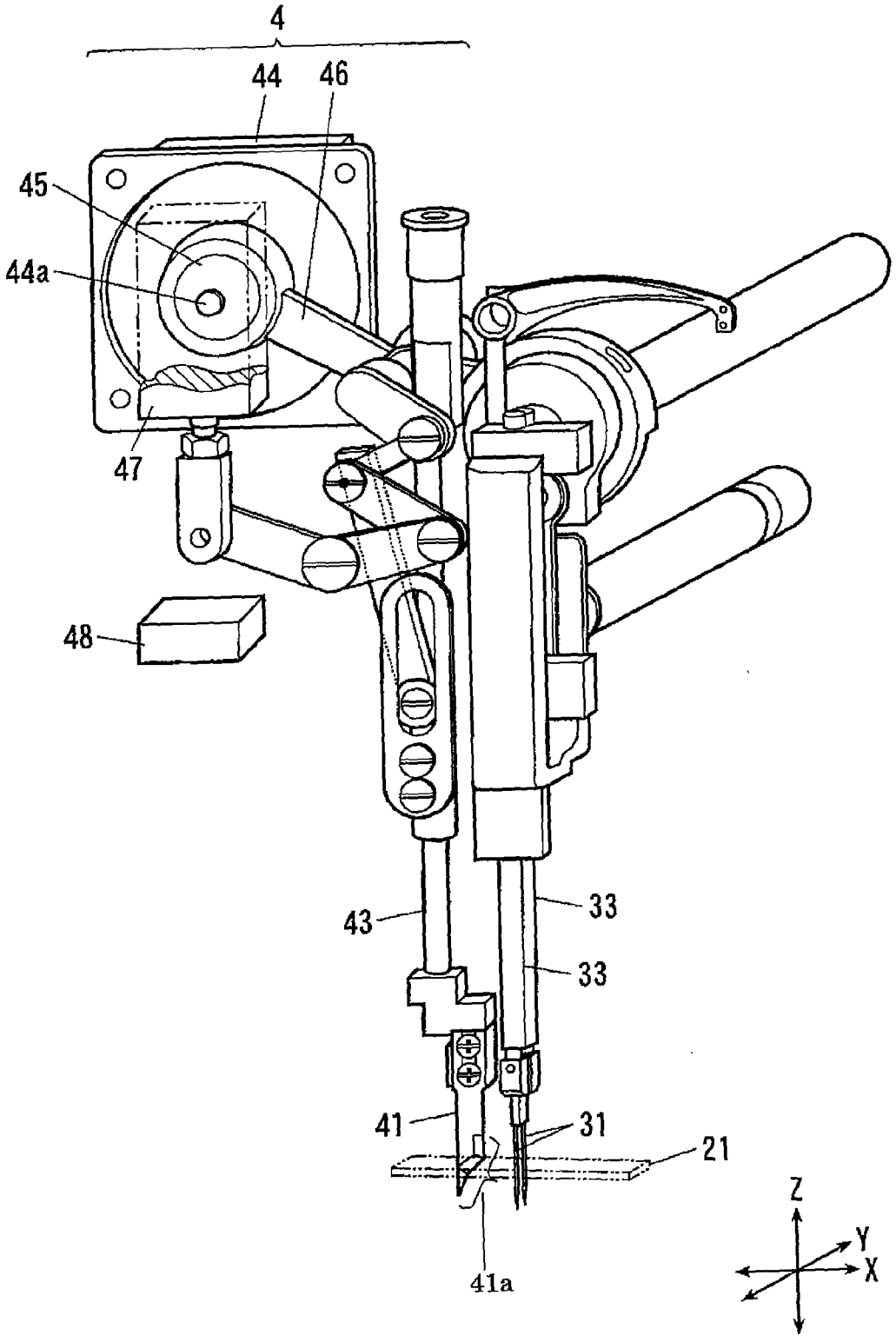


FIG. 4

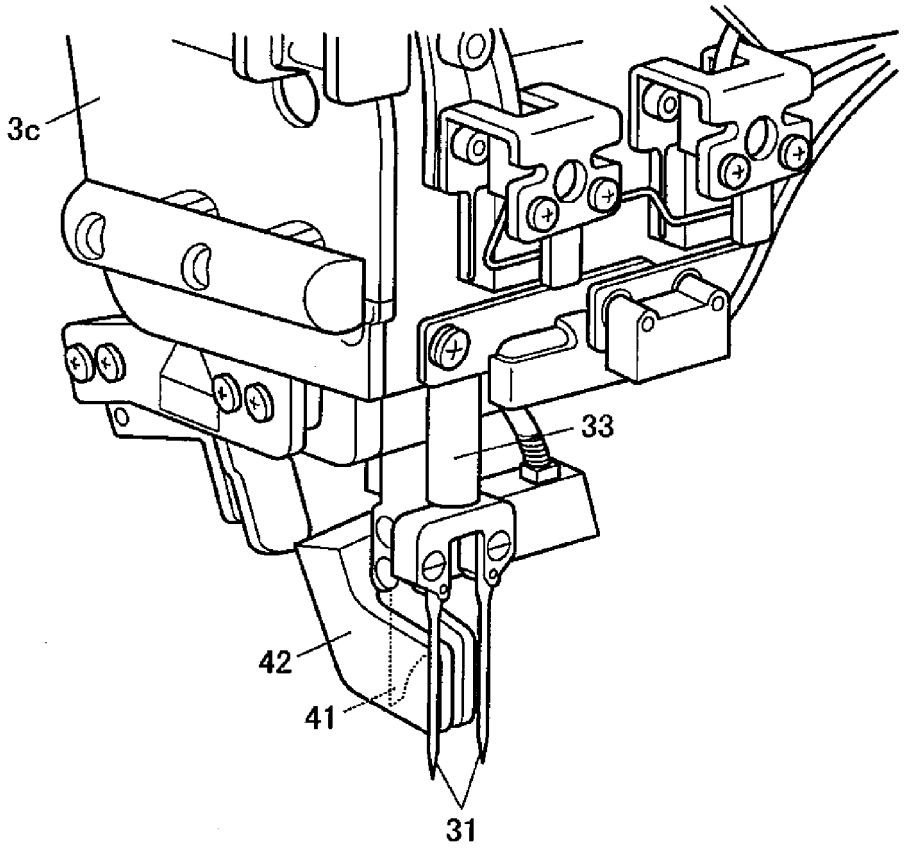


FIG. 5

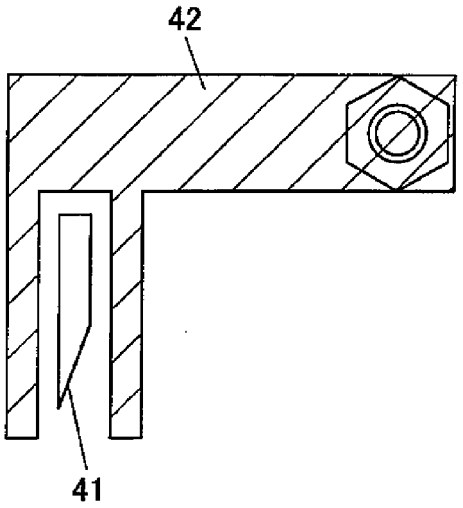


FIG. 6

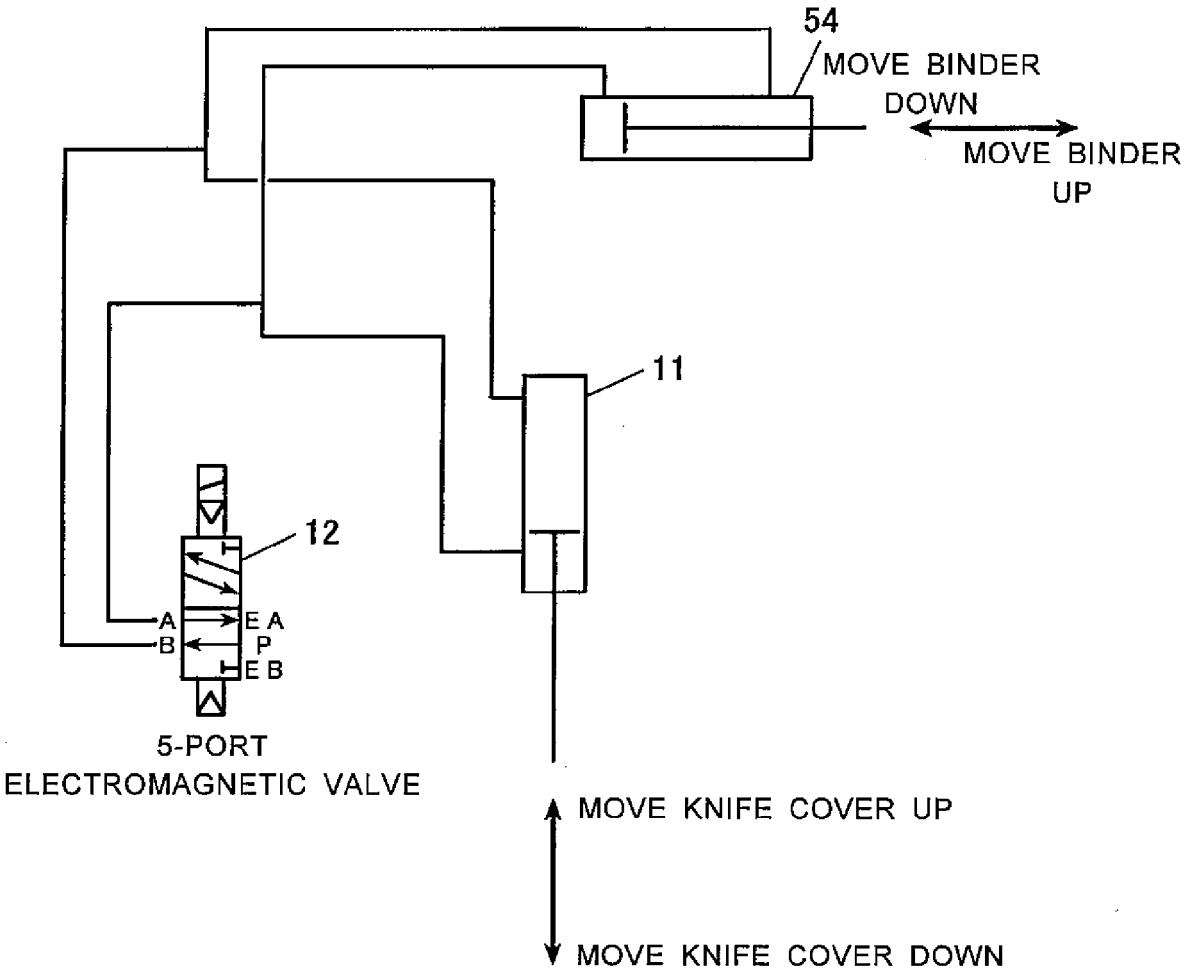

54
MOVE BINDER DOWN
MOVE BINDER UP
11
12
A
B
E A
P
E B
5-PORT ELECTROMAGNETIC VALVE
MOVE KNIFE COVER UP
MOVE KNIFE COVER DOWN

FIG. 7

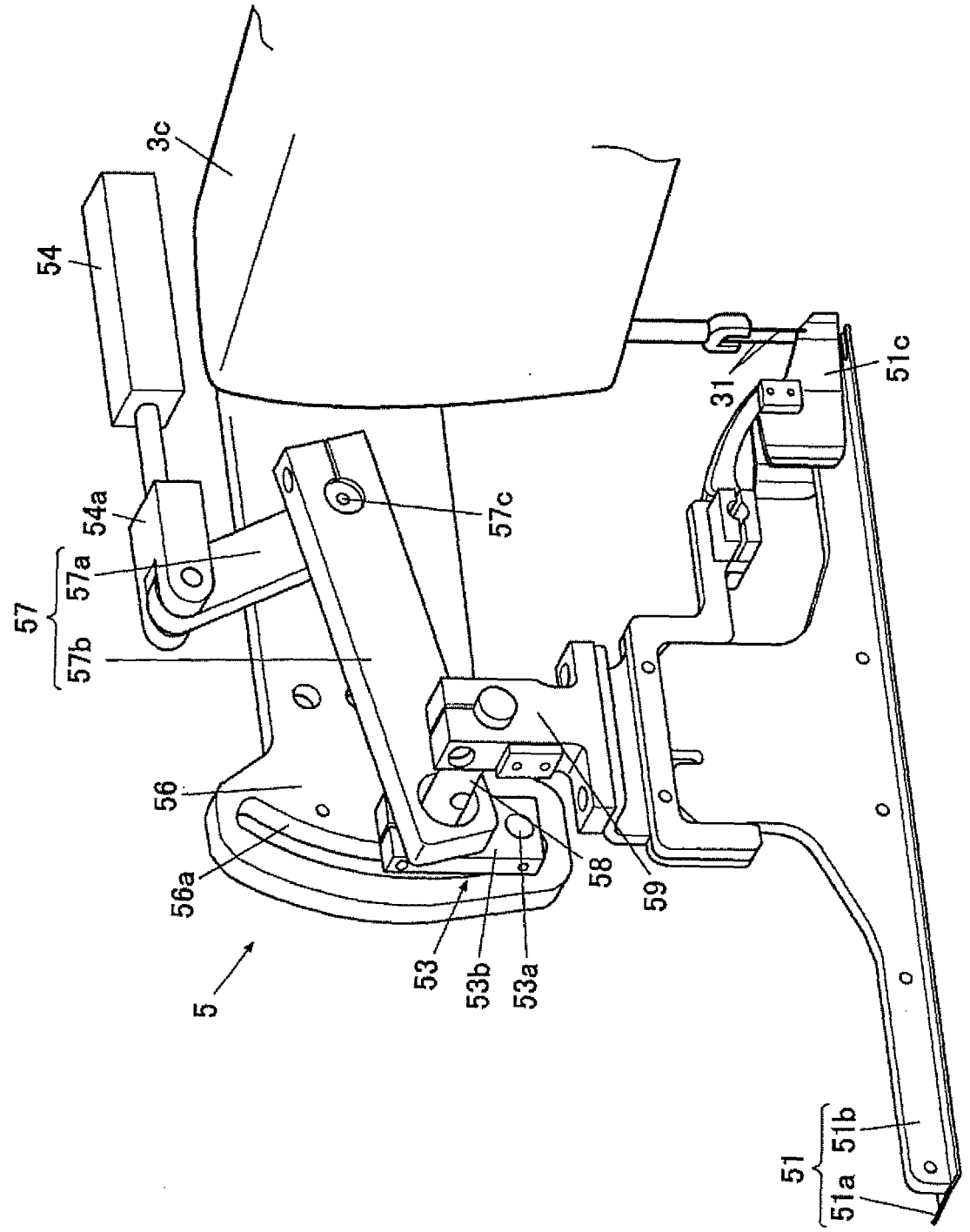


FIG. 8

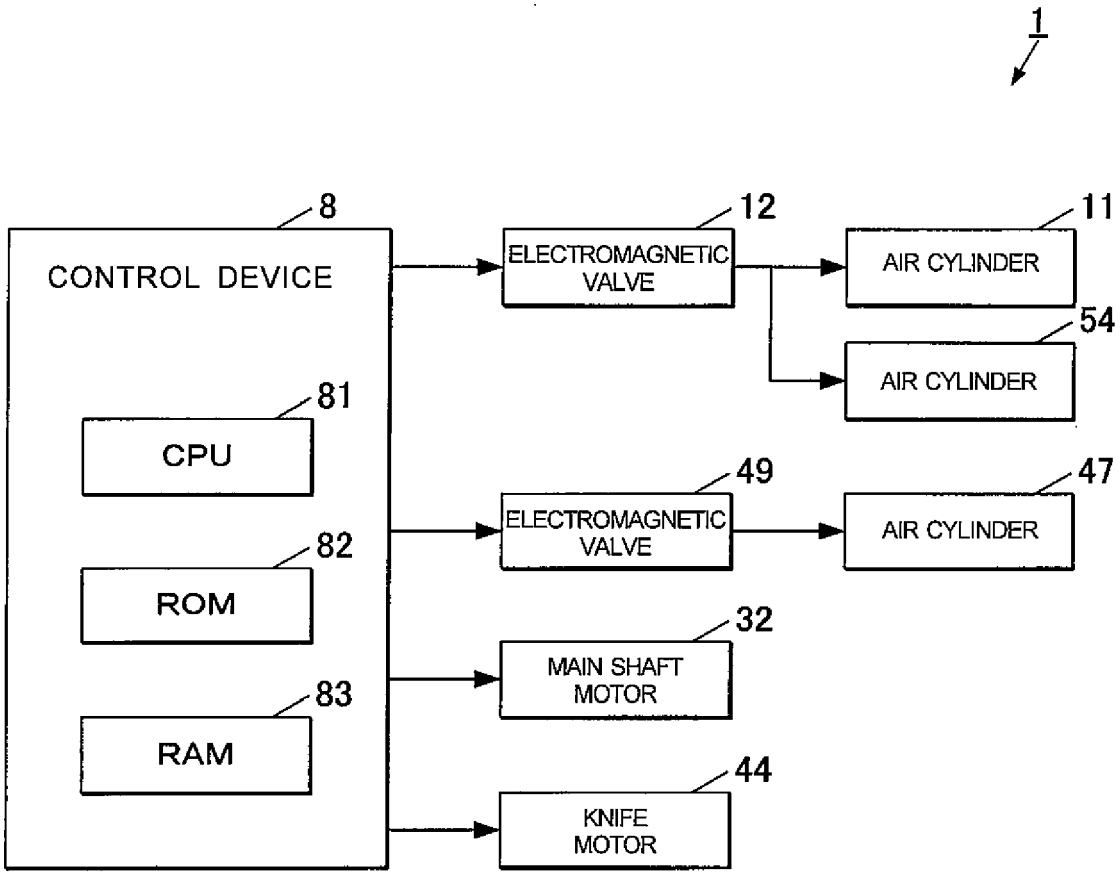

1
8
CONTROL DEVICE
81
CPU
82
ROM
83
RAM
12
ELECTROMAGNETIC VALVE
11
AIR CYLINDER
54
AIR CYLINDER
49
ELECTROMAGNETIC VALVE
47
AIR CYLINDER
32
MAIN SHAFT MOTOR
44
KNIFE MOTOR

FIG. 9

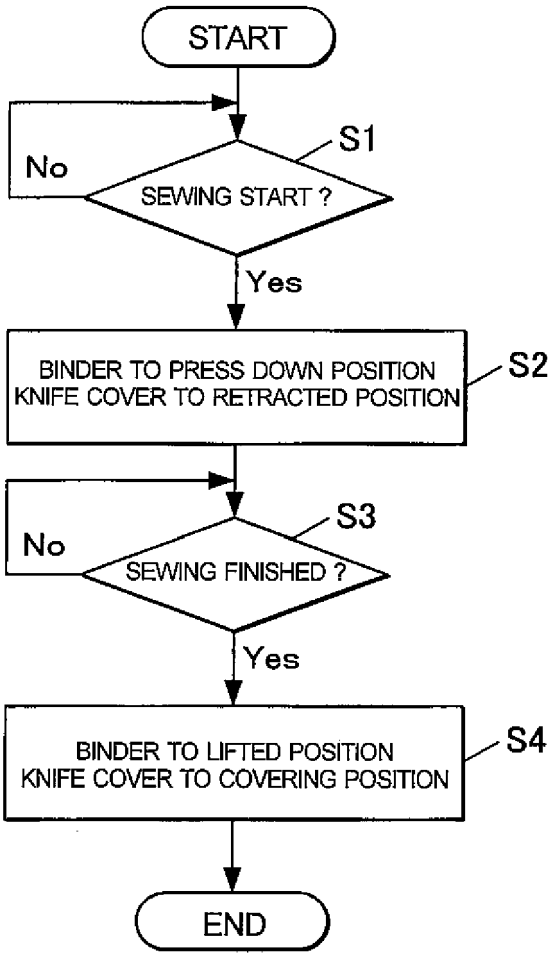
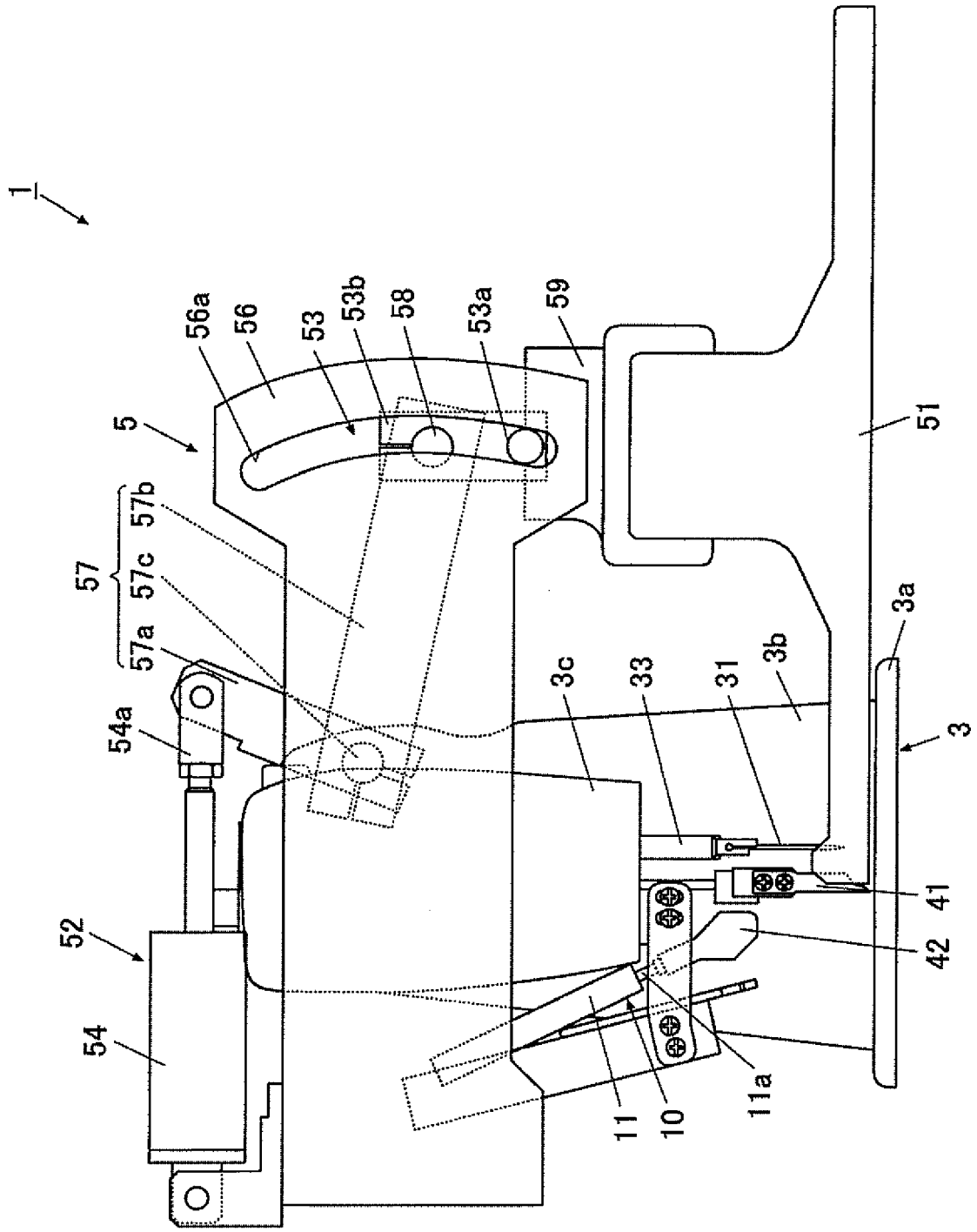

START
S1
No
SEWING START ?
Yes
BINDER TO PRESS DOWN POSITION
KNIFE COVER TO RETRACTED POSITION
S2
S3
No
SEWING FINISHED ?
Yes
BINDER TO LIFTED POSITION
KNIFE COVER TO COVERING POSITION
S4
END

FIG. 10


1
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56a
56
53
53b
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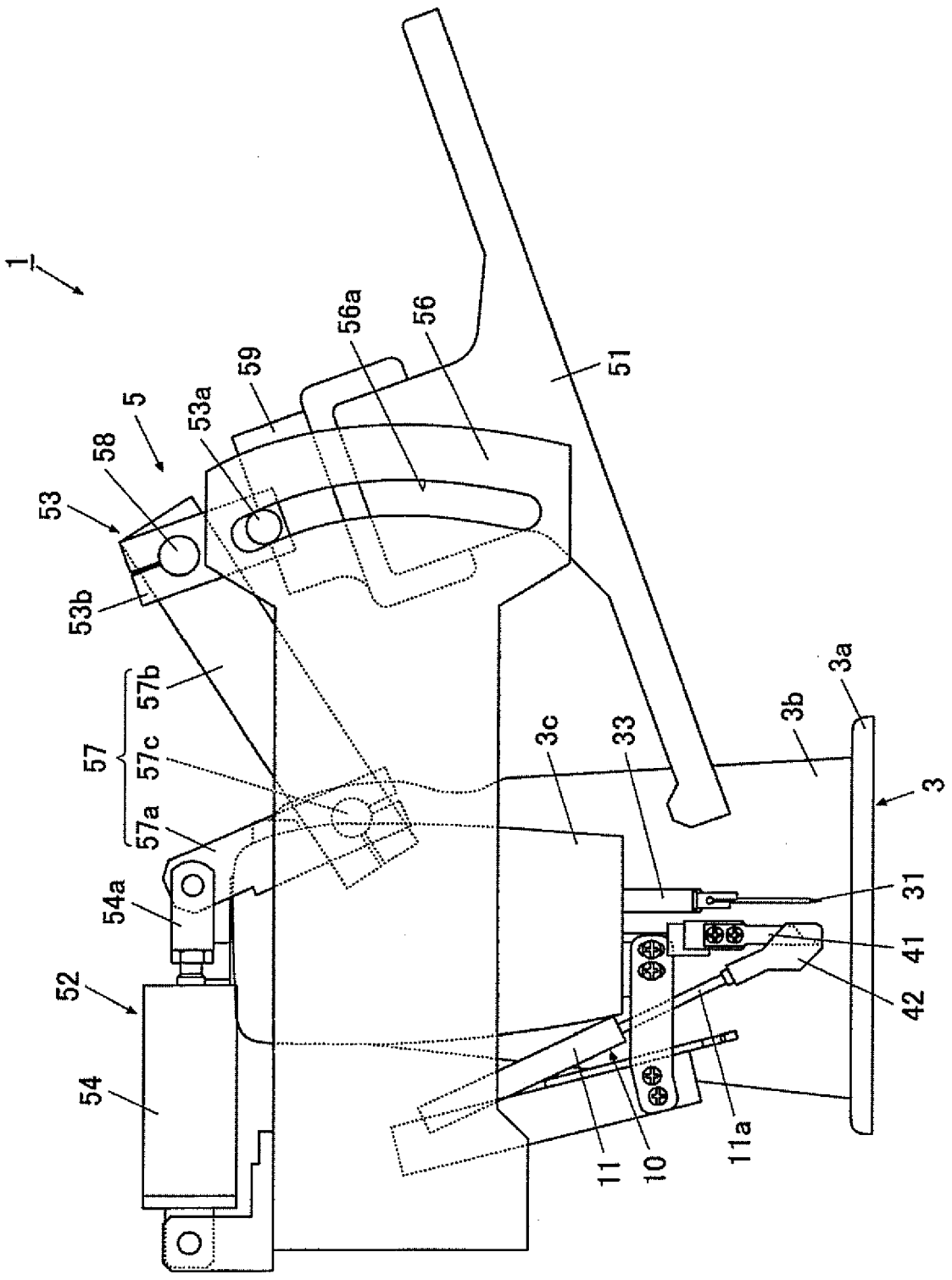
59
51
57
57b
57c
57a
54a
3c
33
31
3b
3a
3
41
42
52
54
11
10
11a

FIG. 11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54a
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56a
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57c
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3c
31
33
41
42
10
11
11a

FIG. 12

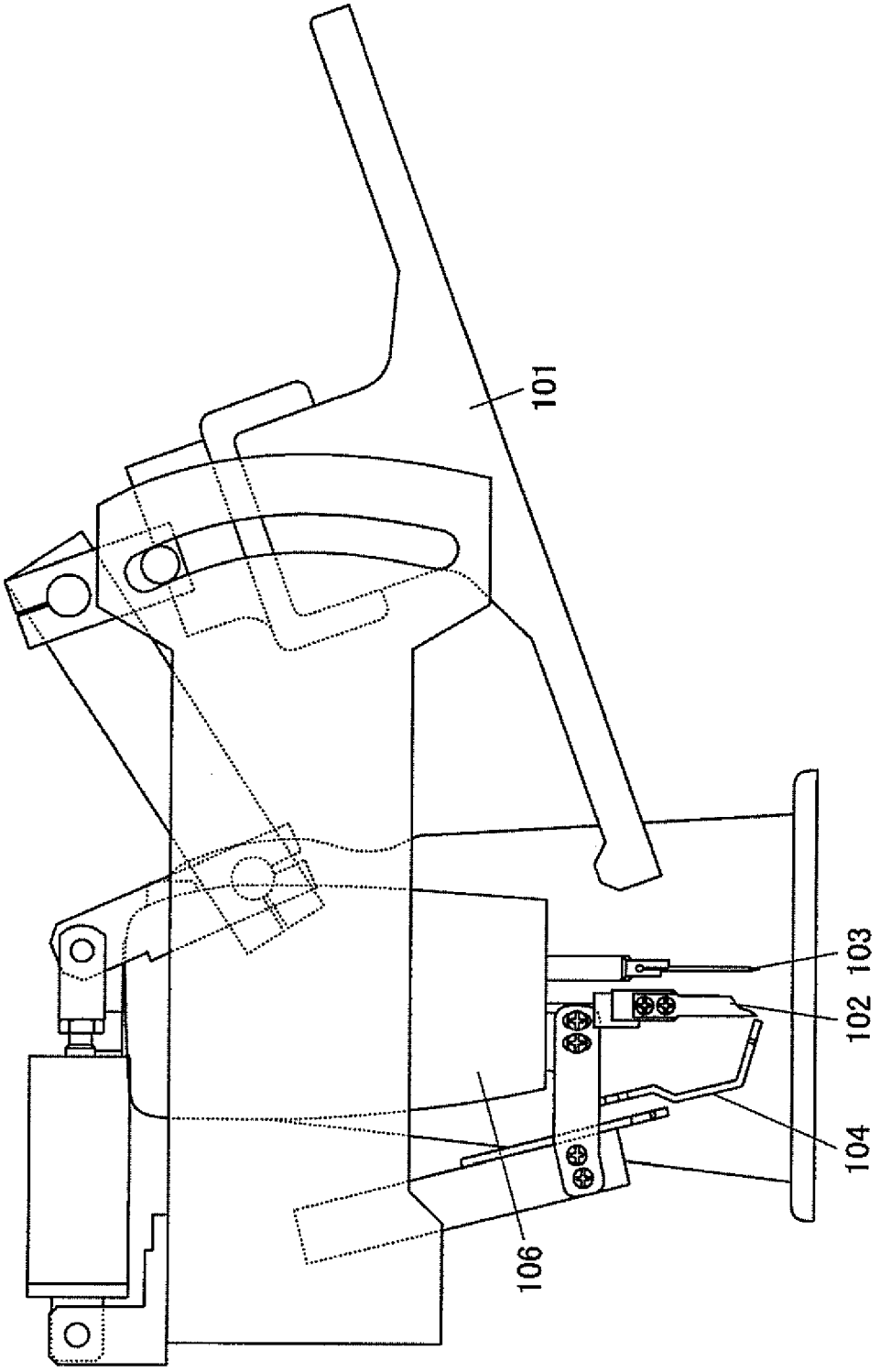


FIG. 13

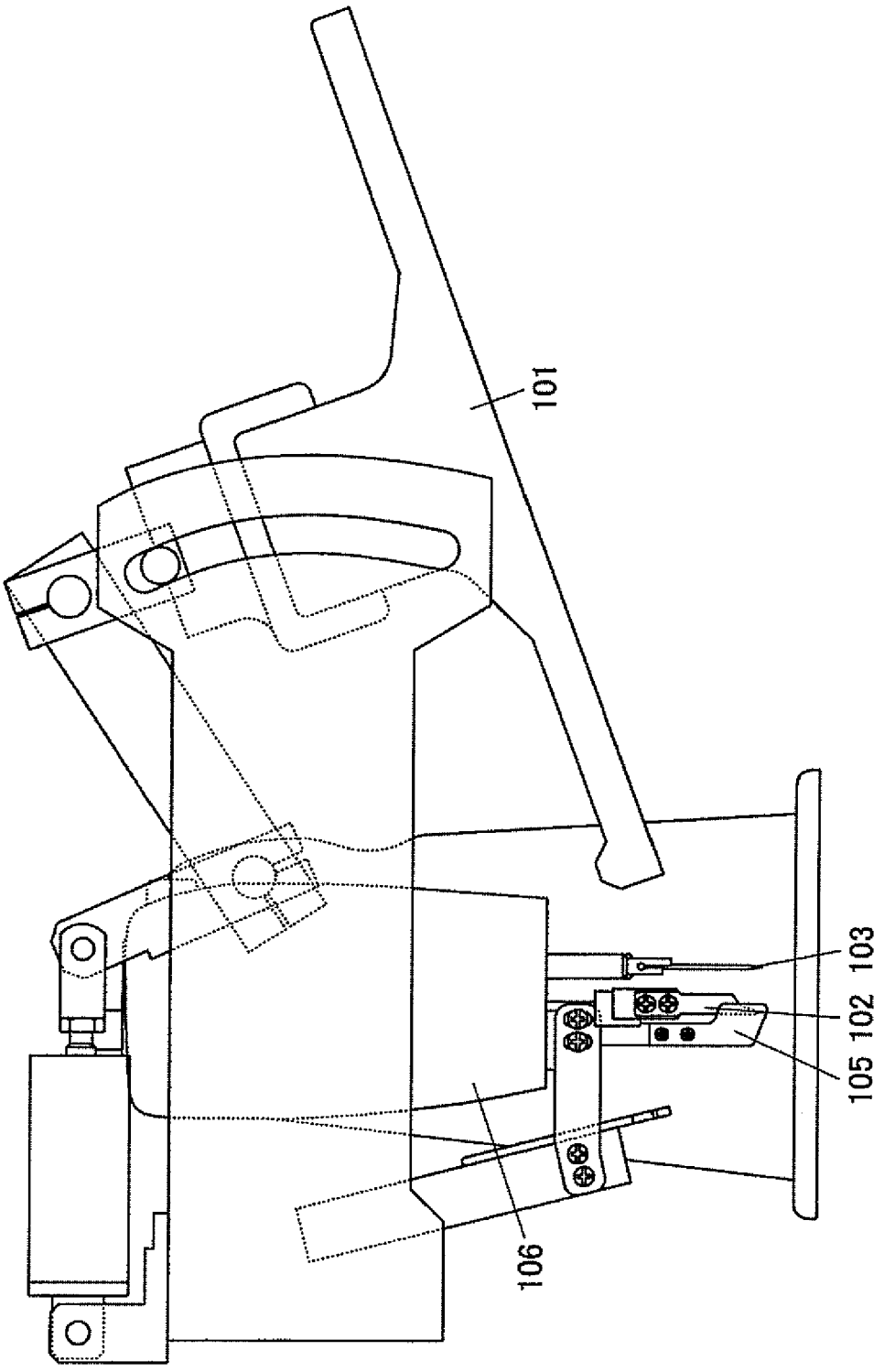


FIG. 14

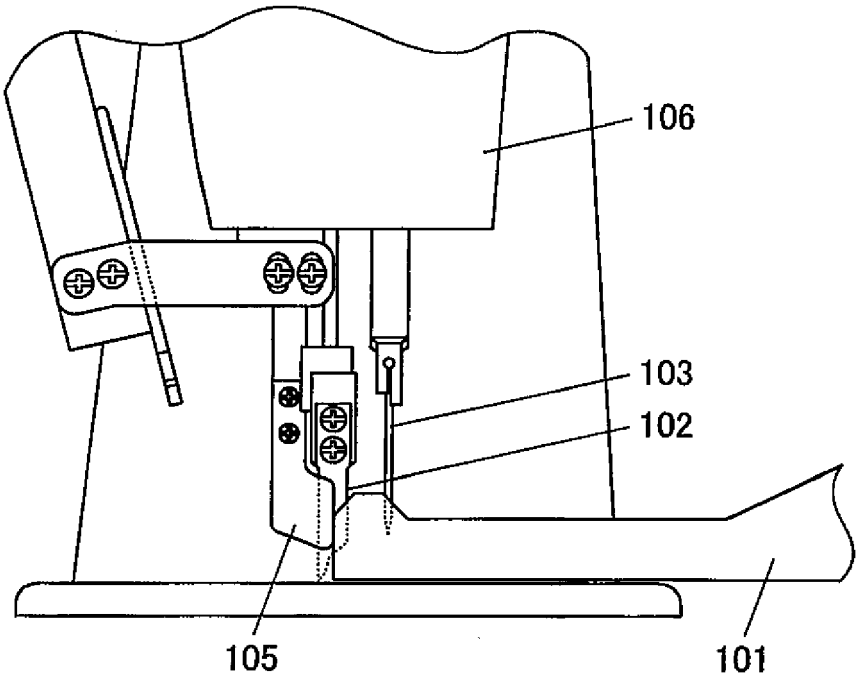


FIG. 15

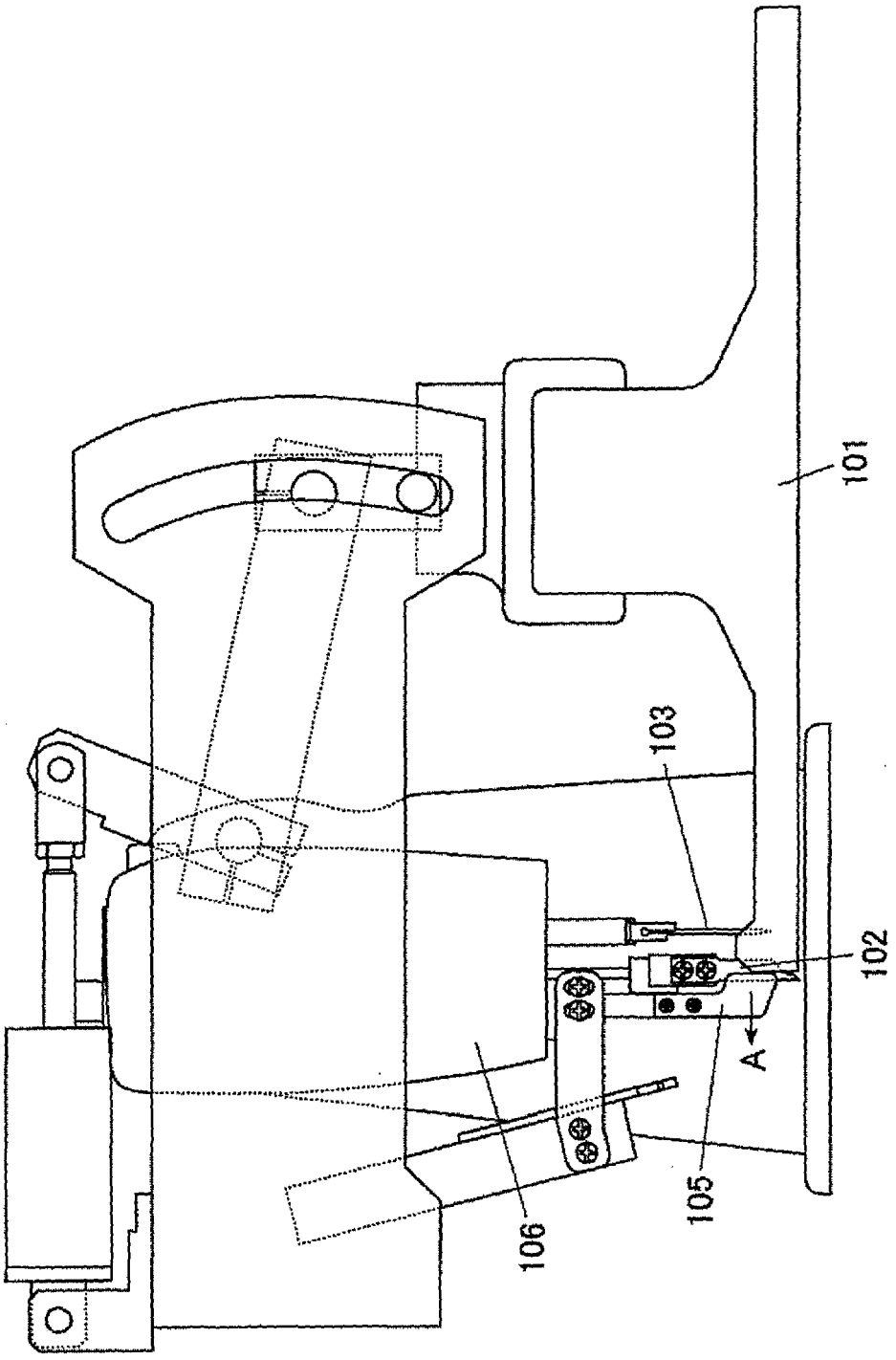
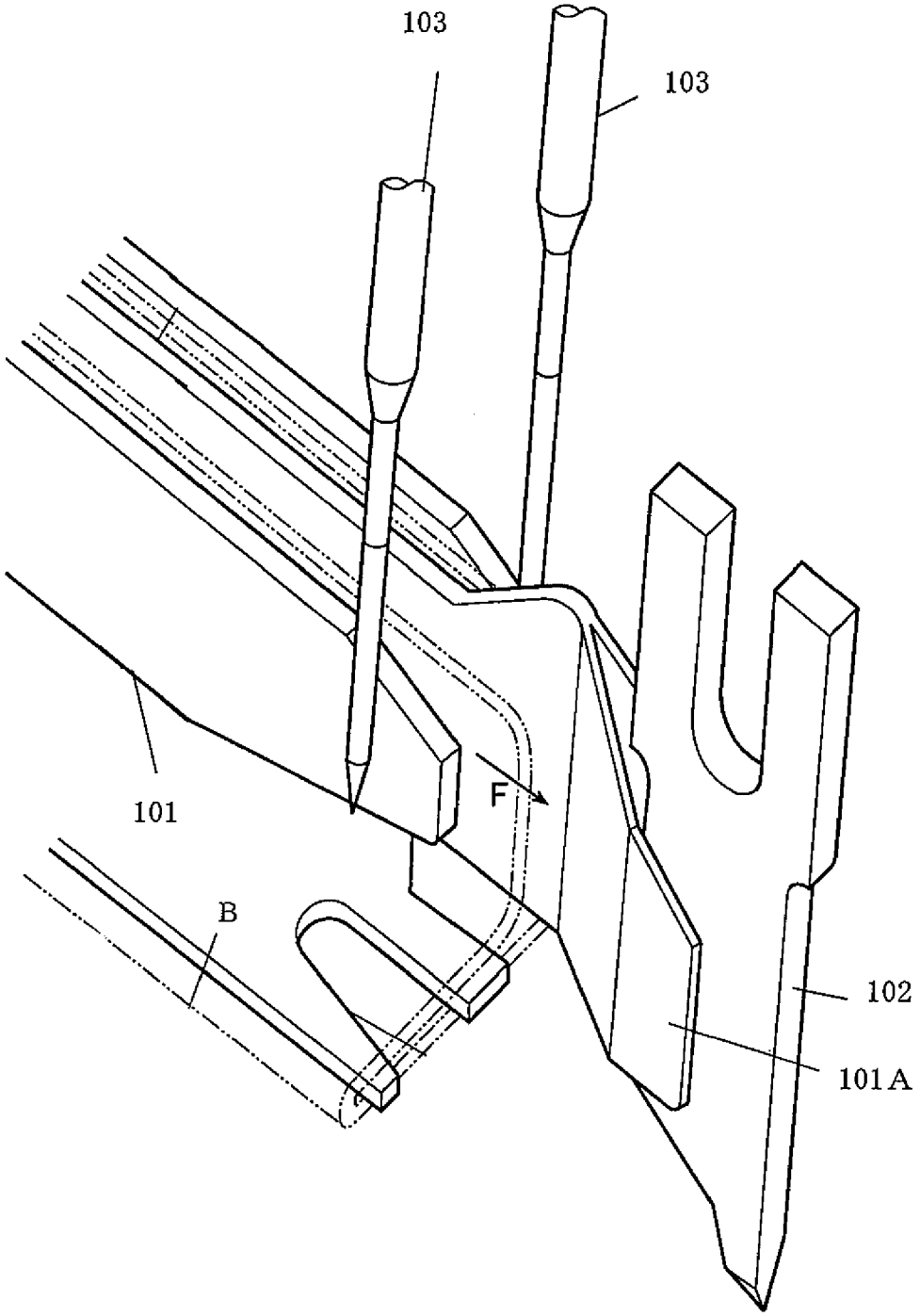


FIG. 16



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Patent documents cited in the description

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