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(71) Applicant: **Altopack S.P.A.**
55011 Altopascio (LU) (IT)

(72) Inventor: **VEZZANI, Giuseppe**
6902 PARADISO LUGANO (CH)

(74) Representative: **Mittler, Andrea et al**
MITTLER & C. s.r.l.
Viale Lombardia, 20
20131 Milano (IT)

(54) **MACHINE FOR PACKAGING BAGS FOR FOODS**

(57) A packaging machine of a plurality of bags (2) for foods is described; the machine comprises production means (901, 902) for producing plastic bags containing foods and a conveying apparatus (700) of the bags to be or previously packaged. The conveying apparatus comprises a closed loop chain (703) meshed between a driving ring gear (704) and an idle ring gear (705), both with

vertical rotation axis, and a plurality of retaining elements (709) of the bags which are to be or have been packaged, each retaining element of the plurality of retaining elements is associated with the chain and a single bag of the plurality of bags is retained by a single retaining element of the plurality of retaining elements. (Fig. 1)

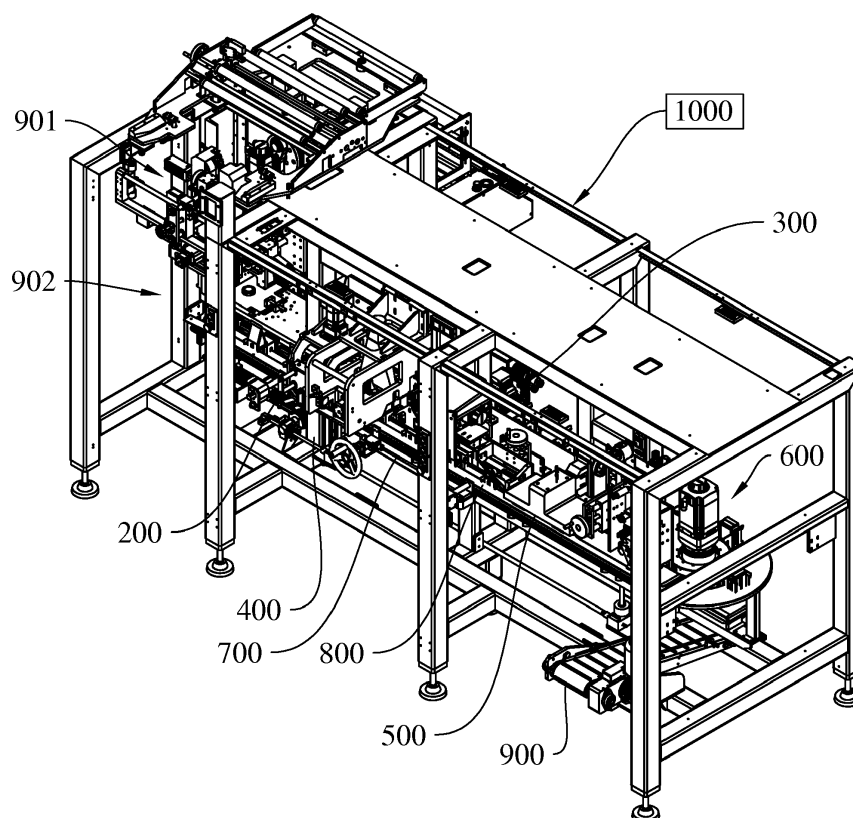


FIG.1

Description

[0001] The present invention relates to a machine for packaging bags for foods, preferably alimentary pasta, granular products and the like, preferably plastic bags.

[0002] Machines for packaging bags, e.g. of pasta, which comprise a conveyor belt able to convey the packages along the machine through a plurality of manufacturing stations arranged in cascade, are known in the prior art. Typically, the conveyor belt supports a succession of compartments each able to accommodate at least one package, and each compartment comprises two walls, one upstream and one downstream, and a base, which is the base of the conveyor belt itself, said walls being orthogonal with respect to the base.

[0003] The drawbacks of the use of such a conveyor belt are, on one hand, not being able to ensure a stable positioning of the package inside the respective compartment, and, on the other hand, the impossibility of manufacturing packages of mutually different type.

[0004] In said packaging machines, the bag is arranged in a first station for a given period of time to undergo a first manufacturing, to then pass to the successive station to the last station, from which the now completed bag exits. Various stations form the head of the bag and each one comprises means moved by a moving system of the rack and pinion type or by belts and pulleys; the known machines may comprise a single motor to move all the means for forming the head of the bag.

[0005] This determines a more complex forming operation of the head associated with a low bag packaging speed.

[0006] US-A-2009/0071105 describes a machine for packaging a plurality of bags for foods.

[0007] It is the object of the present invention to provide a machine for packing bags for foods which is much simpler than those known and which also allows greater bag production.

[0008] According to the present invention, said object is achieved by a packaging machine as defined in claim 1.

[0009] The features and the advantages of the present invention will be apparent from the following detailed description of a practical embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, in which:

figure 1 is a diagrammatic, perspective view of the machine for packaging bags for foods according to the present invention;

figures 2-3 are diagrammatic, perspective views of the machine of figure 1 free from supporting frame; figure 4 is a front view of the packaging machine of figure 3;

figure 1a is a perspective view of the apparatus of the first station of the machine of figure 1;

figure 2a is a perspective view of the apparatus of figure 1a in a resting position;

figure 3a is a section view taken along line III-III of

the apparatus of figure 2a;

figure 4a is a section view taken along line IV-IV of the apparatus of figure 2a;

figure 5a is a section view taken along line V-V of the apparatus of figure 2a;

figure 6a is a front view of the apparatus of figure 1 in first working position;

figure 7a is a section view taken along line VII-VII of the apparatus of figure 6a;

figure 8a is a section view taken along line VIII-VIII of the apparatus of figure 6a;

figure 9a is a front view of the apparatus of figure 1 in second working position;

figure 10a is a section view taken along line X-X of the apparatus of figure 9a;

figure 11a is a section view taken along line XI-XI of the apparatus of figure 9a;

figure 12a is a section view taken along line XII-XII of the apparatus of figure 9a;

figure 1b is a perspective view of the apparatus of the second station of the machine of figure 1;

figure 2b is a front view of the apparatus of figure 1b in a resting position;

figure 3b is a section view taken along line III-III of the apparatus of figure 2b in a first working position;

figure 4b is a section view taken along line III-III of the apparatus of figure 2b in a second working position;

figure 5b is a section view taken along line III-III of the apparatus of figure 2b in a third working position;

figure 6b is a section view taken along line III-III of the apparatus of figure 2b in a fourth working position;

figure 7b is a section view taken along line III-III of the apparatus of figure 2b in a fifth working position;

figure 8b is a plan view of the apparatus of figure 1b;

figure 9b is a perspective view in greater detail of the first welding assembly;

figure 10b is a side view of the assembly of figure 9b;

figure 1c shows a first perspective view of the folding assembly or apparatus of the third station of the machine of figure 1;

figure 2c shows a second perspective view of the folding assembly or apparatus of the third station of the machine of figure 1;

figure 3c shows a paced succession of bags conveyed by a chain conveyor visible in the folding assembly of figures 1c and 2c;

figure 4c shows a side view of the folding assembly of Figs. 1c, 2c;

figure 5c shows a front partial section view of the folding assembly of Figs. 1c, 2c;

figure 6c shows a section view of the folding assembly of Figs. 5c taken along line VI-VI;

figure 7c shows a section view of the folding assembly of Figs. 4c taken along line VII-VII;

figure 8c shows a section view of the folding assembly of Figs. 4c taken along line VIII-VIII;

figure 9c shows a top view of the folding assembly of Figs. 1c, 2c;
 figures 10c-13c show first steps of operation of the folding unit in a section view taken along line X-X of Fig. 5c;
 figures 14c-15c show second steps of operation of the folding unit in a section view taken along line XIV-XIV of Fig. 5c;
 figure 1d shows a perspective view of the pressing apparatus of the fifth station of the machine of figure 1;
 figure 2d shows a front view of the pressing apparatus of Fig. 1d;
 figure 3d shows a section view of the part of the pressing apparatus of Fig. 1d taken along the line III-III of Fig. 2d;
 figure 4d shows a side view of the part of the pressing apparatus of Fig. 1d;
 figure 5d shows a section view of the part of the pressing apparatus in fig. 1d taken along line V-V of Fig. 4d;
 figures 9d show steps of operation of the pressing apparatus of Fig. 1d;
 figure 1e shows a perspective view of a conveying apparatus or chain conveyor of the bags for foods for a packaging machine according to the present invention;
 figure 2e shows a perspective view of the part of the conveying apparatus of Fig. 1e;
 figure 3e shows a front view of the conveying apparatus of Fig. 1e;
 figure 4e shows a side view of the conveying apparatus of Fig. 1e;
 figure 5e shows a section view of the conveying apparatus taken along line V-V of Fig. 4e;
 figure 6e shows a perspective view of a containing block comprised in the conveying apparatus of Fig. 1e;
 figure 7e shows a side view of the containing block of Fig. 6e;
 figure 8e shows a perspective view of a runner with attachment plate and locking lever comprised in the conveying apparatus of Fig. 1e;
 figures 9e and 10e show rear views of a runner with attachment plate and locking lever comprised in the conveying apparatus of Fig. 1e in two different steps of working;
 figure 11e shows a perspective view of an adjustment guide comprised in the conveying apparatus of Fig. 1e;
 figure 1f shows a front view of an adhesive tape application apparatus of the sixth station of the machine in figure 1 according to the present invention;
 figure 2f shows a top view of the apparatus of Fig. 1f;
 figure 3f shows a section view of the apparatus of Fig. 1f taken along line III-III;
 figure 4f shows a section view of the apparatus of Fig. 2f taken along line IV-IV;

figure 5f shows a section view of the apparatus of Fig. 1f taken along line V-V;
 figure 6f shows a section view of the apparatus of Fig. 1f taken along line VI-VI;
 figure 7f shows a perspective view of a detail of the apparatus of Fig. 1f;
 figures 8f-16f show details of the apparatus of Fig. 1f during the steps of operating;
 figure 17 shows a perspective view of the machine with a wiring assembly on top of it;
 figure 18 shows a perspective view of the machine with a conveying module of a pillow bag.

[0010] Figures 1-4 show a machine for packaging bags 2 for foods, preferably for alimentary pasta, granular products and the like, according to the present invention. The bag 2 may be of variable size and made of plastic material; instead of the bag 2 made of plastic material, the packaging machine may package cardboard boxes with bags made of plastic material inside. Hereinafter, bag to be packaged 2 will mean a bag made of plastic material or a cardboard box with a bag made of plastic material inside.

[0011] The packaging machine comprises production means of plastic bags containing foods and a conveying apparatus or chain conveyor 700 of the bags to be packaged 2 which is able to convey the bags along the X axis from one station to the next for the operations that each station must perform on the bag. The conveying apparatus 700 is an essential part of the packaging machine according to the present invention.

[0012] If the packaging machine is fed with sheets of film, preferably from a plastic film reel, it comprises an assembly 901 for longitudinally welding the sheet of film and a transverse welding clamp assembly 902 for forming the plastic bag, and an assembly 900 for letting out the previously packaged bags 2. The film is unwound by a drive and passes along a set path to a forming tube, where the tube is wound about a pipe to form the bag. The film is kept centered with respect to the forming tube axis (which corresponds to the dropping axis of the product in the packaging machine) along the path by a carriage with drive. The film is accompanied along the forming pipe by a pair of feeding tracks (each track is provided with independent drive), which suck the film and accompany it in step with the movement of the welding assembly 901.

[0013] The latter provides the longitudinal welding by a device consisting of a nickel-chrome strip, which is turned by a specific brushless motor and heated to the necessary temperature by electric resistor. The welding device is positioned so that the belt is in contact with the film without preventing its sliding. The belt moves in step with the film or is moved away by pneumatic cylinder when the film stops, so as to prevent burning it.

[0014] The transverse welding is achieved by an assembly consisting of a pair of hot clamps 902 (heated by electric resistors) which, located under the unwinding roll-

ers, have the purpose of heating and cutting the bags transversally. The pair of clamps 902 is formed by a front clamp and by a rear clamp, which by electric resistors, are heated and kept at a constant temperature by thermocouples (such device may be replaced by an ultrasound cold welding assembly). The clamps are opened and closed by a horizontal movement, while they are translated vertically from the top down and vice versa. The film is compressed between the surfaces of the two clamps and is pulled and welded transversally. A knife actuated by a pneumatic device is present in the rear clamp and makes it possible to divide the packages from one another concurrently with the step of welding. Such device is provided with blowing assembly consisting of four spears (two lower and two upper) which intervene on the lower and upper part of the package, whereby forming the "edging" of the package. Furthermore, the clamp makes it possible to completely weld the upper part of the head of the bag, if fin packages are made, or to leave a portion of the head of the bag open, in case of a double block bottom bags.

[0015] So, a plastic bag exits from the clamp assembly 902 which may be entirely welded both on the bottom and on the top, and in the latter case the bag may be the previously packed bag which is arranged directly in a retaining element of the chain conveyor 700 and carried towards the outlet assembly 900, or arranged in a cardboard box which is in turn arranged in a retaining element of the chain conveyor, making the bag to be packaged 2, which is carried towards the assembly 900. In the latter case, the bag to be packaged 2 will be subjected to the gluing of the upper part of the cardboard box by a specific station before being carried by the conveying apparatus 700 towards the assembly 900.

[0016] Alternatively, a plastic bag entirely welded only on the bottom and not entirely at the top, i.e. with the head partially closed, can exit from the clamp assembly 902, and in this case, in order to make a double block bottom bag to be packaged 2, the plastic bag passes in sequence through the plurality of stations or modules before reaching the assembly 900.

[0017] The plurality of stations or module in succession comprises the following stations:

a first station or module 200, which comprises an apparatus for forming the head 1 of the bags 2 for foods,

a second station or module 400, which comprises a welding and cutting apparatus of the head 1 of the packages 2 for foods exiting from the first station 200, to weld the head 1 of the bag 2 so as to form a flap 3100 and cut the upper part of the head 1 of the bag in excess,

a third station or module 300 for folding and pressing the flaps 3100 of the bags exiting from the second station 400.

[0018] The plurality of stations preferably also comprises

a fourth station or share 800 able to turn by 90° the flaps 3100 of the bags 2 exiting from the third station 300, so as to take them to horizontal position and obtain the flaps 502.

[0019] The plurality of stations preferably comprises a fifth station 500 able to press the flaps 502 of the bags 2 exiting from the fourth station 800 onto the body 9003 of the bag 1.

[0020] The plurality of stations preferably comprises a sixth station 600 able to place an adhesive tape on the upper flap 3100, 502 of the bag, preferably on the folded flap 502 pressed onto the body 9003 of the bag 2 exiting from the fifth station 500, so as to keep the squared shape conferred to the package; the taping station 600 may also act on the flap 3100 exiting from the third station 300 or on the flap 3100 folded horizontally exiting from the fourth station or share 800.

[0021] The fifth station 500 may also not be present on the machine and the sixth station 600 may be replaced by a labeling station or may be missing.

[0022] Therefore, the packaging machine according to the invention is of modular type so that only some of the various stations or modules may be present or present only in part. In this manner, the packaging machine according to the invention may have only some essential modules for packaging the bags 2 and not all those listed above.

[0023] The packaging machine according to the present invention comprises a control unit 1000 able to control the single assemblies and/or modules for operations to be performed, in particular all the moving means envisaged in each station and in the conveying apparatus 700.

[0024] Figures 1a-12a describe the first station 200, i.e. the apparatus for forming the head 1 of the bags 2 for foods if the head of the plastic bag is partially closed.

[0025] The apparatus or assembly comprises a device 210 for forming the head 1 of the bag 2 and a device 220 for deflating the head 1 of the bag 2.

[0026] The device 210 comprises a pair of spears 211, preferably of triangular shape, actuated by a single motor 212, e.g. of electric type, for forming the head 1 of the bag 2 in the working position 2B.

[0027] The apparatus also comprises a further device 215 able to displace the pair of spears 111 from a resting position 2A to a first working position 2B1, intermediate between the resting position 2A and the working position 2B. The device 115 also comprises a single electric motor 216 for displacing the pair of spears 211.

[0028] The device 220 comprises a press with two elements 221 able to close in the working position 2B for deflating the head 2 of the bag 1; the two press-like elements 221 are actuated by a single electric motor 222.

[0029] The electric motors 212, 216 and 222 are controlled by a control device 2100 belonging to the control unit 1000.

[0030] The electric motors 212 and 222 are mutually separated and mutually independent. The electric motor

216 is separated from the electric motors 212, 222 and is independent from them.

[0031] As shown in greater detail in figures 3, 5, 7 and 11 the device 210 comprises two runners 213 sliding on two guides 214 along axis X; the two spears 211 are anchored to the two runners 213 in sliding manner along the Y axis, orthogonal to axis X.

[0032] The two runners 213 are connected to a rotational plate 217 connected to the motor 212 by connecting rods 218 rotationally anchored in points 219 to the runners 213 and in points 2190 to the rotational plate 217. The clockwise or counterclockwise rotation of the rotational plate 217 determines an approach or distancing of the runners 213 along the X axis.

[0033] As shown in greater detail in figures 3a, 5a, 7a and 11a, the device 215 comprises two elements 2151 which carry the spears 211; the elements 2151 are sliding on a guide 2152 along the X axis by runners 2153.

[0034] The two elements 2151 are anchored to the runners 213 in sliding manner along axis Y, orthogonal to axis X.

[0035] The guide 2152 is connected to a rotational plate 2154 connected to the motor 216 by a connecting rod 2155 rotationally anchored in point 2156 to the guide 2152 and anchored in point 2157 to the rotational plate 2154. The clockwise or counterclockwise rotation of the rotational plate 2154 respectively determines the displacement of the spears 211 from the resting position 2A to the working position 2B1 and the displacement from position 2B1 to position 2A again along the Y axis.

[0036] As shown in greater detail in figures 3a, 4a, 6a and 10a, the device 220 comprises two runners 223 sliding on two guides 224 along axis Y; the two press-like elements 221 are anchored to the two runners 223.

[0037] The two runners 223 are connected to the rotational plate 225 connected to the motor 222 by connecting rods 226 rotationally anchored in points 228 to the runners 223 and in points 229 to the rotational plate 225. The clockwise or counterclockwise rotation of the rotational plate 225 determines an approach or distancing of the runners 223 along the Y axis.

[0038] The apparatus according to the invention comprises a single frame 250 which carries the motors 212, 216 and 222 and the devices 210, 215 and 220. The stable part of the motors 212, 216 and 222 is integral with the frame 250.

[0039] The apparatus according to the invention operates in the following manner.

[0040] In the step of resting 2A, the bag 2 is conveyed by the chain conveyor 700 to the position under the device 220 and with the head 1 arranged between the elements 221 and preferably with the flaps 210 of the partially joined front and rear walls, as shown in figures 2a-5a.

[0041] Successively, the control device 2100 controls the motor 216 of the device 215 so as to make the rotational plate 2154 turn clockwise; this allows the displacement of the guide 215 along the Y axis and also the dis-

placement of the spears 211, carried by the elements 215, again along the Y axis to the working position 2B1, as shown in figures 6a-8a.

[0042] Successively, the control device 2100 controls at the same time the motor 212 of the device 210 to make the rotational plate 217 turn clockwise and the motor 222 of the device 220 to make the rotational plate 225 turn clockwise.

[0043] The clockwise rotation of the rotational plate 117 allows the approaching of the runners 113 along the X axis and the consequent approaching of the spears 111, carried by the elements 115, which are arranged in the working position 2B, as shown in figures 9a-12a. In the working position 2B, the spears 11 empty the air from the head 1 of the bag 2 by operating on the side parts 131, 132 of the head 1 of the bag. The triangular spears 111, by pushing the side parts 131, 132 towards the inside of the head 2, provide the characteristic triangular formation of the side parts of the head 1 of the bag 2 and contribute to emptying the air from the head 2.

[0044] The clockwise rotation of the rotational plate 225 allows the approaching of the runners 223 along the Y axis and the consequent approaching of the press-like elements 221, carried by the elements 223, which are arranged in the working position 2B, as shown in figures 9a-12a. In the working position 2B, the press-like elements 221 completely deflate the head 1 of the bag 2.

[0045] Figures 1b-10b describe the second station, i. e. the welding and cutting apparatus or assembly 400, which comprise a welding device 410 for welding the flaps 3 of the head 1 of the package 2, a device 420 for cutting the upper part 401 of the head 1 of the bag 2 and a suction device 430 for sucking the previously cut upper part 401, as shown in the figures 1b, 2b and 8b.

[0046] The device 410 comprises a pair of elements 411, 412 able to close in the working position 4A2 to weld the head 2 of the bag 1 (figures 3b-7b); in particular, the device 410 comprises a fixed element 411 and an element 412 actuated by an electric motor 413 by a connecting rod 414 hinged to a pin 415 integral with a plate 416 rotated by the motor 413.

[0047] The apparatus also comprises a further device 440 able to move the previously cut upper part 401 of the head 2 from the welding zone 460 towards the suction zone 431 under the suction mouth 432 of the device 430 (figures 3b-7b, 9b, 10b); the device 440 comprises a pair of clamping elements 442, 443 and moving means 441 of the clamping element 442 alone.

[0048] The device 420 comprises a blade 421 able to cut the head 1 of the bag 2 and create the upper part or tongue 401 to be removed (figures 3b-7b, 9b, 10b); the blade 421 is moved by the moving means 422.

[0049] The apparatus according to the invention comprises a single frame 450 which carries the devices 410, 420, 430 and 440.

[0050] The electric motor 413, the moving means 441, 422 and the suction device 430 are controlled by a control device 490 belonging to the control unit 1000.

[0051] As shown in greater detail in figures 2b, 3b, the device 410 comprises a first structure 417, with which the welding element 411 is integral, and a second structure 418, to which the welding element 412 and the clamping element 443 are fixed; the second structure 418 is totally movable because it is moved by the electric motor 413 by the connecting rod 414, the pin 415 and the plate 416.

[0052] The second structure 418 may be moved by the electric motor 413 from a resting position 4A1 (figure 3b) to a working position 4A2 (figure 4b) and vice versa; the second structure 418 is sliding on a guide 419 integral with the frame 450.

[0053] The first structure 417 is fixed but some of its elements, the blade 421 and the clamping element 442, are movable with respect to the structure 417 itself, as shown in greater detail in figures 3b and 9b, 10bb. The first structure 417 comprises the moving means 422, 441, preferably pneumatic cylinders of the blade 421 and of the element 442.

[0054] The suction device 430 comprises a suction hood 433 integral with the frame 490; the suction mouth 432 is arranged over the suction zone 431 which is adjacent to the zone in which the welding element 412 is present when the element 412 itself is arranged in the resting position 4A1.

[0055] The apparatus 100 according to the invention operates in the following manner.

[0056] In the step of resting 4A1, the bag 2 is conveyed by the chain conveyor 700 to the position under the device 410 and with the flaps 3 of the head 1 arranged between the welding elements 411, 412 and preferably joined, as shown in figures 3b.

[0057] Successively, the control device 490 controls the motor 413 of the device 410 so as to make the rotational plate 416 turn; this allows the displacement of the second structure 417 along the Y axis, orthogonal to the flaps 3 of the walls of the head 1 of the bag 2, so as to slide along the guide 419 and allows the closing of the element 412 on the element 411, as shown in figure 4b. In such a manner, the welding of the flaps 3 is achieved by the elements 411, 412 which are heated, preferably by electric current.

[0058] Successively, the control device 490 controls the moving means 422 to cut the upper part 401 of the flaps 3 over the part 423 of the flaps 3 previously welded in the working position 4A3, as shown in figure 5b, whereby forming an upper flap 3001 and a tongue 401. The moving means 422 allow the displacement of the blade 421 along the Y axis to cut the flaps 3 of the head 2.

[0059] Successively, the control device 490 controls the moving means 441 to move the clamping element 442 along the Y axis to the working position 4A4 when the second structure 418 returns to the resting position, as shown in figure 6b. The clamping element 442 of the first structure 417 collaborates with a clamping element 443 of the structure 418 so as to grip the tongue 401 and convey it into the suction zone 431 under the suction

mouth 432 of the hood 433. At the same time, the control device 490 controls the moving means 422 to take the blade 421 to its resting position.

[0060] So, the tongue 401 is displaced from the welding zone 460, in which the elements 411 and 412 are closed to weld the flaps 3 of the head 2, to the suction zone 431 which coincides with the zone of the resting position 4A1 of the welding element 412.

[0061] Successively, the control device 490 controls the activation of the suction device 430 and the moving means 441 to displace the clamping element 442 along the Y axis to the resting position, as shown in figure 7b, in which the new working position of the apparatus 400 is indicated by position 4A5. In such a manner, the tongue 401 is sucked by the suction device 430 through the mouth 432 and the hood 433.

[0062] The welding elements 411, 412 are protected by the suction flow coming from the hood 433 by the presence of the clamping elements 442, 443 in the working position 4A5 of the apparatus 400, i.e. the elements 411, 412 are arranged between the elements 411, 412 and the suction mouth 432 in the suction flow path of the hood 433, preferably a path along the axis Z, preferably a vertical axis.

[0063] Preferably, the suction hood 433 is arranged so that the vertical symmetry axis 4A of its transversal section coincides with the side profile of the welding element 412.

[0064] Figs. 1c, 2c show the third section, i.e. the apparatus for folding and pressing the upper flap 3100 of the bag 2 containing foods (Fig. 3c).

[0065] For example, the bag 2 is a flat bottom package made of plastic material, which may have a quadrilateral shape and corresponding side surfaces. As shown in Fig. 3c, the upper ends of the bag 2 which will be let into to the apparatus 300 are approached and welded, so as to form said upper flap 3100. Each upper flap 3100 of the bags 2 is substantially two-dimensional and therefore may be represented by a plane P. Such welding operation, together with the cutting operations, is performed by a welding and cutting assembly (not shown in the figures) arranged upstream of the apparatus 300 in the packaging machine.

[0066] The bag 2 is taken to the folding apparatus 300 by the chain conveyor 700 able to transport a paced succession of bags 2 oriented with the plane P of each upper flap 3100 parallel to said moving direction X (Fig. 3c) along a moving direction along axis X (or moving direction X).

[0067] The apparatus 300 is configured to fold a part or a free end 3103, of the previously welded upper flap 3100 of the bag 2 onto the part of the upper flap 3100 not subject to folding, whereby making an angle smaller than 45° between the parts. In particular, the apparatus 300 comprises a folding sheet 304 and a "U"-shaped element 313, and moving means 350 able to make said "U"-shaped element 313 mate with the folding sheet 304 to fold the previously welded upper flap 3100 of the bag 2.

[0068] The folding apparatus 300 also comprises a guiding plate 303 parallel to said folding sheet 304, both defining a space able to receive, through an inlet slot 302, the upper flap 3100 of one bag 2 at a time of said paced succession of bags 2, said bags 2 being oriented with the plane P of the upper flaps 3100 parallel to said guiding plate 303 and said folding sheet 304.

[0069] Said space between the guiding plate 303 and folding plate 304 is configured to house at least the upper flap 3100 of one bag 2 at a time introduced through the inlet slot 302 (Figs. 2c, 4c). So, the longitudinal measurement of the guiding plate 303 and of the folding plate 304 is greater than or equal to the longitudinal measure of the upper flap 3100. Advantageously, the ends of both the guiding plate 303 and the folding plate 304 have a spreading 306 at the inlet slot 302 able to promote the introduction of the upper flap 3100 of the bags 2 into the apparatus 300 (Fig. 1c).

[0070] The chain conveyor 700 is arranged at a lower height than the apparatus 300 (Fig. 1c), so that only the upper flap 3100 of the bags 2 is introduced inside the apparatus 300, and so that such free end 3103 of the upper flap 3100 itself exceeds the folding sheet 304 in height (Fig. 10c).

[0071] The apparatus 300 comprises a rear supporting plate 307 (Fig. 4c) which constitutes an anchoring support for the various elements of which the apparatus 300 is formed. The folding sheet 304 is fixed to a pair of first plates 304, each fixed in turn by a front guiding support 347 to a corresponding support angle bar 309, which is anchored to the rear supporting plate 307. The guiding plate 303 is instead fixed directly to said supporting angle bars 309 (Figs. 1c, 2c).

[0072] Said moving means 350 comprise a cam 310, rotating about a first rotation axis O parallel to the moving direction X of the bags 2 (Figs. 1c, 2c), by virtue of a supporting shaft 348, to which the cam 310 is fixed, free to turn inside the support 349 anchored to the rear supporting plate 307.

[0073] The cam 310 is able to move by first linkages 311 at least one folding lever 312 with said "U"-shaped elements able to fold the upper flap 3100 of the bags 2, transversally to the plane P of the upper flaps 3100 and over said folding sheet 304.

[0074] In particular, said "U"-shaped element 313 (Fig. 6c) is able to fold the free end 3103 of the upper flap 3100 which exceeds the folding sheet 304 in height, pushing it and putting it into contact with an outer surface of the folding blade 304. The "U"-shaped element 313 is shaped so as to have a cavity 314 substantially complementary with the profile of the folding sheet 304, so that the hook-shaped end is able to be superimposed on the top, interlocking the folding sheet 4.

[0075] The folding lever 312 is fixed by first pins 315 (Fig. 5c) to both the supporting angle bars 309 and may turn partially about a second rotation axis O', also parallel to the moving direction X of the bags 2, between an opening position, in which it is raised (Fig. 10c), and a folding

position, in which it is in contact with the upper flap 3100 of the given bag 2 over the folding sheet 304 (Fig. 11c). As will be explained better below, the upper flap 3100 of a bag 2 is inserted during the opening position, while the same upper flap 3100 is folded during the closing position.

[0076] The cam 310 is actuated by a motor 316 with reducer 317 (Figs. 7c, 8c) positioned in axis with respect to the cam 310, the drive shaft 316 coinciding with the first rotation axis O of the cam 310. The motor 316 is also fixed to the rear supporting plate 307 by a supporting plate of the reducer 318 and of a supporting plate of the assembly 319 (Figs. 5c, 9c).

[0077] The cam 310 comprises a first groove 320 of eccentric shape (Fig. 6c), present on a first side 321 of its surface, which acts as sliding rail for a first bearing 322 connected to said first linkages 311 (Fig. 7c).

[0078] In particular, the first linkages 311 (Fig. 6c) comprise a first lever 323 to which the first bearing 322 is centrally hinged; a second plate 325, which is fixed to the rear supporting plate 307 of the apparatus 300, and a connecting rod 326, which is hinged to the folding lever 312 by a second pin 327, are connected to the ends of said first lever 323.

[0079] The cam 310 is also able to move a keeping mallet 329 of the folding of the upper flap 3100 of a bag 2 by second linkages 328 (Fig. 4c), said second linkages 328 being actuated by the cam 310 in manner substantially alternating with respect to said first linkages 311. The keeping mallet 329 is able to keep the upper flap 3100 folded over the folding sheet 304. In particular, the keeping mallet 329 is made by a substantially triangle-shaped sheet (Figs. 1c, 2c), with the plane of the sheet parallel to the moving direction X of the bags 2; the base of the triangle is curved by about 90° and forms the head of the mallet. The keeping mallet 329 is able to keep, by the mallet head, the free end 3103 of the upper flap 3100 in contact with the outer surface of the folding sheet 304.

[0080] Furthermore, the cam 310 comprises a second groove 330 of eccentric shape (different by conformation with respect to said first groove 320) present on a second side 331 of its surface, which acts as sliding rail for a second bearing 332 (Fig. 8c) connected to said second linkages 328. In particular, the second linkages 328 comprise a carriage 333, to an end of which the keeping mallet 329 is fixed. Said second bearing 332 is hinged to said carriage 333 in central position, said carriage 333 being able to slide transversally with respect to the moving direction X of the bags 2 between an opening position, in which the keeping mallet 329 is distanced from the bending sheet 304 (Fig. 10c), and a keeping position, in which the keeping mallet 329 is placed in contact with the upper flap 3100 folded against the folding sheet 304 (Fig. 12c). As shown in greater detail below, during the opening position, the upper flap 3100 of a bag 2 is folded by the folding lever 312, while during the closing position the upper flap 3100 itself is kept pressed against the folding sheet 304 by the keeping mallet 329.

[0081] The carriage 333 comprises an upper pair and a lower pair of runners 334, 335 (Figs. 1c, 7c) fixed to a surface of the carriage 333, each of which comprising a cylindrical opening, able to house an upper tubular guide 336 and a lower tubular guide 337, fixed orthogonally respectively between the rear supporting plate 307 and a further supporting plate 338. Said further supporting plate 338 is fixed, in turn, between said supporting angle bars 9 and by a shim 339 to the rear supporting plate 307 (Fig. 1c). The runners of the upper and lower pair 334, 335 are able to slide on the respective upper and lower tubular guides 336, 337 to allow the movement of the carriage 333 transversally with respect to the moving direction X of the bags 2.

[0082] Advantageously, the keeping mallet 329 is fixed to the carriage 33 by one or more shims, which define the distance of the keeping mallet (and thus of the mallet head) from the folding sheet 304.

[0083] Finally, the apparatus 300 comprises a pressing assembly 340 (Figs. 1c, 2c) arranged downstream of the space defined between the guiding sheet 303 and the folding sheet 304, in the moving direction X of the bags 2. Said pressing assembly 340 being able to firmly fix the flap of the upper flap 3100 of the bags 2.

[0084] In particular, the pressing assembly 340 comprising an insulating element 341 transversally movable with respect to the moving direction X of the bags 2 and able to come into contact with the upper flap 3100 folded against a hot mallet 342 (heated by a cartridge resistor). The pressing assembly 340 is positioned substantially at the same height as the guiding plate 303 and the folding plate 304 and is able to receive one bag 2 at a time with the upper flap 3100 of the bag 2 folded so that it is in a space comprised between the insulating element 341 and the hot mallet 342, said pressing assembly 340 being able to fix the folding of the upper flap 3100. For this purpose, the longitudinal measure of insulating element 341 and mallet must be either greater than or equal to that of the upper flap 3100.

[0085] The hot mallet 342 is fixed and is fixed, by a front cylinder attachment 343, to a support 344, which is fixed in turn to said support plate of the assembly 319 and, thus, to the rear supporting plate 307. Conversely, the insulating element 341 is movable and moved by a pneumatic cylinder 345, fixed to the rear supporting plate 307 by a further supporting angle bar 346 (Fig. 2c).

[0086] During operation, the folding apparatus 300 operates by the following steps.

[0087] In a first step (Fig. 10c), a bag 2 of the paced succession of bags 2 is taken by the chain conveyor 700 to the folding apparatus 1 through the inlet slot 302 between the guiding sheet 303 and the folding sheet 304, along the moving direction X. Said bag 2 is thus made to advance further by the chain conveyor 700 until the upper flap 3100 of the bag 2 is entirely inside the space between the guiding plate 303 and the folding plate 304. In said first step, the flap folding lever 304 is in opening position, i.e. raised, and the keeping mallet 329 is also

in opening position and therefore distanced from the folding sheet 304.

[0088] In a second step (Fig. 11c), the cam 310 moves the flap folding lever 312 by the first linkages 311. The flap folding lever 312 rotates partially about the second rotation axis O' and goes from said opening position to said folding position. The "U"-shaped element 313 of the folding lever 312 pushes, transversally with respect to the moving direction X of the bags 2, the free end 3103 of the upper flap 3100 which exceeds the height of the folding sheet 4, so that said free end 3103 is placed into contact with the outer surface of the folding sheet 304 and the "U"-shaped element 313 of the folding lever 312 is superimposed, whereby interlocking the folding sheet 304. In said second step of operation, the cam 310, by the second linkages 328, holds the keeping mallet 329 in opening position.

[0089] In a third step (Fig. 12c), the cam 310 moves, by the second linkages 328, the keeping mallet 329, which moves from the opening position to the keeping position. In this step, the folding lever 312 it is still in folding position, so that the upper flap 3100 is folded over the folding sheet 304 and, particularly, the free end 3103 is in contact with the outer surface of the folding sheet 304. The mallet head is thus placed into contact with the free end 3103 of the upper flap 3100 against the folding sheet 304, keeping the folding of the upper flap 3100.

[0090] In a fourth step (Fig. 13c), the cam 310 moves, by the first linkages 311, the folding lever 312, which moves again from the folding position to the opening position. In said fourth step of operation, the cam 310, by the second linkages 328, holds the keeping mallet 329 in keeping position.

[0091] In a fifth step (Fig. 14c), the cam 310 moves, by the second linkages 328, the keeping mallet 329, which moves from the keeping position to the opening position. In the meantime, the bag 2 with the folded upper flap 3100 is taken, again by the chain conveyor 700, along the moving direction X towards the pressing assembly 340 arranged downstream of the space defined between the guiding sheet 303 and the folding sheet 304. The movable insulating element 341 is distanced with respect to the hot mallet 342, so that in said fifth step the folded upper flap 3100 is taken into the space comprised between the insulating element 341 and the hot mallet 342.

[0092] In a sixth step (Fig. 15c), the insulating element 341 is moved transversally (by the pneumatic cylinder 345) with respect to the movement direction X of the bags 2 and is put into contact with the upper flap 3100 folded against the hot mallet 342, whereby firmly fixing the folding of the upper flap 3100 of the bag 2 which may be taken to the successive steps of manufacturing.

[0093] Particularly, the share 800 able to fold the upper flap 3100 is present inside the packaging machine after the third station 300; the share 800, as known, has a vertical inlet and a horizontal outlet connected to each other by a slot, which progressive moves down and turns by 90°. When it arrives at the inlet of the share, the upper

flaps of each bag 2 filled with the short pasta are mutually approached and welded so as to form a vertical upper flap 3100, the top portion of which is also folded. The purpose of the flap folding share is to receive in input the upper flap 3100 of the vertical inlet slot and by virtue of the gradual angular variation of the slot to turn the upper flap 3100 by 90° and to output it in substantially horizontal position, whereby forming a flap 502.

[0094] Figures 1d-9d describe the fourth station 500, i.e. the pressing apparatus 500 for pressing the bags 2 for foods; the pressing apparatus 500 is configured to make the shape of the bags 2 square by hot pressing (Fig. 6d).

[0095] The pressing apparatus 500 is able to confer a squared shape to the previously filled bag 2, by compression, in order to improve the quality of the shape. The pressing apparatus 500 is able to receive the bags 2 with an upper flap 502 folded over the bag in substantially horizontal position from said share 800; the bags 2 being taken by the pressing apparatus 500 by a chain conveyor 700 able to convey a paced sequence of bags 2 along a movement direction X.

[0096] The pressing apparatus comprises at least a first and a second heating plate 504, 505 (Fig. 5d), which are mutually adjacent along the moving direction X of the bags 2 and arranged above with respect to the chain conveyor 700 at a given height D, which is greater than height of the bags 2 (Fig. 2d). Each of said first and second heating plates 504, 505 comprises a heating plate 506 made of heat conducting material (Fig. 1d).

[0097] The heating plate 506 comprises a first face 507 (Fig. 4d) able to come into contact on top with one of the bags 2 of the paced succession, a second face 508 opposite to the first one 507 with a recessed portion 509, and side faces 510 of which at least two mutually opposite centrally comprise a pair of pins 511, arranged along an oscillation axis 500P of the heating plate 504, 505 perpendicular with respect to the moving direction X of the bags (Fig. 1d) and parallel to axis Y.

[0098] In the embodiment shown in Fig. 1d, the heating plate 506 has a square (or rectangular) shape, with four side faces 510. A serpentine-shaped conductor 512, through which electric current runs, is housed in said recessed portion 509 of said heating plate 506, said conductor 512 being placed in contact with said heating plate 506 and being able to transfer the heat generated by Joule effect produced by the electric current running through the conductor 512 to the heating plate 506. Each heating plate 504, 505 comprises an upper closing cover 533 fixed on top of said heating plate 506.

[0099] The first and the second heating plate 504, 505 are connected to each other in adjacent position by a first and a second bar 513, 514, which are mutually parallel and symmetric, each of said first and second bars 513, 514 (Fig. 3d) being oriented parallel to the moving direction X of the bags 2 and comprising at least one first transversal hole 515 and one second transversal hole 516 at the end of the bar 513, 514 (Fig. 2d). Each of said

first and second heating plates 504, 505 are hinged between the first and the second bar 513, 514 by said pair of pins 511 with which they are provided, which are inserted between a symmetric pair of said first transversal holes 515, in the case of the first heating plate 504, and a symmetric pair of said second transversal holes 516, in the case of the second heating plate 505.

[0100] The pins 511 are free to turn inside the transversal holes 515, 516 so each heating plate 504, 505 can oscillate at least partially on the oscillation axis 500P. This is partially because the first and the second heating plate 504, 505 comprise a pair of stop pins 517 (Fig. 1d), again at the side surfaces of the heating plates, said pins 517 being able to be inserted inside a respective pair of further transversal holes 518 equally distant with respect to said first transversal holes 515 and said second transversal holes 516, so that the oscillation of the respective heating plates 504, 505 is partial and constrained to the movement of the pins 517 inside the further holes 518 (Fig. 2d). The space of the further holes 518 is indeed greater than that occupied by the pins 517 inserted inside.

[0101] The space of the further holes 518 may be modified by screws 531 able to be inserted in each further hole 518 after having crossed a tablet 532; by said screws 531, even the oscillatory movement of the respective heating plate 504, 505 can be locked.

[0102] Furthermore, the pressing apparatus 500 comprises vertical moving means 519 of said first and second heating plate 505 in perpendicular direction with respect to the moving direction X. For each of the bags 2 of the paced succession, said moving means 519 are configured to press said first heating plate 504 over the bag 2 in a first interval of time and also to press said second heating plate 505 over the package 2 in a second interval of time, after the first interval of time.

[0103] In particular, the moving means 519 are able to move said first and second heating plate 504, 505 vertically between a resting position, in which they are at said height D with respect to the chain conveyor 700 (Fig. 6d), and a working position, in which the bag 2 is pressed against the chain conveyor 700 by either the first or the second heating plate (Fig. 7d shows the simplified case related to the manufacturing of a single bag 2) and in which the upper flap 502 is pressed against the body 9003 of the bag 2. Each bag 2 of the succession is pressed twice, a first time by the first heating plate 504 and a second time by the second heating plate 505.

[0104] The moving means 519 comprise a pneumatic actuator 520 with a cylinder 521 and at last one piston 522 (Fig. 3d). Said cylinder 521 is fixed by an upper plate 523, and a pair of side supporting plate 524 which are anchored in turn to a support 525 able to fix the entire pressing apparatus 500 to a frame wall of the packaging machine (not shown in the figures). Said at least one piston 522 is fixed to a lower block 526 to which a passage guide 527 of bag 2, substantially at the same height D as said first and second heating plate 505. The guide 527 (Fig. 5d) is a sheet shaped so as to have a substantially

"U"-shaped section with two vertical portions fixed to two sides of said lower block 526 and a base 528 which has a certain inclination able to vertically compress, if the flap can lift up again, the upper flap 502 of each bag 2 over the bag itself in the passage from said first heating plate 504 to said second heating plate 505.

[0105] Said first and second bar 513, 514 are both connected at a central portion thereof to said lower block 526.

[0106] Finally, said pressing apparatus 500 comprises a casing 529 shaped to cover said pressing apparatus 500 on top, said casing 529 being fixed by spacers 530 to said pair of supporting side plates 524 (Fig. 3d).

[0107] In operation, the pressing apparatus 500 works according to the following steps of operation.

[0108] By the chain conveyor 700, a paced succession of said bags is taken at said pressing apparatus 500. As mentioned, each of the bags 2 which reach the heating plates have its upper flap 502 folded over the bag in substantially horizontal position. However, for the sake of simplicity of description, hereinafter a single bag 2 isolated from the paced succession will be considered.

[0109] Both heating plates 504, 505 are in resting position in said height D which, as mentioned, is higher than the height of the bag 2, until the bag 2, carried by the chain conveyor 700, is under the first heating plate 504 (Fig. 6d).

[0110] When the bag 2 is under the first heating plate 504, the moving means 519 move the heating plates downwards until the first face 507 of the heating plate 506 of the first plate 504 is in contact with the upper flap 502 and the top part of the bag 2 (working position) (Fig. 7d). The pins 511 with which the first heating plate 504 is provided ensure that during the step of hot pressing the heating plate 504 itself can oscillate slightly adapting to the initial conformation of the bag 2, which is not perfectly squared. The oscillation is constrained by virtue of the pins 517 inside the further holes 518. Such first step of pressing lasts for said first interval of time, during which the heating plate 506 is kept in contact cover upper flap 502 and bag 2.

[0111] After said first interval of time, the moving means 519 move both heating plates 504, 505 upwards from the resting position again to the working position, at said height D (Fig. 8d). At this point, the first bag 2, again conveyed by the chain conveyor 700, is taken passing under the guide 527 which, by virtue of its inclined conformation descends in height in the moving direction X, keeps the upper flap 502 of the bag 2 folded in the passage from said first to said second plate, avoiding the upper flap 502 (which has not been fixed yet to the top of part of the bag 2) can lift up and interlock in parts of the bending apparatus 500.

[0112] When the bag is under the second heating plate 505, the moving means 519 move both heating plates 504, 505 downwards again until the first face 507 of the heating plate 506 of the second plate 505 is in contact with upper flap 502 and the bag top (working position) (Fig. 9d). Such successive step of pressing lasts for a

second interval of time, during which the heating plate 506 is kept in contact cover upper flap 502 and bag.

[0113] Once the successive step of pressing is finished and thus after said second interval of time, the moving means 519 move both heating 504, 505 again from the working position to the resting position (Fig. 6d). At this point, the bag has a well squared shape by virtue of the two successive steps of pressing which convey a substantially parallelepiped shape to the bag.

[0114] In practice, if the bags 2 of the paced sequence are manufactured, the heating plates 504, 505 work at the same time, thus making it possible to press for the first time a given bag, by the first heating plate 504, when at the same time the previous bag is pressed for the second time by the second heating plate 505. Manufacturing times are optimized in this manner.

[0115] By virtue of the pressing apparatus 500 it is possible to make a bag 2 with a squared shape. The double pressing process of the bag makes it possible to use low working temperatures of the heating plates, so as not to damage the bags. However, despite the low temperature of the heating plates, it is possible to speed up the moving of the pressing apparatus 500 and of the chain conveyor 700, whereby optimizing performance quality.

[0116] Figures 1e-11e show a conveying apparatus or chain conveyor 700, of a paced succession of bags to be packaged 2 containing foods, e.g. alimentary pasta.

[0117] The bag to be packaged 2 may be a bag of variable size made of plastic material or a cardboard box with bag made of plastic material inside.

[0118] The conveying apparatus 700 (Fig. 2e) comprises at least one closed loop chain 703 chain meshing between a drive ring gear 704 and an idle ring gear 705, whereby defining a closed path which comprises two rectilinear positions 706 and two curved portions 707, which are mutually opposite; the drive ring gear is controlled by the controlled unit 1000. At least one of the two rectilinear positions 706, 707, in particular defines a moving direction X of the bags 2. The rotation axes of both ring gears 704, 705 are mutually parallel and further vertical and perpendicular with respect to the moving direction X of the bags 2. The drive ring gear 704 is moved by a brushless motor 708.

[0119] For example, said at least one closed loop chain 703 comprises a succession of pins connected to each other by tablets with a given possibility of relative movement, forming a plurality of meshes which given step and inner width of the link (Galle chain), and said drive ring gear 704 and said idle ring gear 705 having shape and size such to mesh with said at least one closed loop chain 703. The conveying apparatus 700 may envisage adjustment means of the distance between driving ring gear 704 and idle ring gear 705, so as to tension the chain appropriately.

[0120] Advantageously, in a preferred embodiment, the conveying apparatus 1 comprises a closed loop double chain 703 and consequently respective driving ring gears 704 and double idle ring gears 705.

[0121] The conveying apparatus 700 comprises a plurality of retaining elements 709 of the bags associated with an outer side of said at least one closed loop chain 703 so that a bag of said plurality of bags is retained by a single retaining element 709 of said plurality of retaining elements 709. Preferably, each retaining element 709 can be fixed to the chain 703 in removable manner so that the retaining elements 709 are mutually independent, and can be fitted and removed onto and from said chain 703.

[0122] Each retaining element 709 (Fig. 6e) houses inside 710 the bag 2 and comprises a fixing element 713 able to house it to the closed loop chain 703. Preferably, the retaining element is "C"-shaped and comprises a rear wall 711 from which two side walls 712 provided with recesses 753 depart; the bag is arranged between the side walls 712 and the fixing element is integral with the rear wall 711. The side walls 712 and the rear wall 711 are oriented vertically.

[0123] The fixing element 713 is provided with a plurality of first holes 714 on the back symmetrically arranged about a locking pin 715 (e.g. there are four first holes 714). The locking pin 715 (Fig. 7e) comprises a cylindrical element 716 provided with a substantially pointed end 717, said cylindrical element 716 also comprising an intermediate profile 718 with a smaller section with respect to the cylindrical element 716.

[0124] In particular, the fixing element 713 is fixed to the chain 703 by a runner 719 (Fig. 8e) provided with attachment plate 720 which is connected to the runner 719 itself by a plurality of shims able to be inserted in corresponding second holes with which the runner 719 is provided. The attachment plate 720 also comprises, on one coupling side with the containing block 709, a plurality of pins 721 (e.g. four pins 721) able to be inserted in said plurality of first holes 714, with which the first supporting element 713 is provided for centering the retaining element 709 on the attachment plate 720, and a central hole 722 able to allow the insertion of the locking pin 715.

[0125] The runner 719 is substantially parallelepiped-shaped and comprises at least one rear groove 749 able to house a stretch of said at least one chain 703 and being fixed to the latter by an angle plate. In said preferred embodiment, in which there is a double chain 703, the housing is shaped to offer housing to both the chains and the latter are fixed by respective angle plates. Furthermore, the runner 719 comprises a further central hole 750 (Figs. 9e, 10e) able to also house said locking pin 715, as well as groove for housing in sliding manner, in transversal direction with respect to the insertion direction of the locking pin 715, a locking lever 723 interposed between the runner 719 and the attachment plate 720 (Fig. 8e).

[0126] The locking lever 723 comprises at least one third hole 724 (Figs. 9e, 10e) with a first portion 725, of larger size, able to allow the introduction of the locking pin 715, and a second portion 726, of smaller size, able

to allow the housing of the intermediate portion 718 only of the locking pin 715. The locking lever 723 is connected to a side wall of the attachment plate 720 by a pair of springs 727 and is shaped to move transversally with respect to the direction of insertion of the locking pin 715 between a resting position (Fig. 9e), in which the second portion 726 of the third hole 724 is aligned with the locking pin 715 (and also with the further central hole 750 of the runner 719) and the springs 727 are distended, and a traction position (Fig. 10e), in which the first portion 725 of the third hole 724 is aligned with the locking pin 715 and the springs 727 are compressed.

[0127] For fitting the retaining element 709 to the runner 719 (and therefore to the chain 703) it is sufficient to press the containing block 709 against the attachment plate 720 of the runner 719 so that, by virtue of the insertion of the pointed end 717, the locking lever 723 is pushed transversally until the intermediate portion 718 of the locking pin 715 enters into the third hole 724 and the locking lever 723 is pushed by the springs 727 back to resting position; the intermediate portion 718 is the only one to have a section such to be able to be introduced in the second portion 726 of the third hole 724. For removing the retaining element 709, the locking lever 723 must be gripped, pulling it against the bias of the springs 727 so as to return the third hole 724 with the first portion 725 coinciding with the central hole 722 of the attachment plate 720, so that the retaining element 709 can be extracted; once the retaining element 709 has been extracted, the springs 727 will return the locking lever 723 to resting position.

[0128] By virtue of the particular shape of the retaining element 709, the conveying and manufacturing of cardboard boxes which are substantially parallelepiped-shaped and which fit into the retaining element 709, resting on the rear surface 711 and being retained by the two side surfaces 712, is also allowed. In order to handle cardboard boxes (but also other types of bags 2) of different size, said retaining elements 709 may have different sizes.

[0129] The conveying apparatus 700 then comprises an upper rail 728 and a lower rail 729 able to couple with complementary grooves 752 with which the runner 719 is provided; similarly to the path of the chain 703, said upper and lower rails 728, 729 replicate the path of the chain 703, comprising a pair of rectilinear portions joined to one another by a pair of curved portions. The upper and lower rails 728, 729 have the purpose of stabilizing the retaining elements 709 during their movement, preventing oscillation phenomenon.

[0130] Preferably, the conveying apparatus 700 comprises a sliding base 730, which also follows the path of the chain 703 and, thus, is also shaped envisaging two rectilinear portions connected to each other by two curved portions; said sliding base 730 is able to support the bags 2 and to facilitate the sliding to the bottom of each of the bags 2.

[0131] Alternatively to the use of the sliding base 730,

each retaining element 709 is provided with a bottom wall for supporting the bag 2.

[0132] Furthermore, the conveying apparatus 700 comprises an adjustable guide 731 (Figs. 1e, 3e, 4e) arranged so as to externally surround at least one section of said chain 703, said guide 731 being able to keep each package 2 inside the retaining element 709 in which it is contained. In particular, the adjustable guide 731 comprises at least one rectilinear bar 732 and at least one curved stretch 733 elastically deformable which departs as extension of the rectilinear bar 732 and hinged to the latter. The rectilinear bar 732 is positioned at one of the two rectilinear positions 706 near the containing blocks 709, while said curved stretch 733 is positioned near one of the curved portions 707. Furthermore, the rectilinear bar 732 has shape and size such to be inserted inside said recesses 753 onto the side surfaces 710 of the retaining elements 709, although not coming into contact with them, whereby defining a closed perimeter in which one of the bags 2 is obtained (Fig. 5e).

[0133] The guide 731 also comprises adjustment means 734 (Fig. 11e) able to move said at least one rectilinear bar 732 so as to approach it or distance it laterally with respect to the chain 703. In this manner, the correct distance can be determined for each type of bag.

[0134] In particular, the adjustment means 734 (Fig. 11e) comprise a handwheel 735 able to move a Cardan shaft 736 connected to a pair of further orthogonal shafts 737 by a first angular transmission 738, each of said further orthogonal shafts 737 being connected to a threaded shaft 739 by second angular transmissions 740. The first angular transmission 738 and the second angular transmissions 740 are integral with a central supporting sheet 741 and to two side support sheets 742, respectively, said support sheets 741, 742 being fixed to the rectilinear bar 732 of the guide 731; furthermore, a respective pairs of guide shafts 743 depart orthogonally to one of the rectilinear portion 706, 707 of the chain 703 by the side support sheets 742.

[0135] Furthermore, the adjustment means 734 comprise a pair of fixing supports 744 to a frame of the packaging machine each comprising a runner 745 through which one of said guide shafts 743 runs, and a pair of lead nuts 746, each integral with one of the fixing supports 744, able to couple with one of the threaded shafts 739.

[0136] The adjustment means 734 are configured to make the guide shafts 743 slide through the runners 745, whereby approaching or distancing the rectilinear bar 732 with respect to the rectilinear stretch 706, 707 of the chain 703 by rotating the handwheel 735 and the consequent transmission of the two threaded shafts 739 which move the lead nuts 746 respectively backwards or forwards. The adjustment of the curved stretch 733 occurs instead by modifying the angle with respect to the rectilinear bar 732 and deforming the curving by further adjustment means 751.

[0137] Finally, the conveying apparatus 1 comprises an upper plate 747 and a lower plate 748 able to close

the chain 703 inside and to offer support to said upper and lower rails 728, 729.

[0138] By virtue of the conveying apparatus, each bag can be stably positioned inside a retaining element 709 of the closed loop chain, allowing the packaging machine to manufacture bags of different type at the same time.

[0139] Along the chain conveyor, on the path which carries the bag 2 towards the outlet 900, is positioned a photocell which must detect whether the upper flap 3100, 502 is closed correctly or for any reason such flap is open. In such case, the open section of the bag sliding plane is closed again (by a pneumatically moved blade) and the faulty package does not proceed towards the outlet assembly 900, advances along the chain conveyor 700 to be then rejected in a collection container.

[0140] Figs. 1f-7f show a taping station 600, i.e. an apparatus for cutting and applying a portion 601 of adhesive tape 602 over a bag 2 containing foods.

[0141] The adhesive tape 602 is a plastic or paper tape on a side of which an adhesive substance is applied, while the opposite side is not adhesive.

[0142] The apparatus 600 is able to receive the bags 2 with an upper flap 502 folded over the bag 2 in substantially horizontal position coming from the share 800 or from the pressing station 500; the bags 2 are taken by the conveying means 500 able to convey a paced sequence of bags 2 along a moving direction X to the apparatus 600.

[0143] The apparatus 600 for applying the portion 601 of adhesive tape 602 comprises at least one spool 603 of said adhesive tape 602 arranged on an idle wheel 604 positioned in a tape holder bracket 605, said tape holder bracket 605 being hinged on a rear supporting plate 606, in order to be able to change its orientation. As shown in Fig. 1f, the spool 603 of adhesive tape 602 is positioned in a top part of the apparatus 600.

[0144] Furthermore, the apparatus 600 comprises at least one motorized roller 607 for unwinding the adhesive tape 602 from said spool 603. Said at least one motorized roller 607 comprises at least one rough surface able to feed the adhesive tape 602 to allow its unwinding from said spool 603 of adhesive tape 602. In particular, the apparatus 600 comprises a motor 608 able to move at least one pulley 610 integral with said motorized roller 607 by a belt 609. The motor 608 is supported by a motor holder plate 611, which is fixed to the rear supporting plate 606 by a movable bracket 612. The motorized roller 607 is positioned in a lower part of the apparatus 600.

[0145] Arranged underneath said idle wheel 604 on which the spool 603 of adhesive tape 602 is arranged, there is a first idle roller 613 on top of which the adhesive tape 602 winds; said first idle roller 613 is also positioned on said tape holder bracket 605.

[0146] The apparatus 600 comprises at least one pair of pivoting idle rollers 614, 615 fixed to the end of the plate 651 elastically hinged on the rear supporting plate 606 and able to keep the adhesive tape 602 taut between the idle wheel 604 and said motorized roller 607, said

pair of pivoting idle rollers 614, 615 being arranged at a lower height than the first idle roller 613. Particularly, the plate 651 is fixed to a pin 616 inserted in a specific hole made in the rear supporting plate 606, a spring 617 being inserted on said pin 616 and having a first end coupled to a first socket head screw integral with the pin 616 and a second end coupled to the rear supporting plate 606.

[0147] One roller 614 of said pair of pivoting idle rollers 614, 615 is able to receive the adhesive tape 602 from said first idle roller 613, said adhesive tape 602 being wound as an "S" between the rollers of the pair of pivoting idle rollers 614, 615, so that the elastic force of the spring 617 opposes the unwinding of the adhesive tape 602 caused by the traction by the motorized roller 607. The adhesive tape 602 is wound under the second idle roller 614 which receives the adhesive tape 602 from said first roller 613, while it is wound on top of the other roller 615 of the pair which provides it to the motorized roller 607.

[0148] A second idle roller 620, arranged at a lower height with respect to the pair of pivoting idle rollers 614, 615, is able to receive the adhesive tape 602 from said roller 615 of the pair, the adhesive tape 602 being wound underneath said second idle roller 620 and being sent through at least one idle roller 621, 622 towards said motorized roller 607. In particular, a third idle roller 621 is configured to receive the adhesive tape 602, winding it on top and sending it to a fourth idle roller 622 (positioned substantially at the same height as the motorized roller 607) which, after having wound it underneath, sends it to said motorized roller 607. Said third and fourth idle rollers 621, 622 are vertically aligned with each other.

[0149] The motorized roller 607 is able to take, by a fifth idle roller 623, the adhesive tape 602 driven in interposition by a roller with central groove 624 and with a roller with central relief 625 of complementary shape with respect to that of the central groove and cooperating with each other so that the central relief is at least partially inserted in the central groove.

[0150] The adhesive tape 602 is wound on top of the motorized roller 607, near the fifth motorized roller 623 and between the roller with central groove 624 and roller with central relief 625. The roller with central relief 625 is pressed onto said roller with central groove 624 and both are configured to deform the adhesive tape 602 so as to longitudinally stiffen the structure. The roller with central relief 625 is supported by a pair of mutually orthogonal levers 626, 627, of which one (lever 626) is coupled with a plate hinged to said rear supporting plate 606, in order to be able to lift the central relief 625 to replace the adhesive tape 602.

[0151] The motor 608, by said belt 609, also moves a further pulley 628 which is integral with at least said roller with a central groove 624, which therefore is also motorized and synchronized with said motorized roller 607 (Figs. 2f, 4f).

[0152] The apparatus 600 comprises moving means 629 of an applicator 630 provided with a cutting blade

631, said applicator 630 being configured to slide with the cutting blade 631 on a counter-blade 640 for cutting said portion 601 of adhesive tape 602 and the simultaneous pressing of said portion 601 of adhesive tape 602 cut over the bag 2. The portion 601 is positioned so as to be applied in part on said upper horizontal flap 502, folded over the bag 2, and in part on at least one surface of the bag 2 (e.g. for example the upper and side surface) to ensure that the upper flap 502 remains folded.

[0153] Particularly, the moving means 629 are configured to move the applicator 630 between a resting position and a cutting and applying position, as will be described in greater detail below. The moving means 629 comprise a pneumatic cylinder 632 connected to said applicator 630. The pneumatic cylinder 632 is fixed to said rear supporting plate 606 by an angular plate 633 connected between a side 634 and the rear supporting plate 606 itself.

[0154] The applicator 630 is a solid "L"-shaped element, connected to said pneumatic cylinder 632 by a joint 618, said "L"-shaped element comprising a vertical face and a horizontal face 635. The cutting blade 631 is fixed to the vertical face of the "L"-shaped element with the sharp edge underneath, while the horizontal face 635, i.e. the lower one, acts as a contact surface with the non-adhesive side of the portion 601 of adhesive tape 602.

[0155] Advantageously, the applicator 630 comprises an air suction hole 636 able to allow the portion 601 of adhesive tape 602 to adhere to the applicator 630 once it has been cut and positioned accurately over the upper flap 502 and bag 2. In particular, said suction hole 636 is made in said horizontal face 635 of the "L"-shaped element.

[0156] The counter-blade 640 comprises a plate provided with an opening 637 through which the adhesive tape 602 is introduced, said counter-blade 640 being fixed to a support 638 which is hinged in turn to the rear supporting plate 606 in order to be able to adjust the position as a function the type of bag 2. The opening 637 has a sharp base 652, as the cutting blade 631, the shape of which may be for example straight or slightly curved or "V"-shaped. The deformed adhesive tape 602, which comes from said roller with central groove 624 and roller with central relief 625, after having been mutually interposed, is inserted inside said opening 637 of the counter-blade 640; the free end of the adhesive tape 602 which crosses the opening 637 of the counter-blade 640 is the portion 601 of adhesive tape 602 which will be applied on the bag 2.

[0157] An appropriately shaped and height-adjustable protection sheet 639 is able to keep the belt in horizontal position along its entire advancement path.

[0158] The counter-blade 640 is provided with a layer of felt 641, over said opening 637, able to lubricate the cutting blade 631 by a lubricant received from a lubricator 619 through a lubrication conduit arranged behind the counter-blade 640. The cutting blade 631 and the counter-blade 640 are lubricated by the sliding of the cutting

blade 631 on the felt layer 641 moistened by the lubricant.

[0159] The apparatus 600 also comprises further moving means 642 of a brush element 643 able to press an end of said portion 601 of adhesive tape 602 on at least one surface of the bag 2. In particular, the brush element 643 slide on said upper part intended to come into contact with a surface of the bag 2 to attach it to said at least one surface of the bag 2. Said further moving means 642 are configured to move the brush element 643 between a resting position, in which it is not in contact with the portion 601 of adhesive tape 602, and a working position, in which there is contact with the end of the portion 601, sliding pressed on the bag 2.

[0160] The further moving means 642 comprise a further pneumatic cylinder 644 to which said brush element 643 is connected, which in turn comprises a brush 645 which departs from an attachment plate 646. Said further pneumatic cylinder 644 is fixed to the rear supporting plate 606 by adjustment means 647 able to vary the positioning of the brush 645. The adjustment means 647 comprise a block 648 fixed to the rear supporting plate 606 provided with a pair of elongated holes (height adjustment), through which an orientation plate 649 is fixed by screw; the pneumatic cylinder 632 is fixed to said orientation plate 649 by supporting angle bar 650 partially hinged (angular position) to said orientation plate 649.

[0161] Finally, the apparatus 600 comprises on the bottom a guide 653 represented by a plate arranged along the moving direction X of the bags 2, able to take the bag 2 to near an opening in which the guide 653 itself is provided at the applicator 30.

[0162] In the operation, the apparatus 600 for applying a portion 601 of adhesive tape 602 operates according to the following steps.

[0163] The motorized roller 607 feeds the adhesive tape 602, unwinding it from said spool 603. The adhesive tape 602 is always appropriately tensioned by virtue of the action of the pair of pivoting idle rollers 614, 615 through which the adhesive tape 602 is wrapped.

[0164] In a first step (Figs. 8f, 9f), the adhesive tape 602 let out from said roller with central groove 624 and roller with central relief 625, after having been mutually interposed, is arranged inside the opening 637 of the counter-blade 640. As mentioned, the free end of the adhesive tape 602 which crosses the opening 637 of the counter-blade 640 is the portion 601 of adhesive tape 602 which will be applied on the bag 2. The applicator 630 is in resting position, i.e. arranged over and not in contact with the free end of the adhesive tape 602 which crosses the opening 637 of the counter-blade 640. The brush element 643 is also in resting position, and therefore the brush 645 is not in contact with the adhesive tape 602.

[0165] In a second step (Fig. 10f), the applicator 630 is moved downwards by the moving means 629 and moved to cutting position. The cutting blade 631, by sliding on the counter-blade 640, cuts the free end of the adhesive tape 602 which crosses the opening 637 of the

counter-blade 640; particularly, the lower sharp flap of the cutting blade 631 and the sharp base 652 of the opening 637 of the counter-blade 640 work as scissors and cut the portion 601 of adhesive tape 602 which will be applied onto the bag 2. Such portion 601 is sucked against the horizontal face 635 of the applicator 630 by the air suction hole 636, thus remaining firmly positioned in contact with the applicator 630 with the non-adhesive side of the portion 601. The brush element 643 remains in the resting position (Fig. 11f).

[0166] In a third step (Fig. 12f), the applicator 630 is further moved downwards by the moving means 629 and taken to application position. The horizontal face 635 of the "L"-shaped element is placed in contact with the bag 2 and the portion 601 of adhesive tape 602 is positioned so as to be applied on said upper flap 502 folded over the bag 2 in substantially horizontal portion and in part intended to come into contact with a surface of the bag 2. The brush element 643 is moved downwards by the further moving means 642 and taken towards the working position near the portion 601 (Fig. 13f).

[0167] In a fourth step (Fig. 14f), the brush element 643 is in working position and the blade 645 runs on said portion 601 of adhesive tape 602 intended to come into contact with a surface of the bag 2 to attach it to the top and side surface of the bag 2. The applicator 630 is moved upwards by the moving means 629 and moved to cutting position.

[0168] In a fifth step (Fig. 15f), the applicator 630 is in resting position, like the brush element 643. The portion 601 of adhesive tape 602 is applied onto the bag 2 and the apparatus 600 is ready to manufacture a successive bag 2 of the paced succession.

[0169] By virtue of the apparatus 600, according to the present invention, the cutting and the simulation application of a portion 601 of adhesive tape 602 over a bag 2 is allowed, making it possible to speed up manufacturing.

[0170] A labeling station may be able to apply, pre-printed labels on the upper part of the bag 2 be present instead of the taping station 600; the labeling station follows the same operating principle as the taping station.

[0171] As shown in figure 17, the wiring, i.e. the electric means able to electrically supply and control machine, are grouped in box-like elements 31 placed on the top of the machine. Advantageously, the maintenance of said electric means is facilitated because they are over the modules 200, 300, 400, 500, 600, 800.

[0172] Said box-like elements 31 are over a load-bearing frame 35 to house the conveying apparatus 700 and the modules 200, 300, 400, 500, 600, 800.

[0173] Figure 18 shows the machine with a conveying module 32 of bags when these are pillow bags. Said conveying module 32 comprises a conveyor 34 which is used to bypass the modules 200, 300, 400, 500, 600, 800 which are not able to treat a pillow bag.

[0174] Pillow bags do not have a base able to keep the bag upright. They are delimited by a linear flap obtained by welding both on top and bottom.

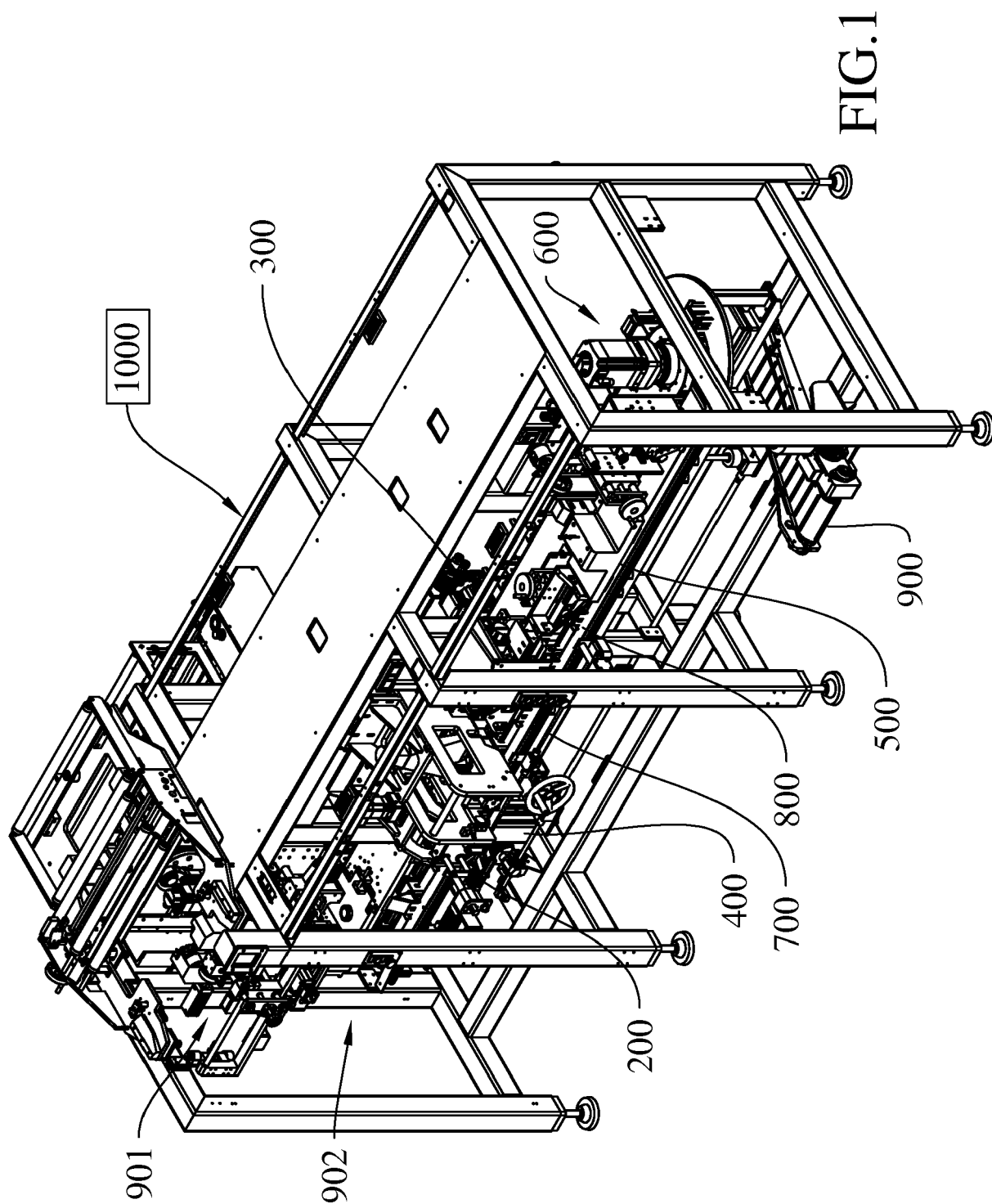
[0175] Consequently, the conveying module 32 makes it possible to bypass the conveying apparatus 700 and thus the modules 200, 300, 400, 500, 600, 800.

Claims

1. Machine for packaging a plurality of bags (2) for foods, said machine comprising means (901, 902) for producing plastic bags containing foods and a conveying apparatus (700) of the bags which are to be or have been packaged, said conveying apparatus (700) comprises a closed loop chain (703) meshed between a driving ring gear (704) and an idle ring gear (705), both with their own vertical rotation axis, and a plurality of retaining elements (709) of the bags which are to be or have been packaged, each retaining element of the plurality of retaining elements being associated with said chain (703), a single bag which is to be or has been packaged of said plurality of bags which are to be or have been packaged being retained by a retaining element of said plurality of retaining elements, **characterized in that** said bags to be packaged are plastic bags and said production means are able to make bags starting from a plastic film so that the head (1) of said bags is partially closed, said machine comprising a plurality of modules (200, 300, 400, 500, 600, 800) able to act on the bags for packaging them, said plurality of modules comprising a first module (200) configured to form the head (1) of the bags (2) for foods, a second module (400) able to weld said head (1) of the bag so as to form a single flap (3100) and able to cut the top part (401) of the head, a third module (300) configured to fold and press the flaps (3100) of the bags exiting from the second module, said conveying apparatus being configured to take said bags into all the modules.
2. Machine according to claim 1, **characterized in that** said first module comprises a press (220) to deflate the head of the bag and a pair of spears (211) for forming the head of the bag, a first electric motor (222) for moving the press and a second electric motor (212) for moving said pair of spears (211) to form the head of the bag.
3. Machine according to claim 1, **characterized in that** said second module comprises
 - a pair of a first (412) and a second (411) welding elements,
 - means (413-416) able to arrange said first and second welding elements in a resting position (A1), in which said first and second welding elements are in opening position, and at a working position (A2), in which said first and second welding elements are in closing position on the flaps (3) of the head of the bag for welding said flaps,
 - cutting means (420) able to cut the upper part (401) of the head of the bag in the working position (A2) of said first and second welding elements, said upper part being positioned over the previously welded part (423) of the head of the bag,
 - suction means (430) able to suck said previously cut upper part of the head of the bag,
 - clamping means (440) able to grip said previously cut upper part of the head of the bag in the working position of said first and second welding elements and to arrange it over said first welding element (412) in the resting position of said first and second welding elements for the suction operation of said suction means.
4. Machine according to claim 1, **characterized in that** said third module (300) is configured to fold a part (3103) of the previously welded upper flap (3100) of the bag on the part of the upper flap (3100) which is not subject to folding, whereby forming an angle smaller than 45° between the two parts, said third module (300) comprising a folding plate (304) and a "U"-shaped element (313), and moving means (350) able to combine said "U"-shaped element (313) with the folding sheet (304) to fold of the previously welded upper flap (3100) of the bag (2).
5. Machine according to claim 1, **characterized in that** it comprises a further module (500) able to act on the bags after the operation of a share (800) able to rotate the flaps (3100) of the bags (2) exiting from the third module (300) so as to take them to horizontal position, said further module being able to press said flaps (502) of the bags (2) onto the body (9003) of the bag, said further module comprising:
 - at least a first and a second heating plate (504, 505), which are mutually adjacent along a moving direction (L) of the bags (501) and arranged above with respect to said chain (503) at a given height (D) which is greater than height of the bag (501), and
 - vertical moving means (519) of said first a second heating plate (504, 505) in a direction perpendicular to said moving direction (L), configured to press said first heating plate (504) over the bag (501) in a first interval of time and also to press said second heating plate (505) over the package (501) in a second interval of time, successive to the first interval of time.
6. Machine according to claim 1 or 5, **characterized in that** it comprises another module (600) for cutting and applying a portion (601) of adhesive tape (602) over the bag (2) containing foods to fix the upper flap

(3100, 502) of the bag (2), said bag (2) exiting from the third module (300) or from a share (800) able to rotate the flaps (3100) of the bags (2) exiting from the third module (300) so as to take them to horizontal position from said further module (500), said other module (600) comprising at least one spool (603) of said adhesive tape (602) arranged on an idle wheel (604) and at least one motorized roller (607) for unwinding the adhesive tape (602) from said spool (603), moving means (629) of an applicator (630) provided with a cutting blade (631), said applicator (630) being configured to cut said portion (601) of adhesive tape (602) by said cutting blade (631) and simultaneously to apply said cut portion (601) onto said upper flap (502) of the bag (2).

7. Machine according to claim 1, **characterized in that** each retaining element (709) of said plurality of retaining elements (709) of the bags of the conveying apparatus (700) is removably fixed to said chain.
8. Machine according to claim 7, **characterized in that** each retaining element (709) of said plurality of retaining elements (709) of the bags of the conveying apparatus (700) is "C"-shaped, each retaining element comprising a rear wall (711) from which two side walls (12) depart, said rear wall being removably fixed to the chain (3) and the bag being arranged between said side walls.
9. Machine according to claim 1 or 5, **characterized in that** it comprises box-like elements (31) able to contain the wiring means of the machine, said box-like elements (31) being placed over a load-bearing frame (35) which houses the conveying apparatus (700) and said modules (200, 300, 400, 500, 600, 800).
10. Machine according to claim 1 or 5, **characterized in that** it comprises a bag conveying module (32) when the bags are pillow bags, said module (32) comprising a conveyor (34) able to bypass the conveying apparatus (700) and consequently the modules (200, 300, 400, 500, 600, 800).



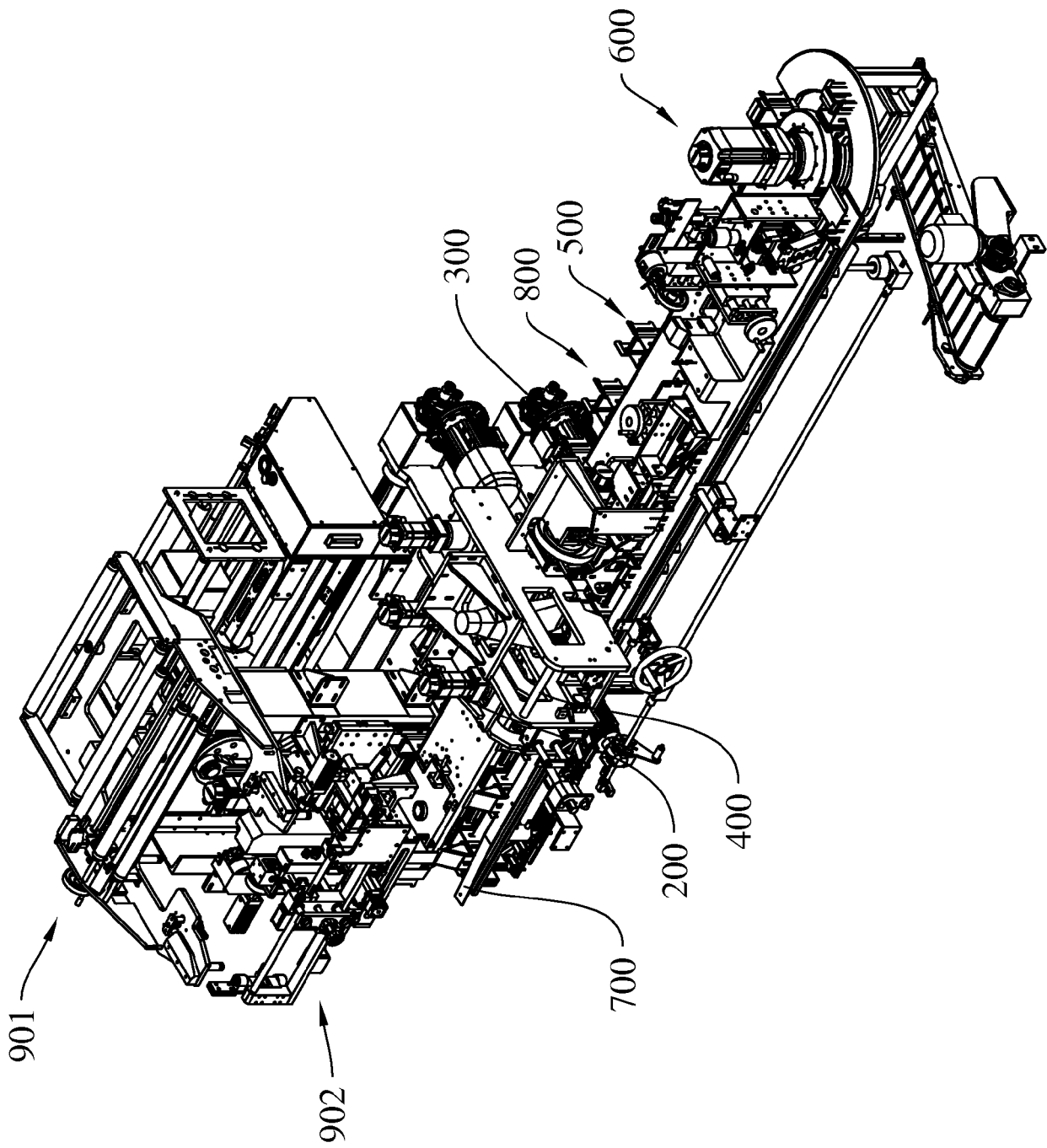


FIG.2

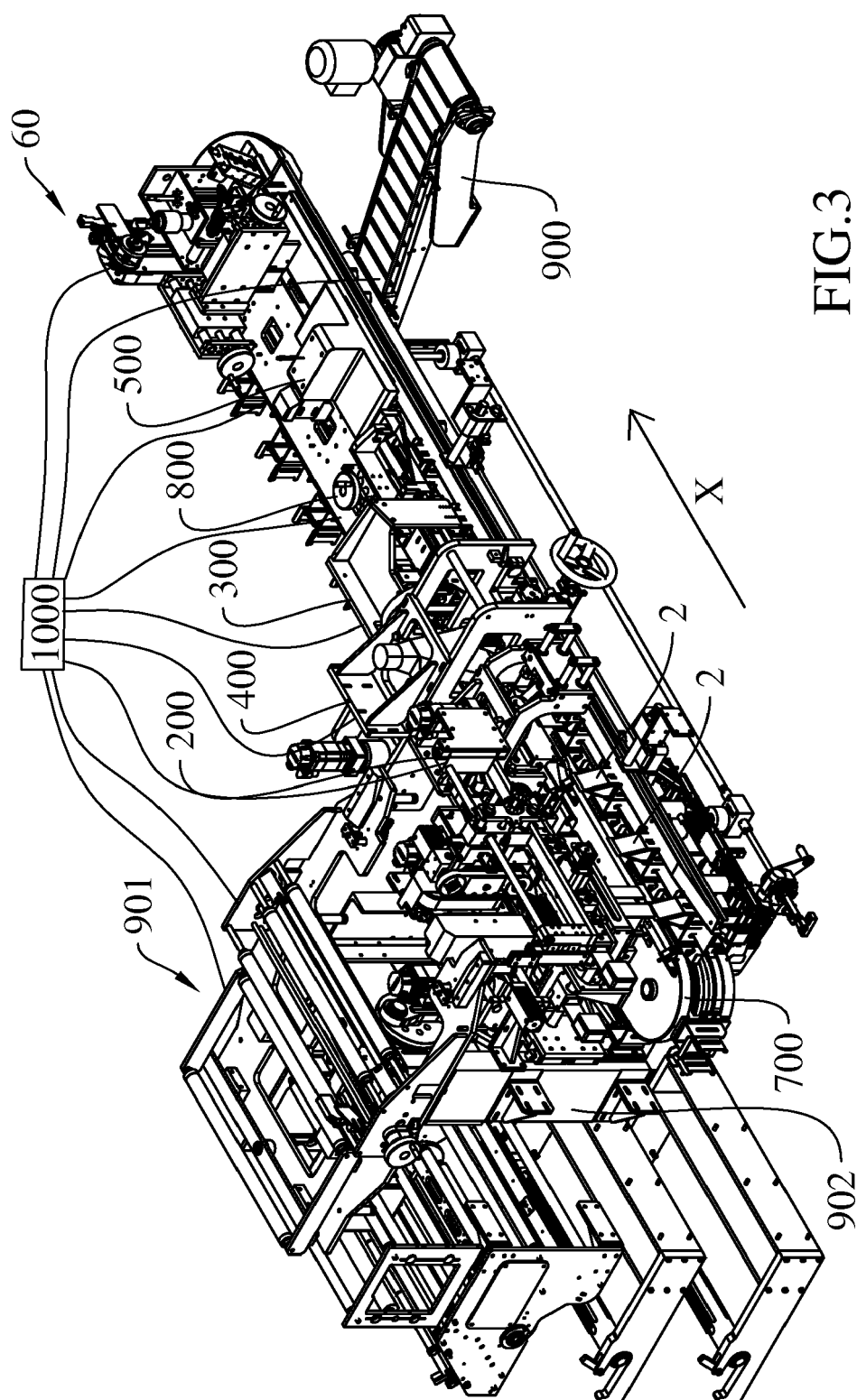


FIG.3

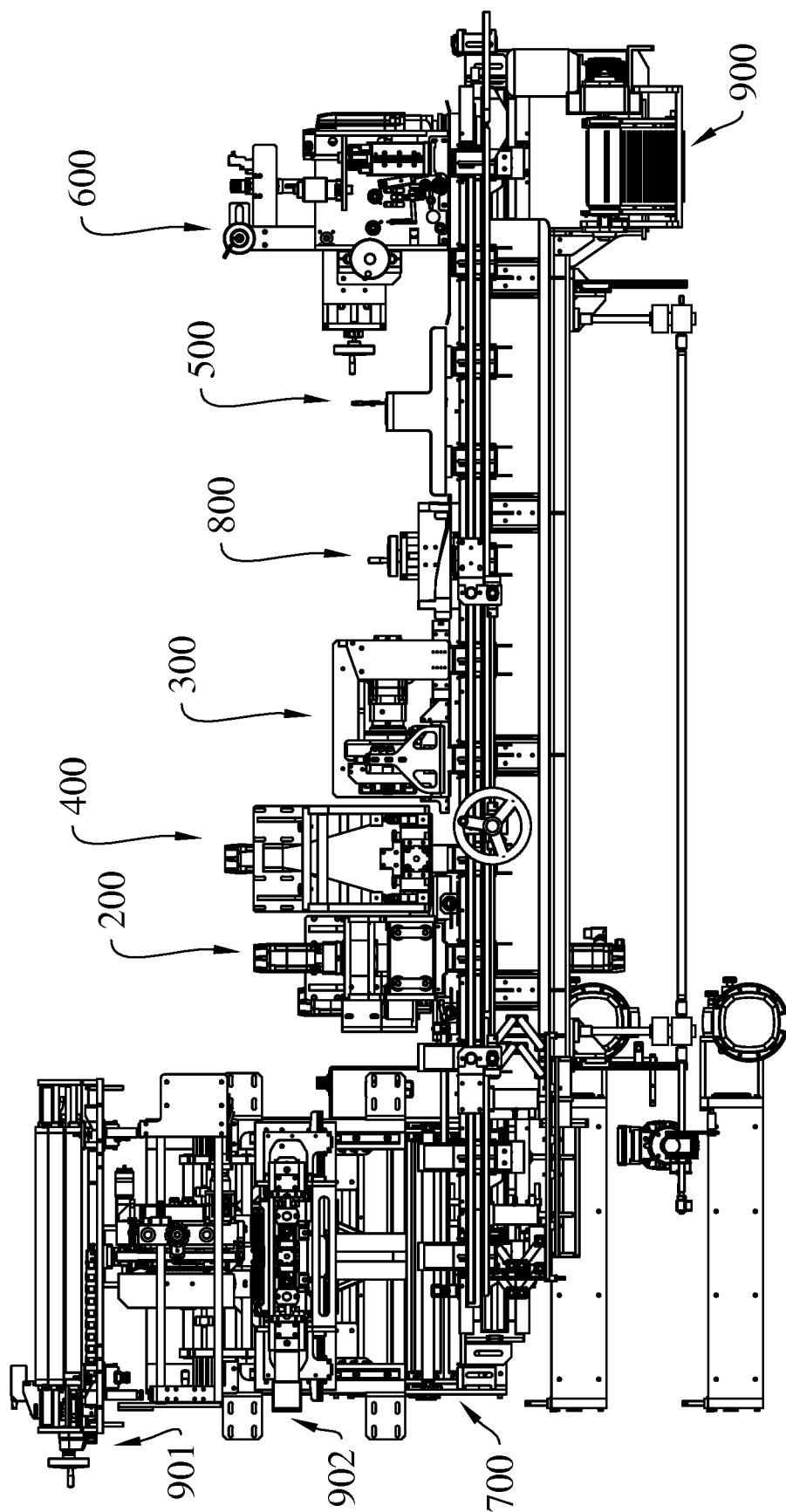


FIG.4

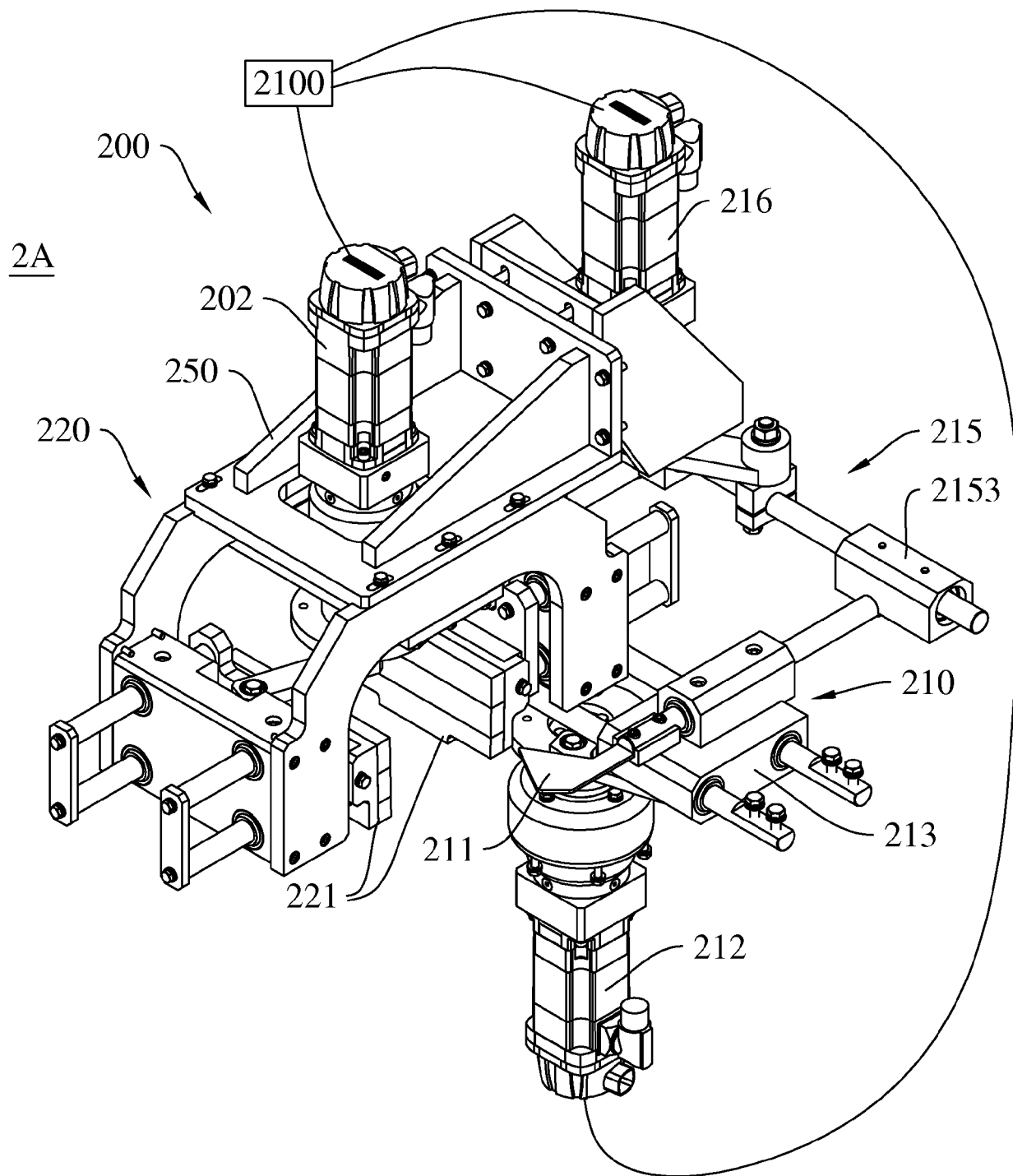
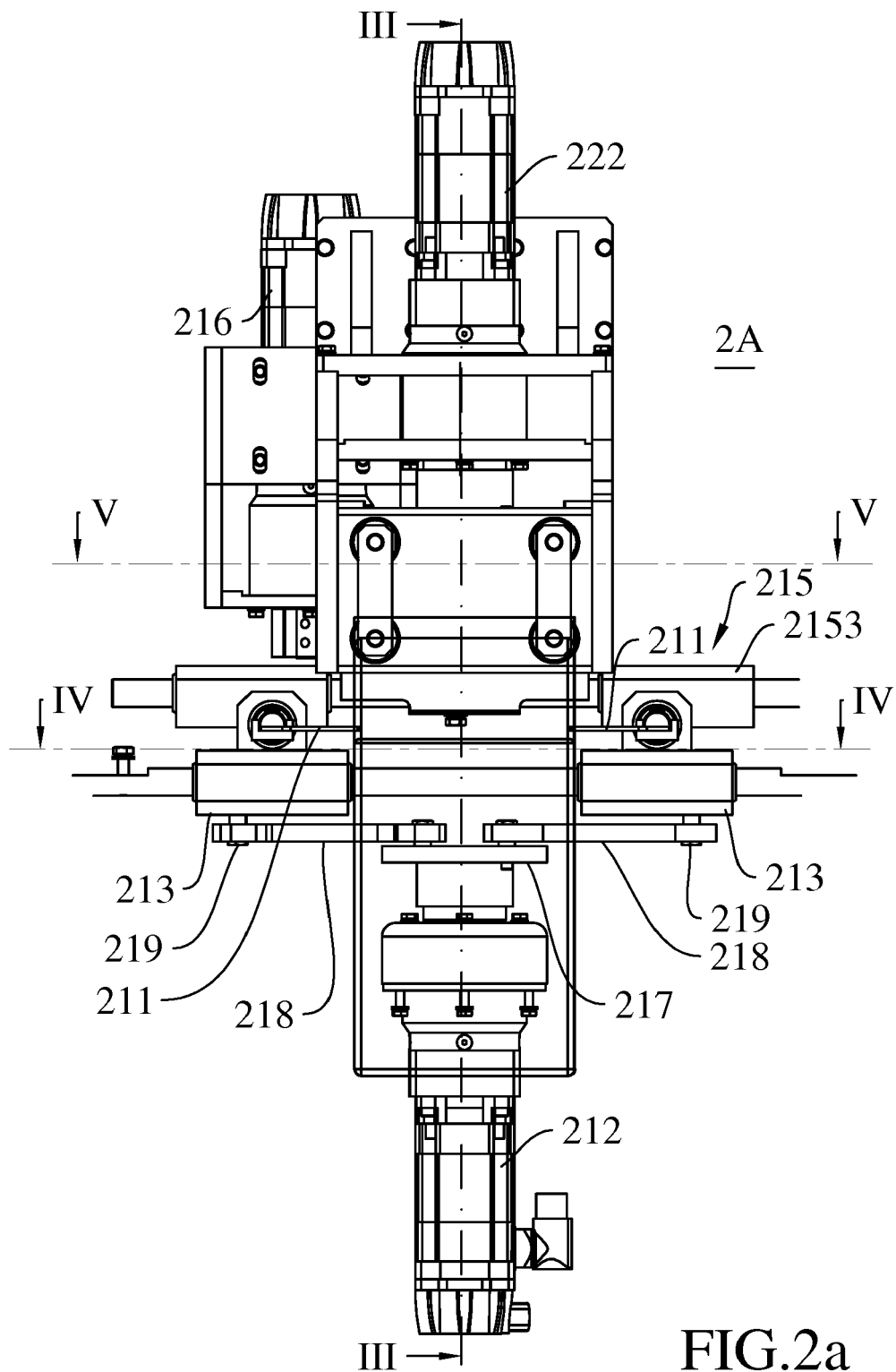


FIG.1a



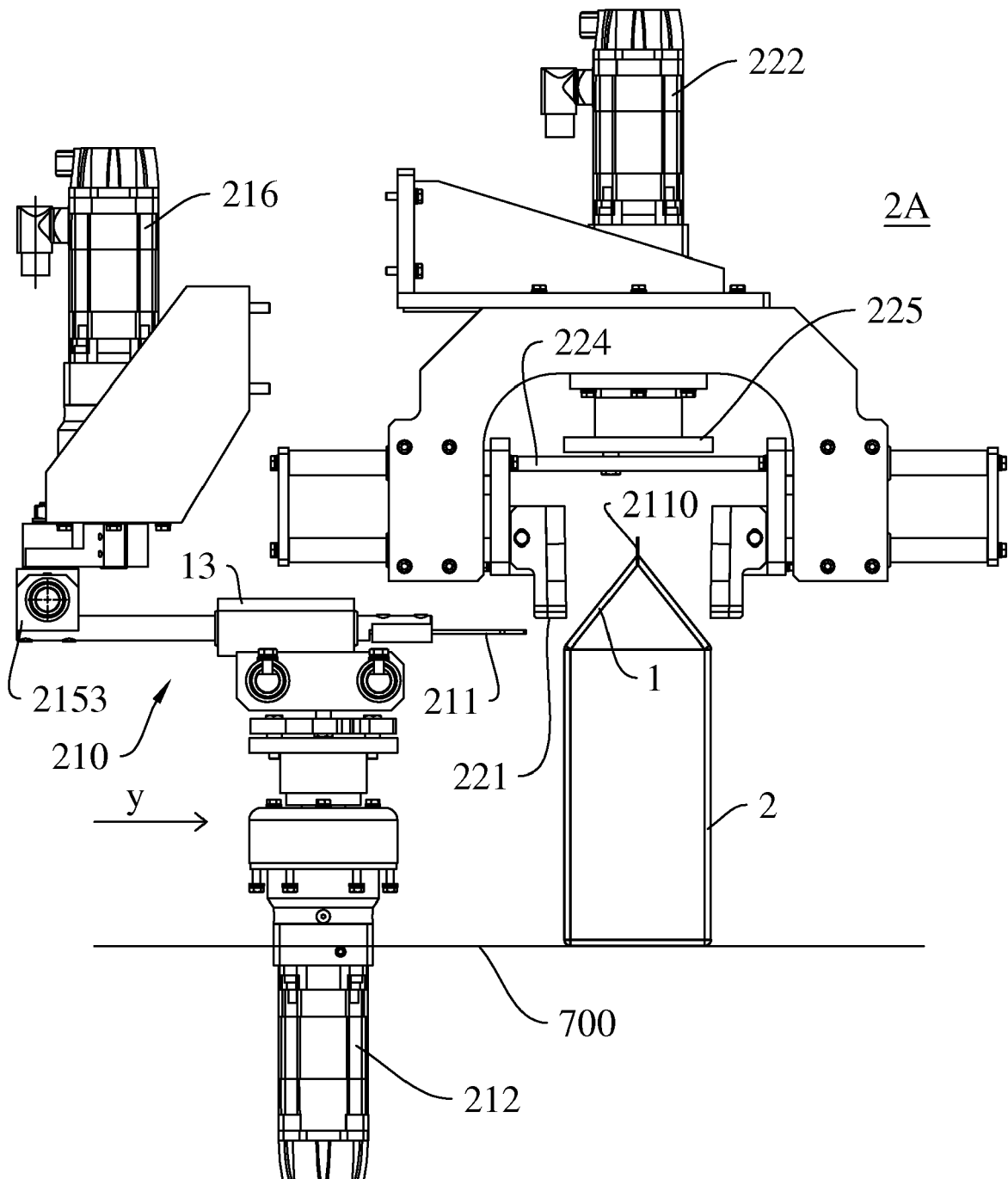


FIG.3a

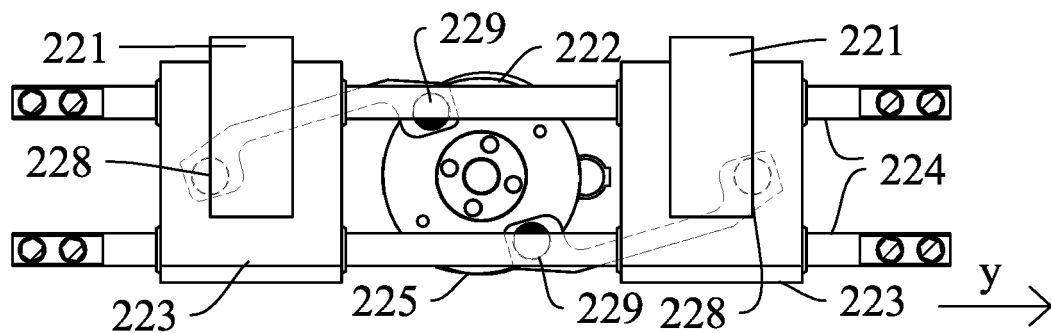


FIG. 4a

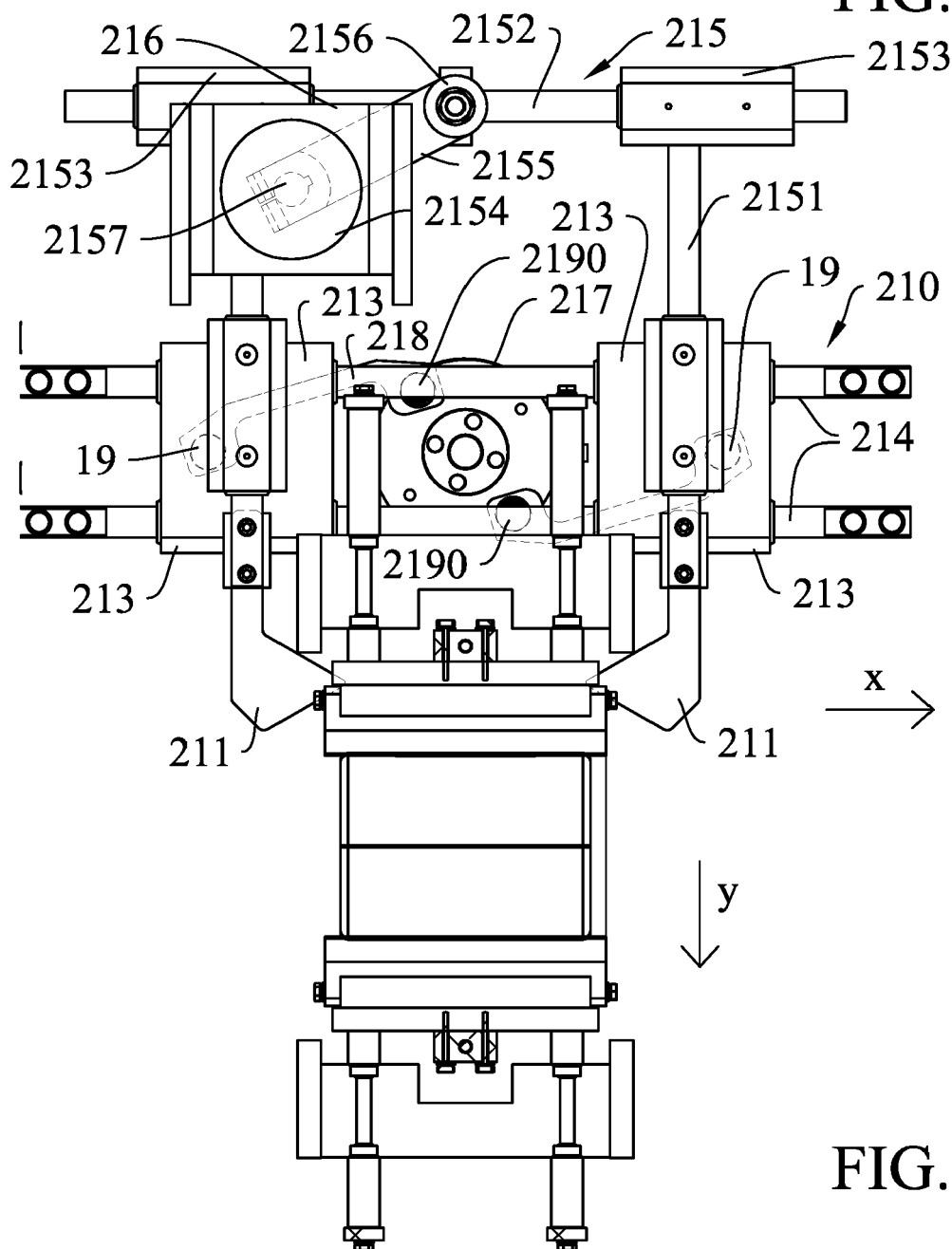
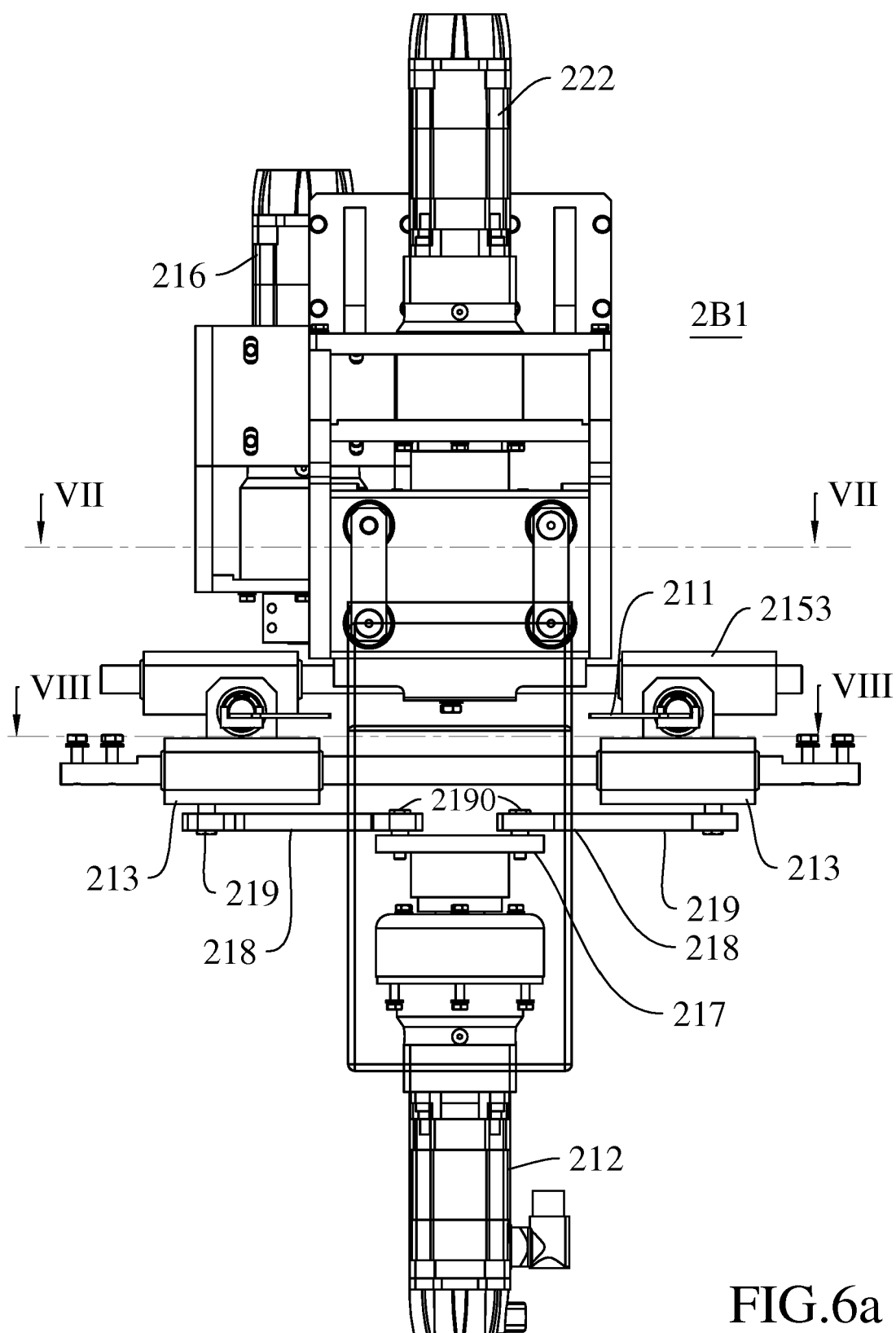
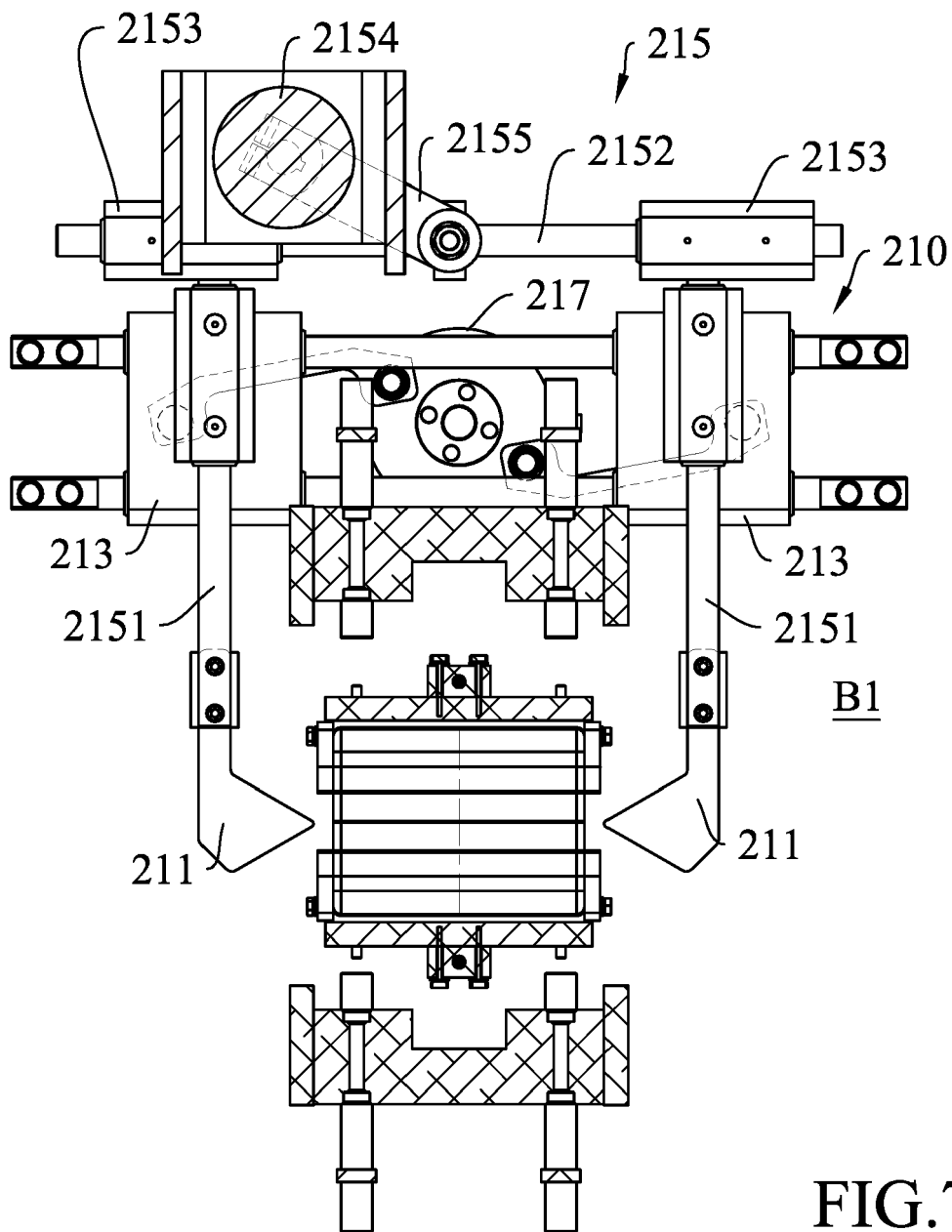
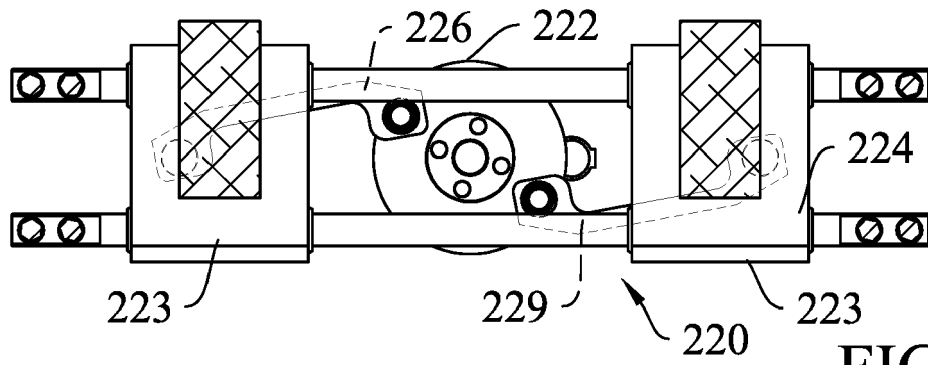
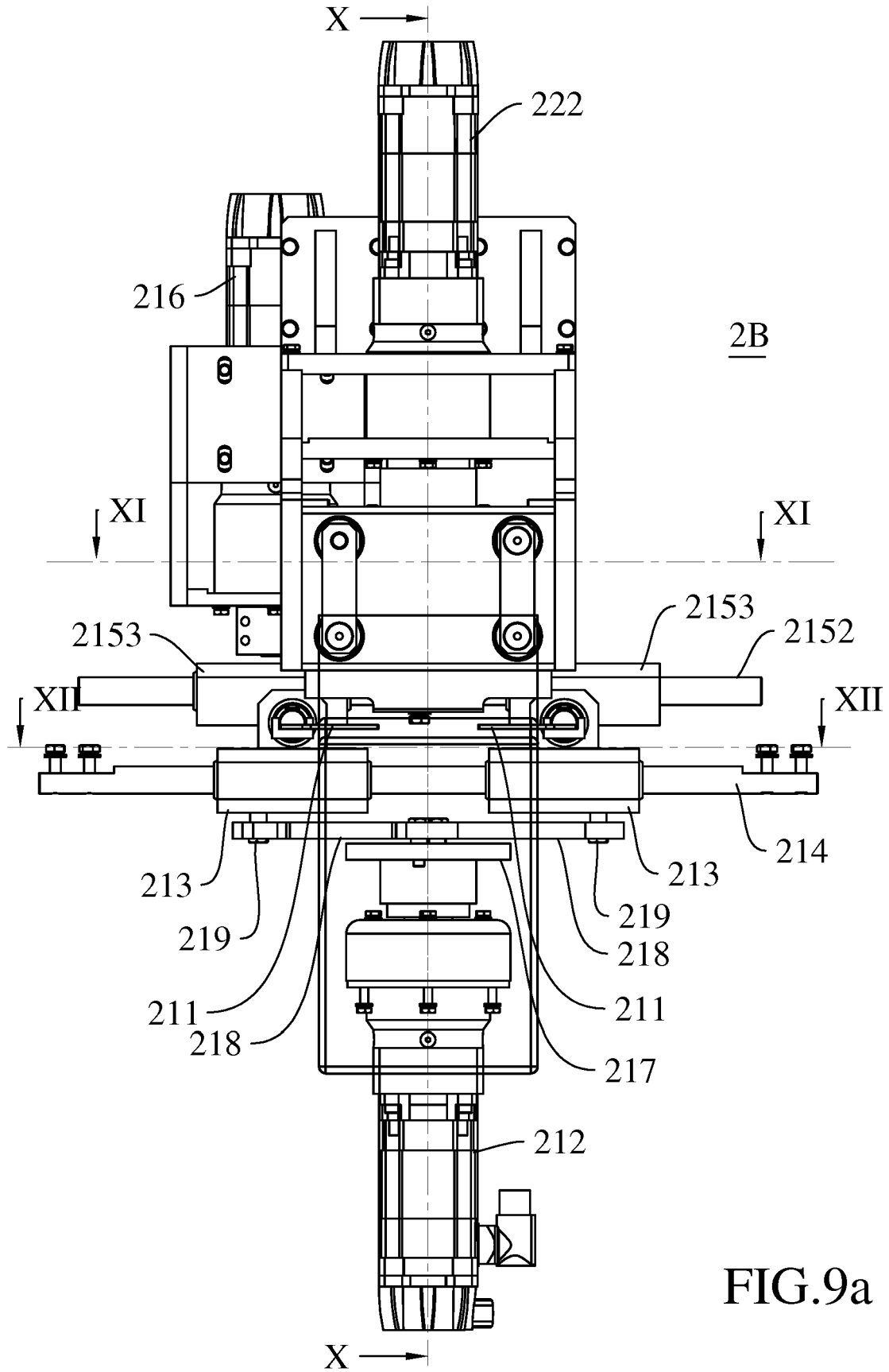
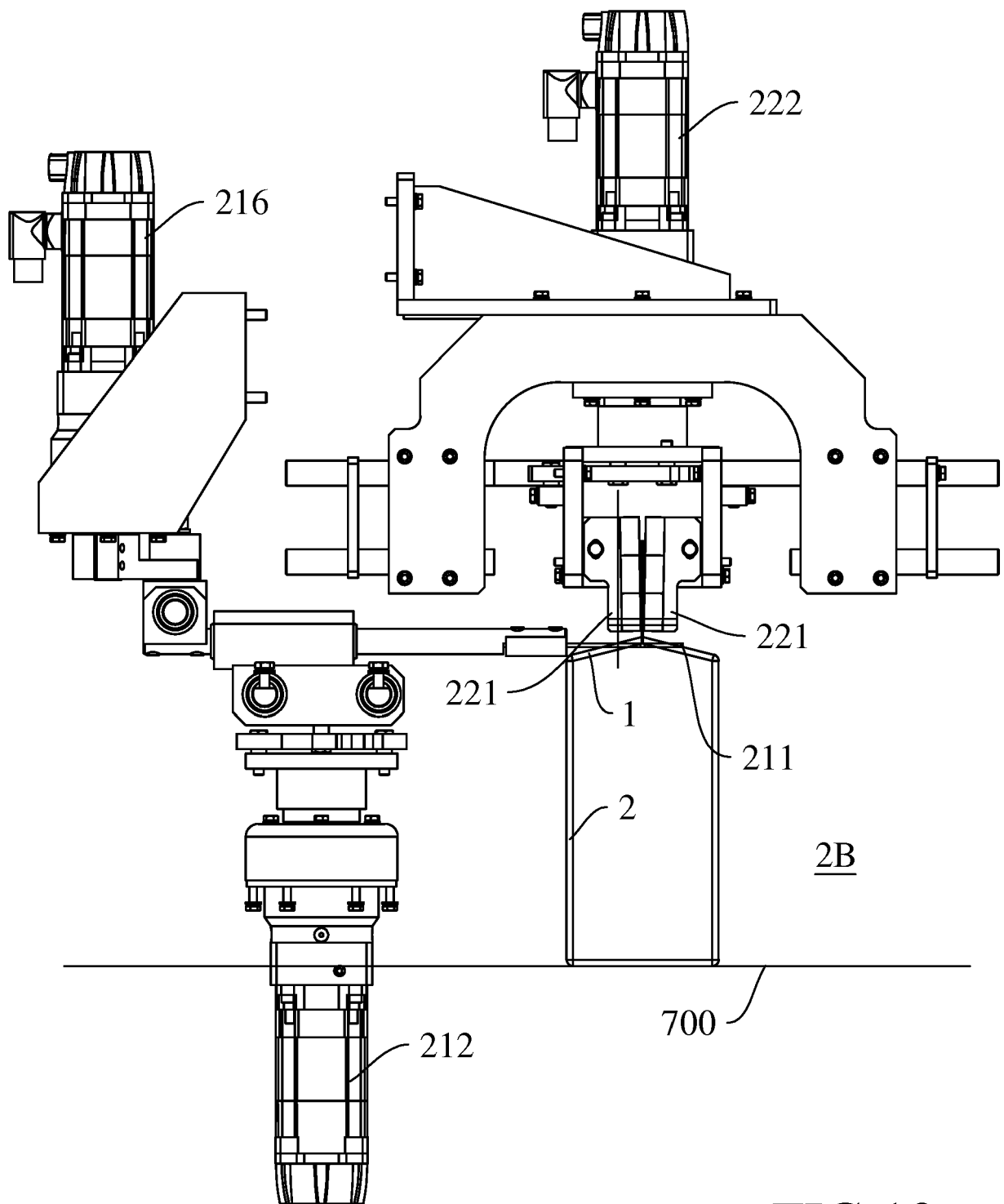


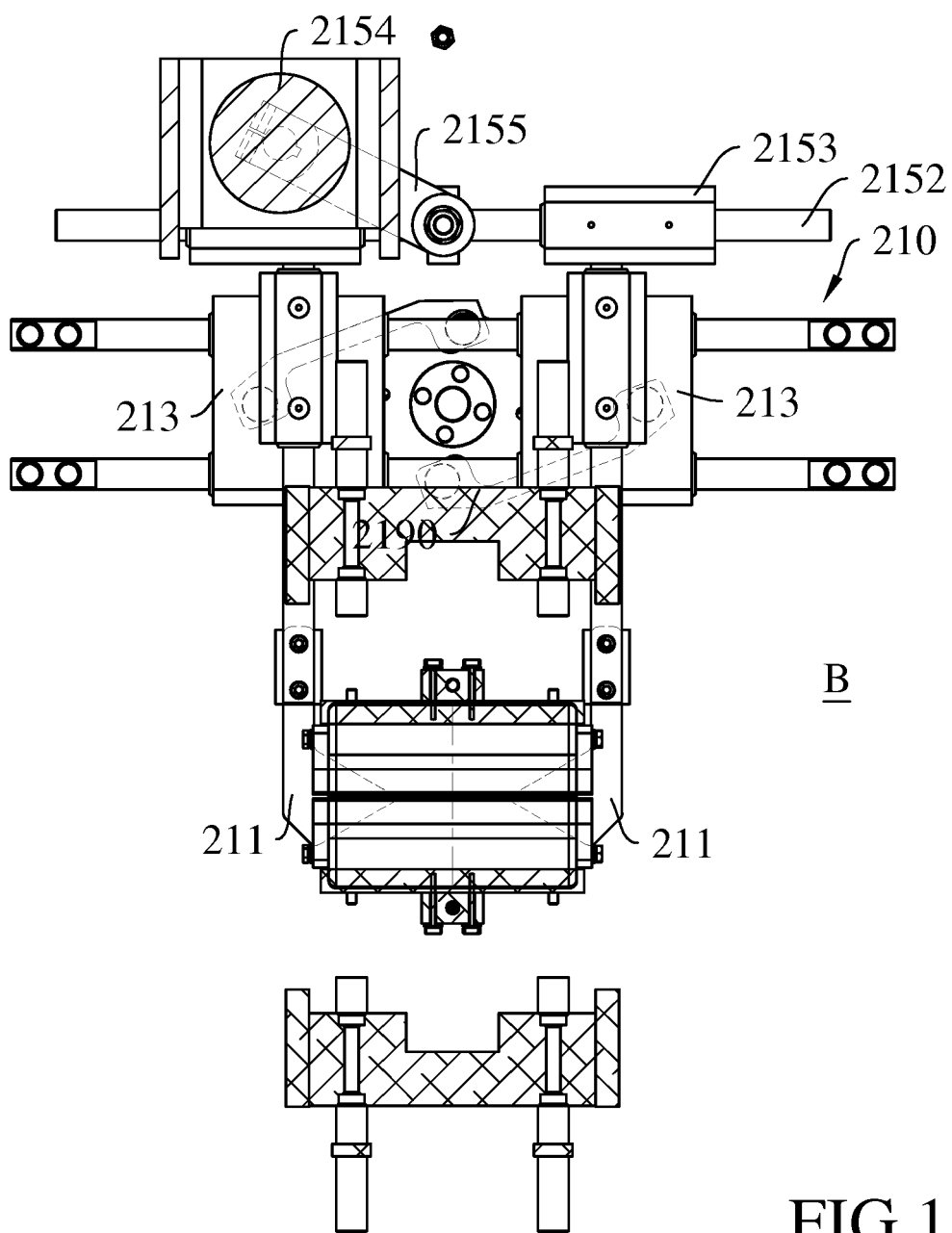
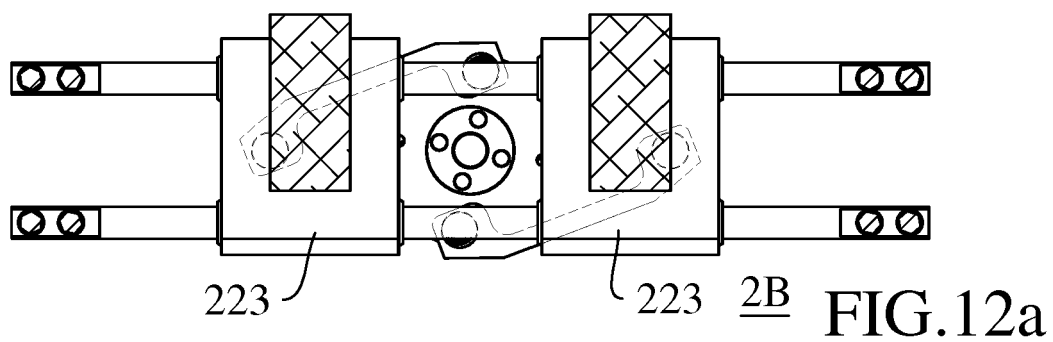
FIG. 5a











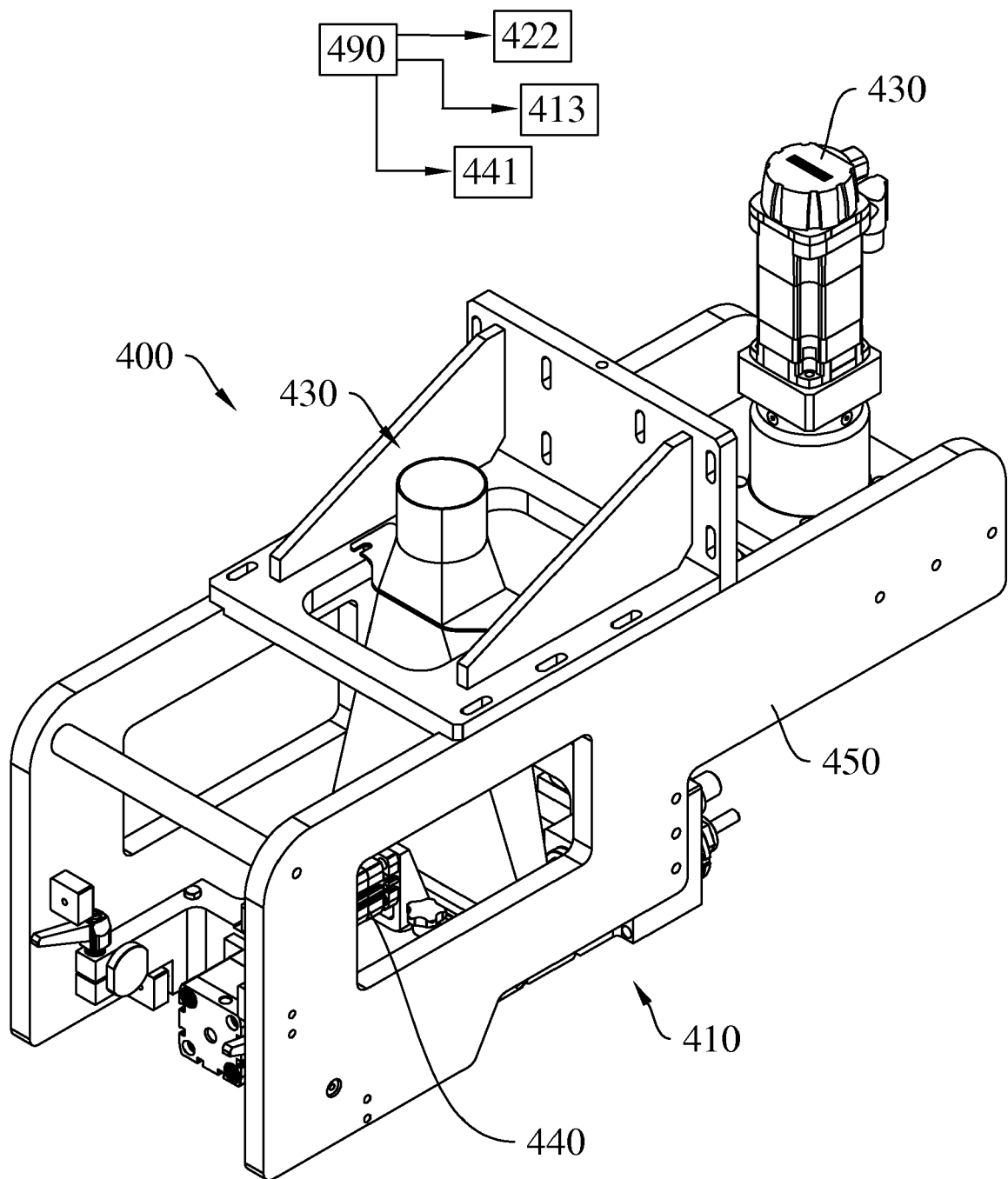


FIG.1b

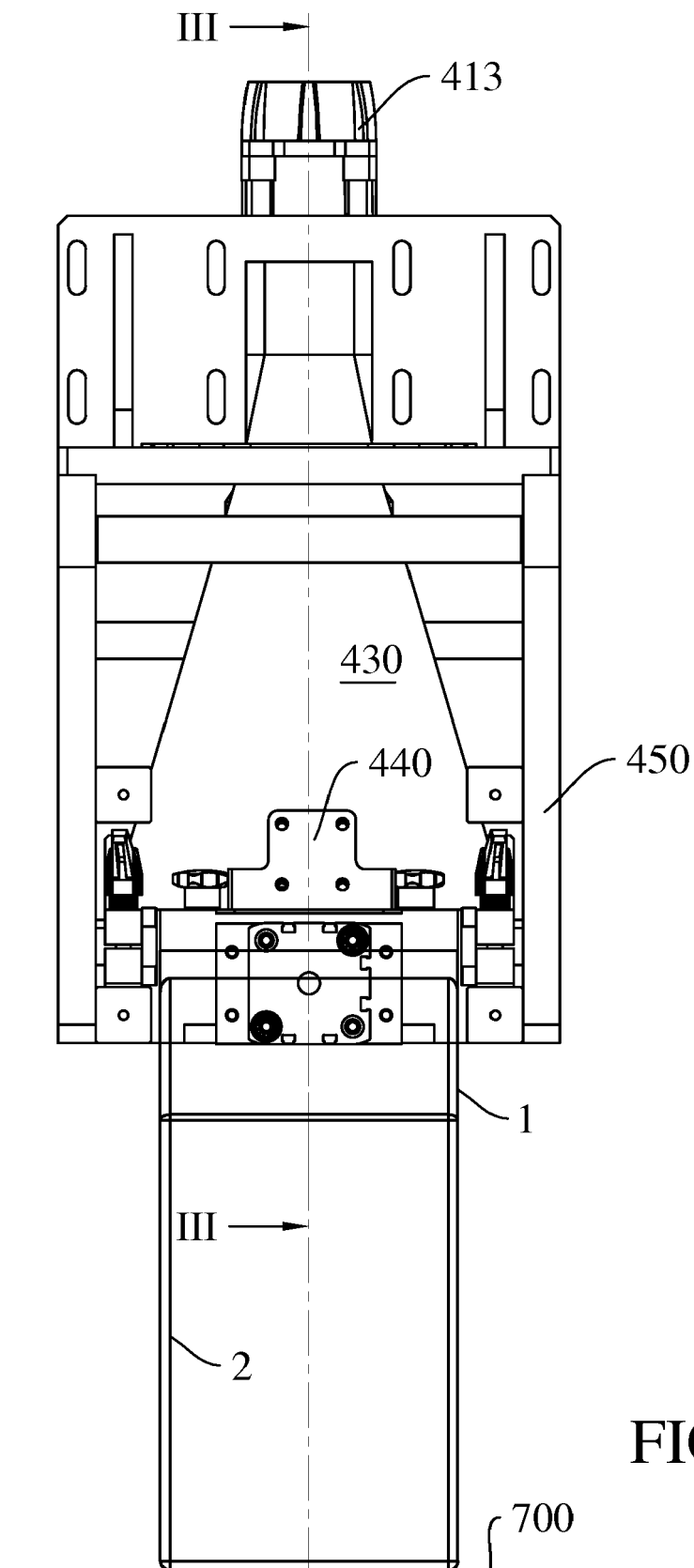


FIG.2b

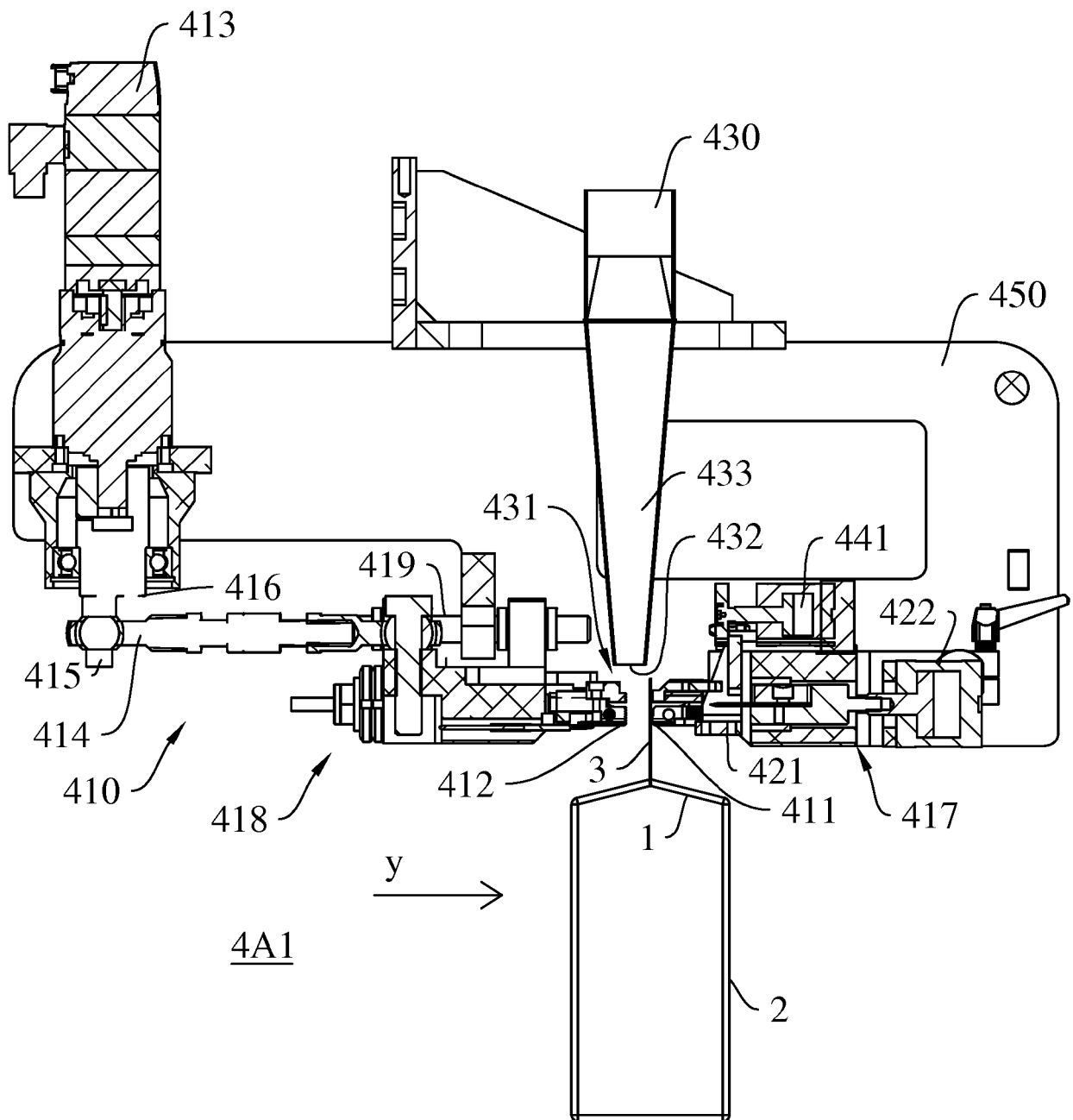


FIG.3b

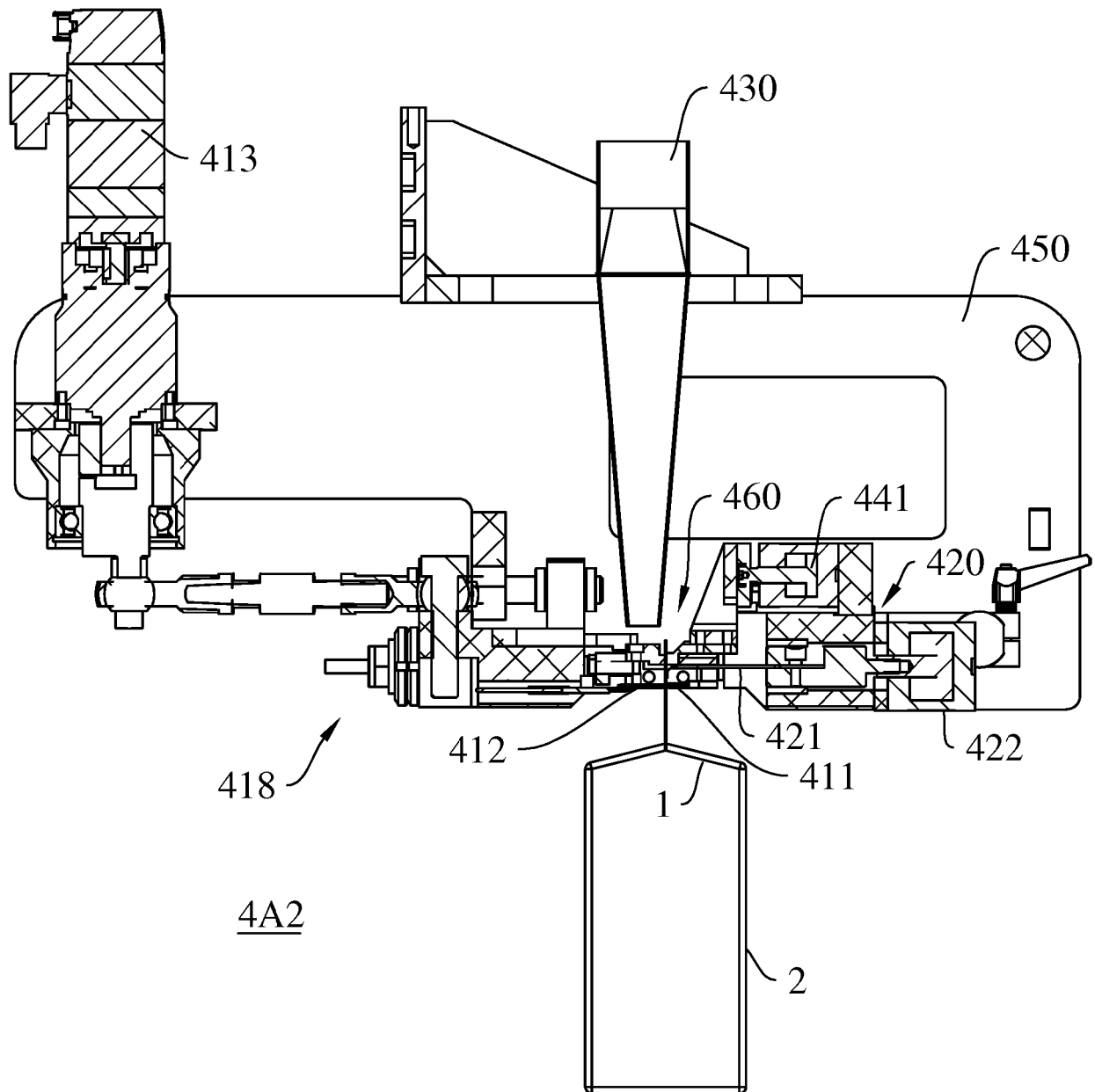


FIG.4b

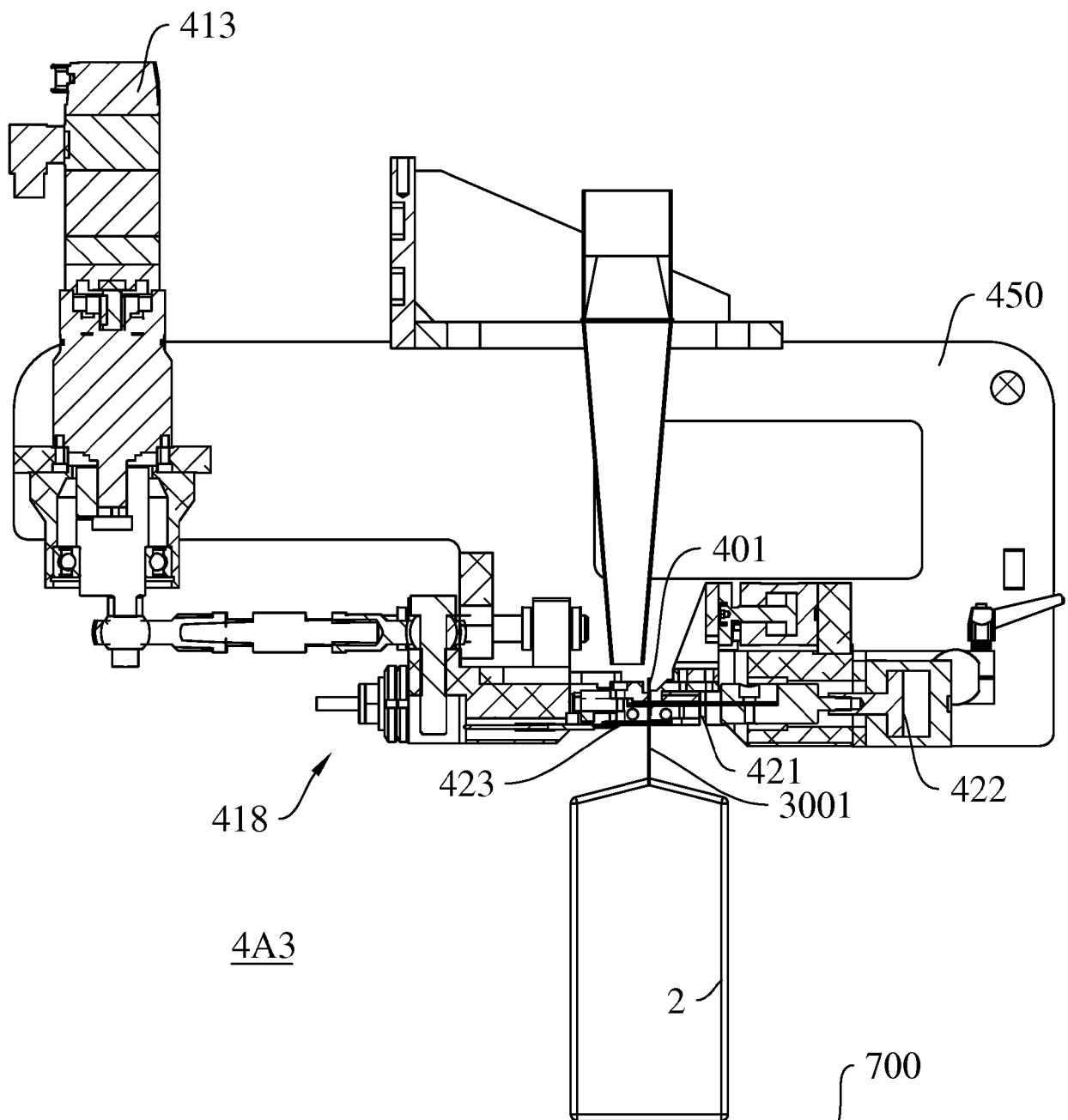


FIG.5b

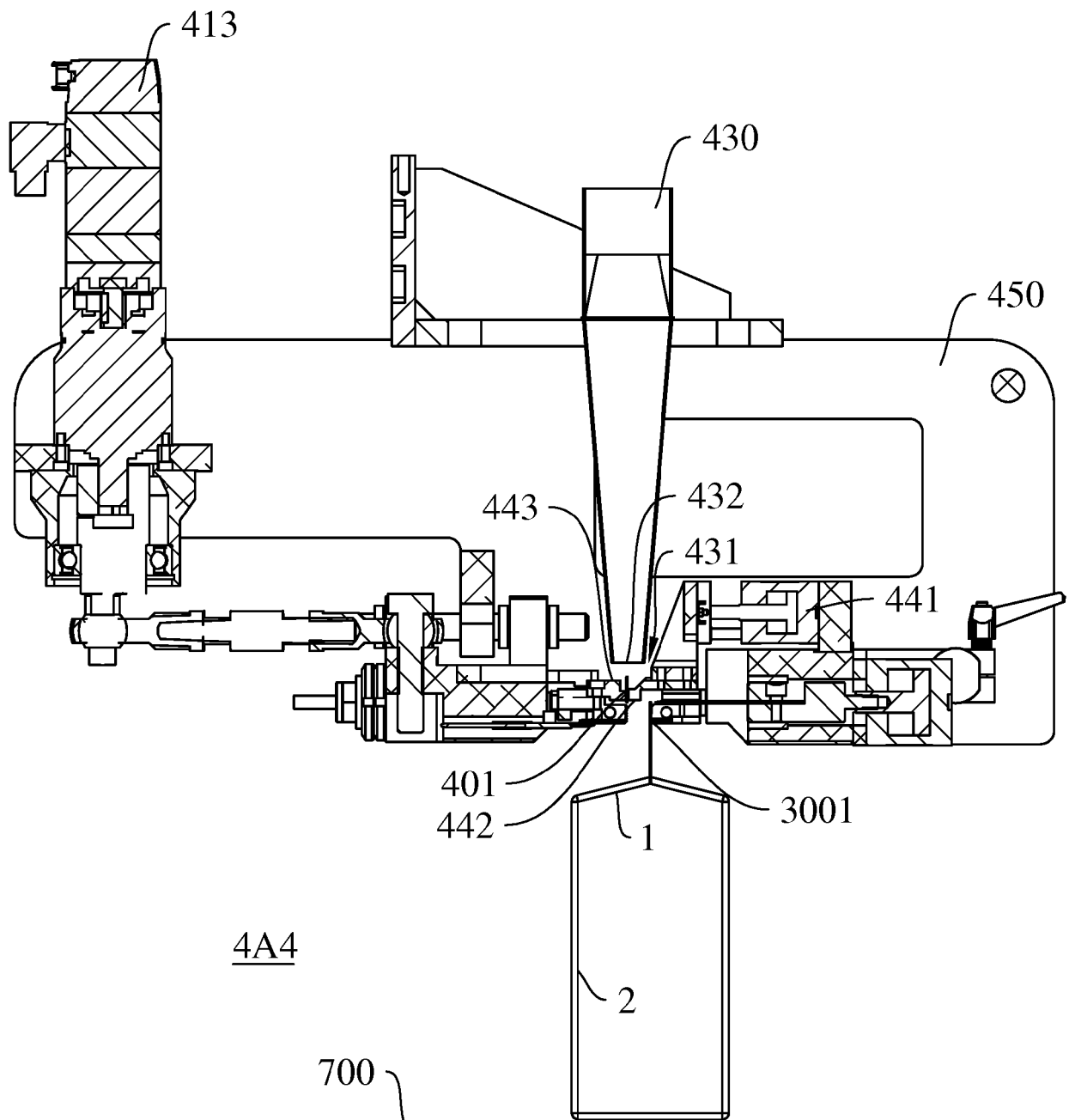


FIG.6b

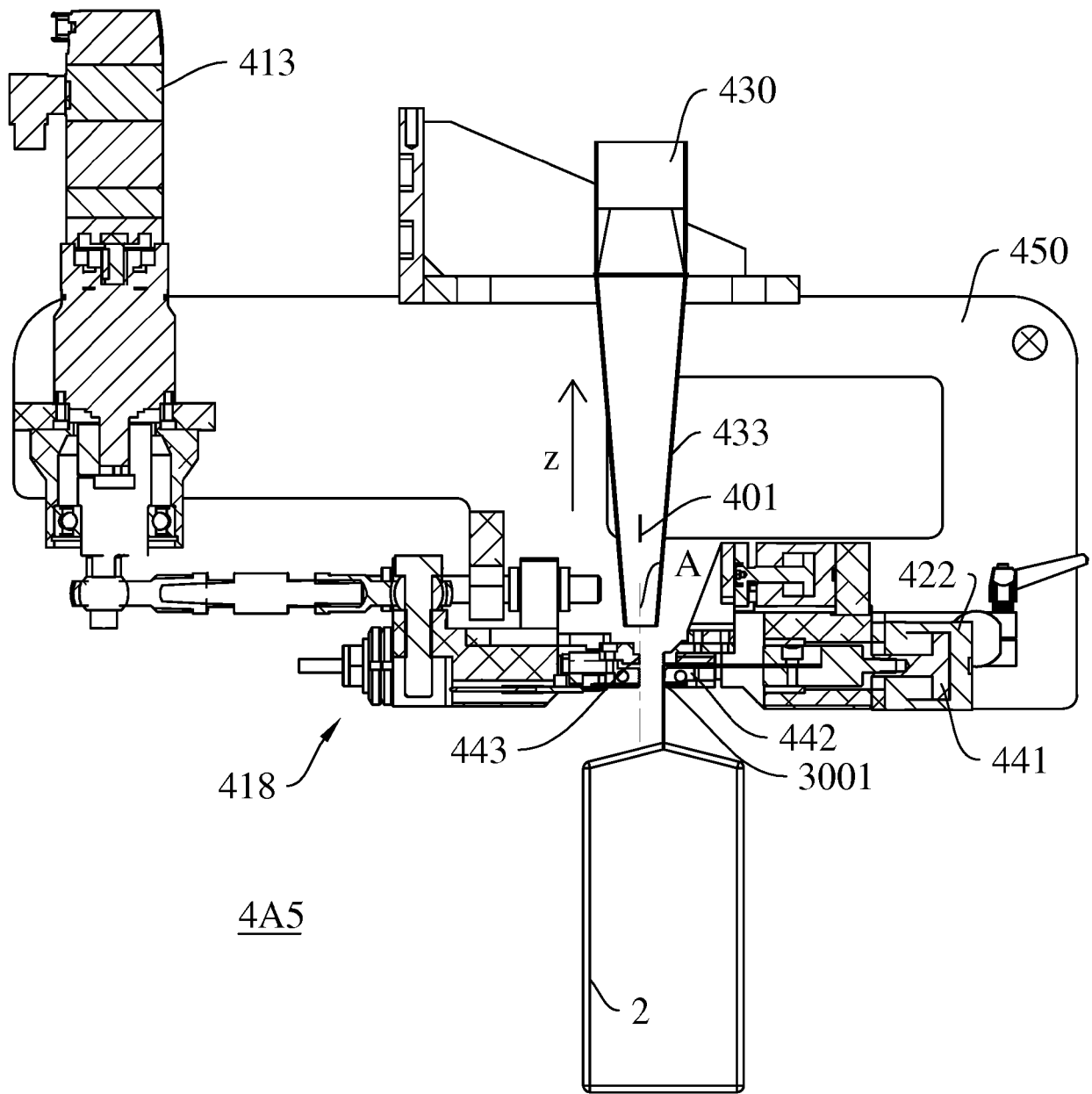


FIG.7b

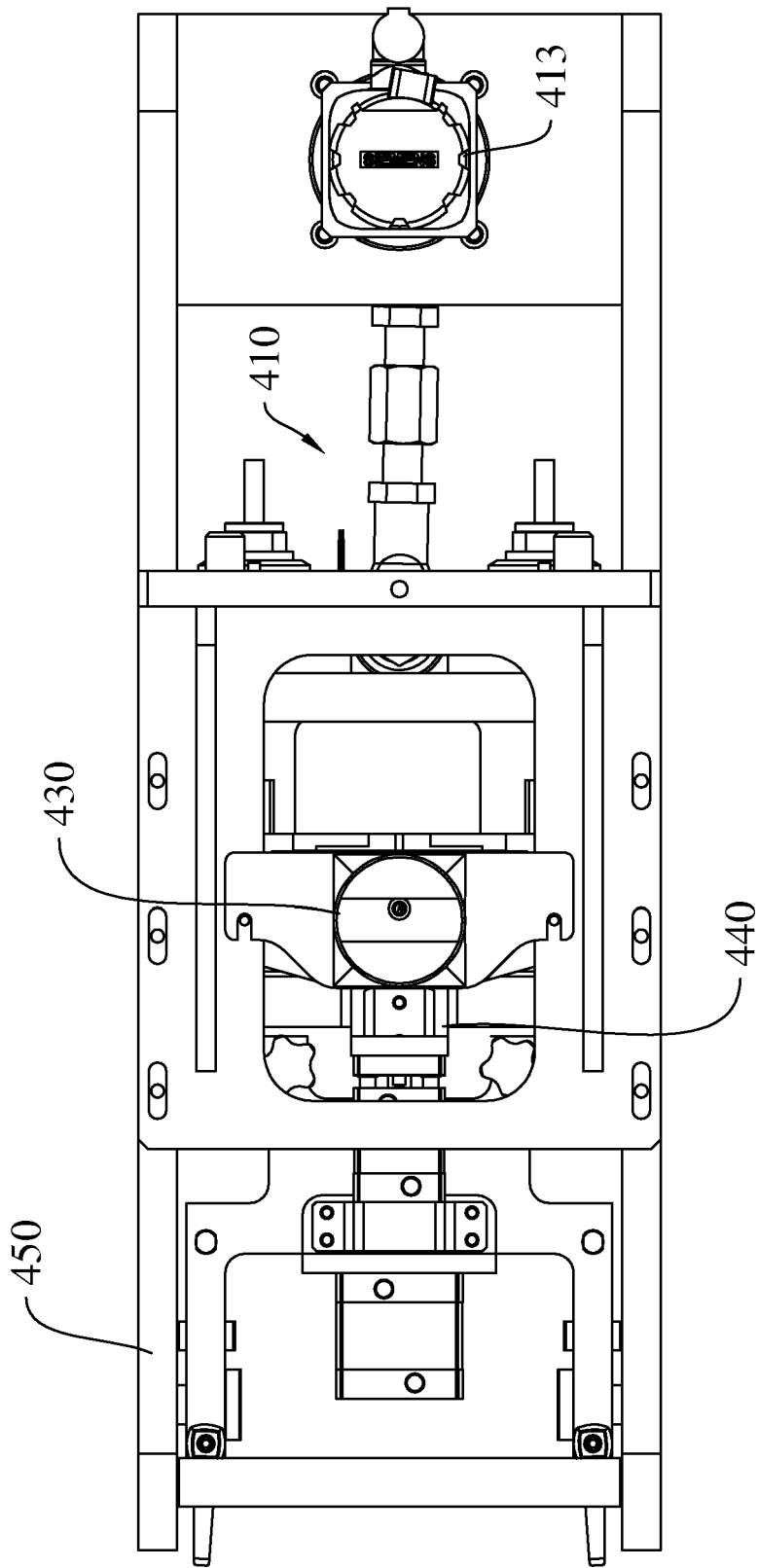


FIG.8b

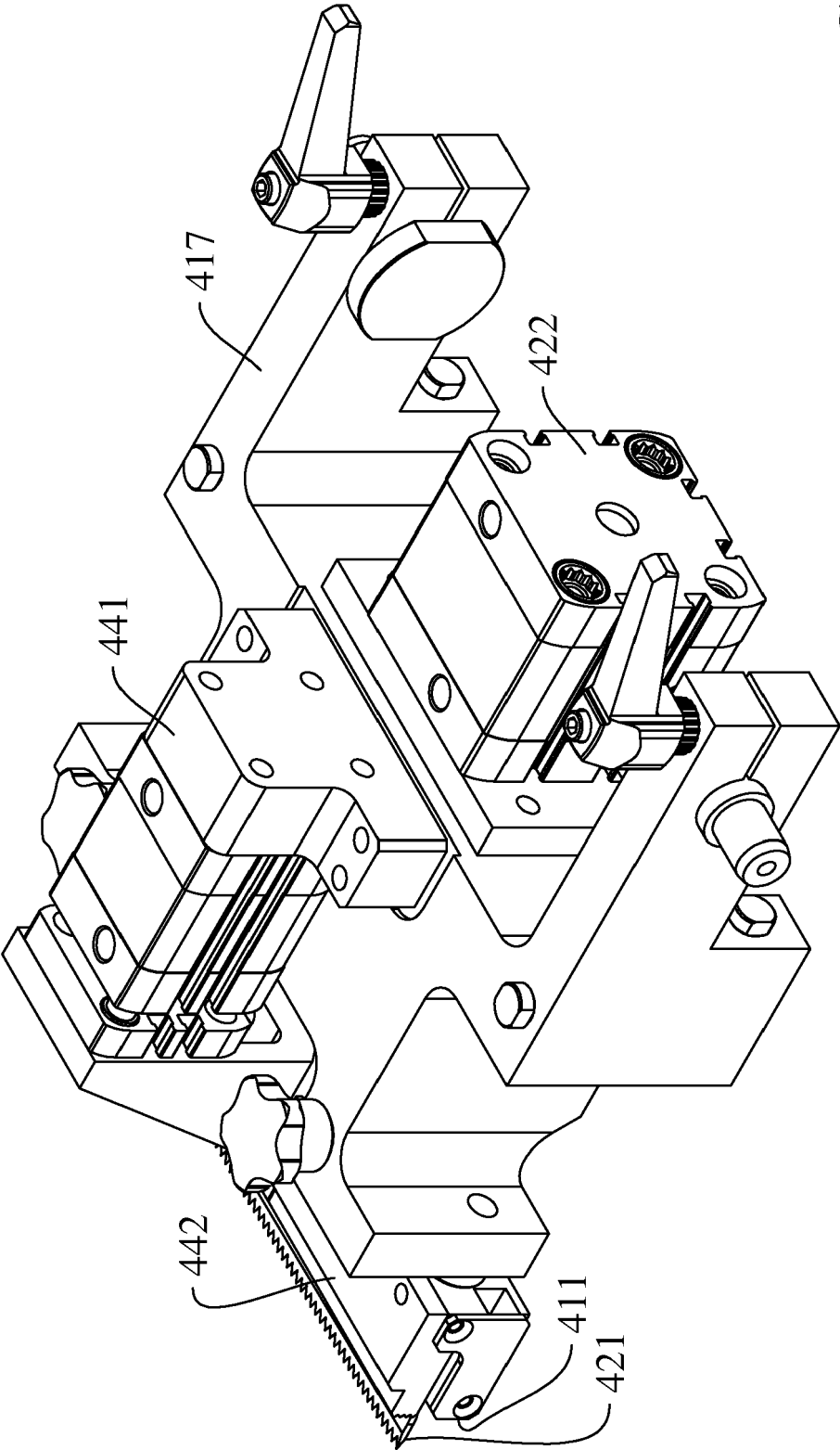


FIG.9b

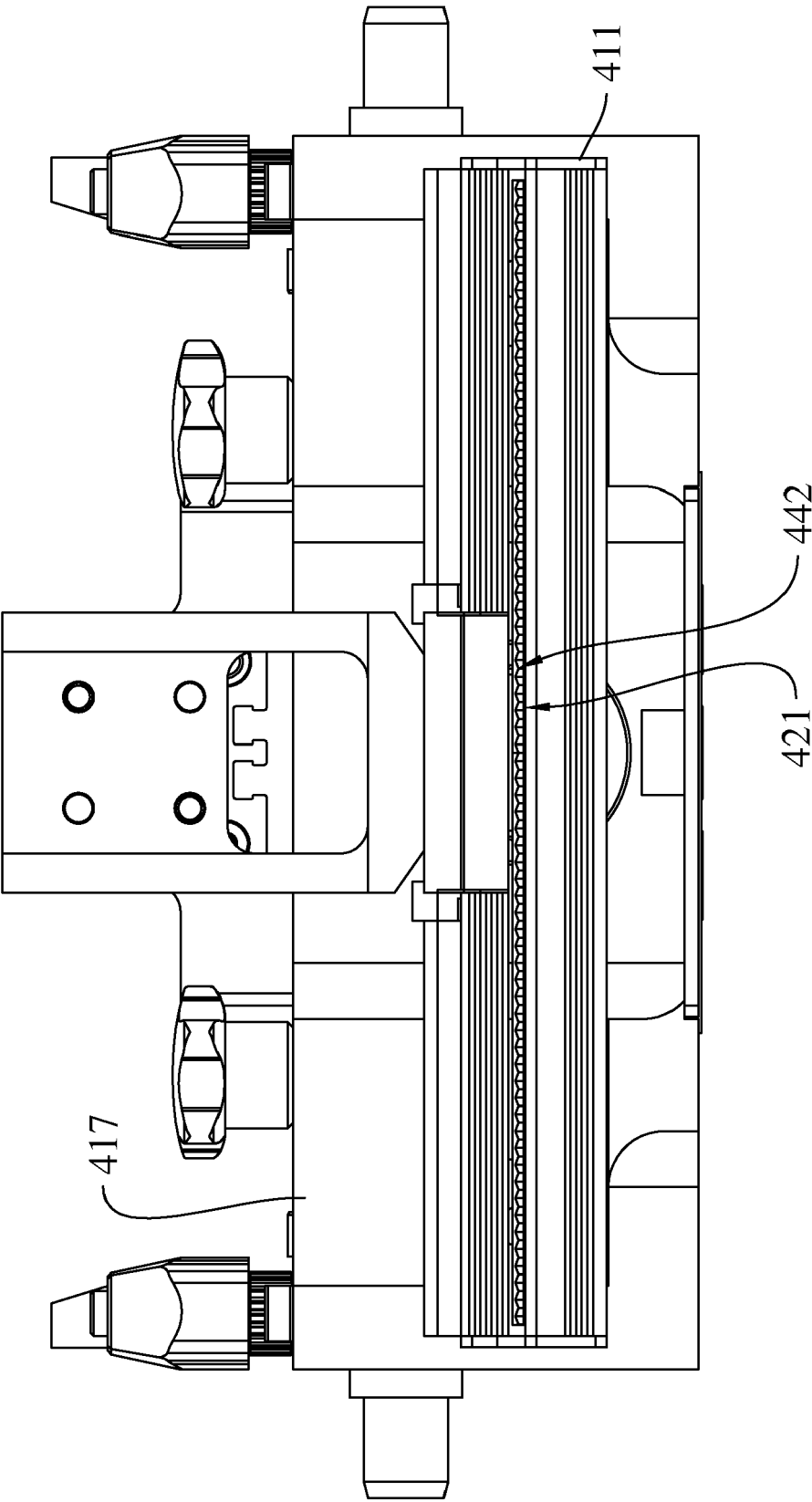


FIG. 10b

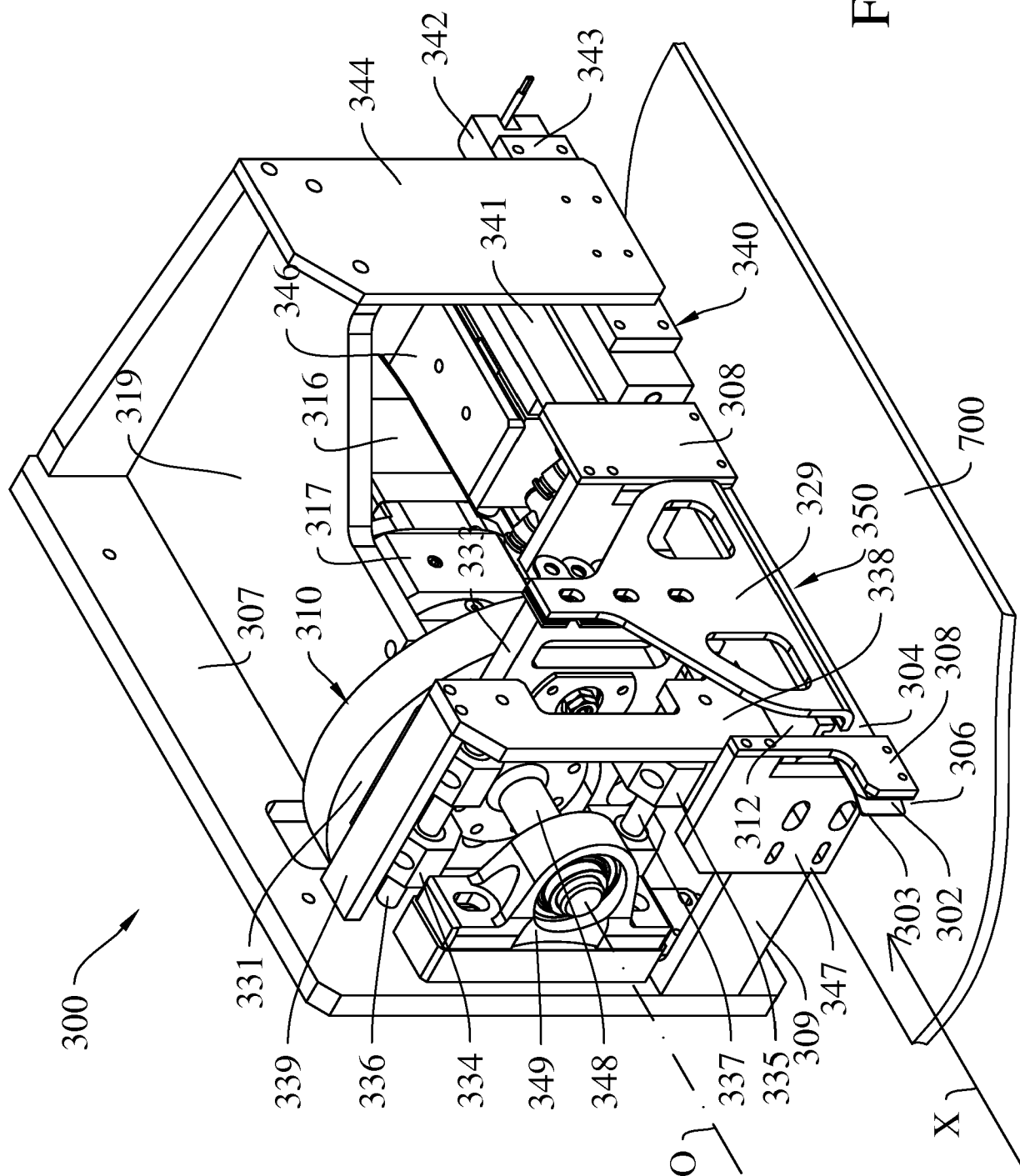


FIG. 1c

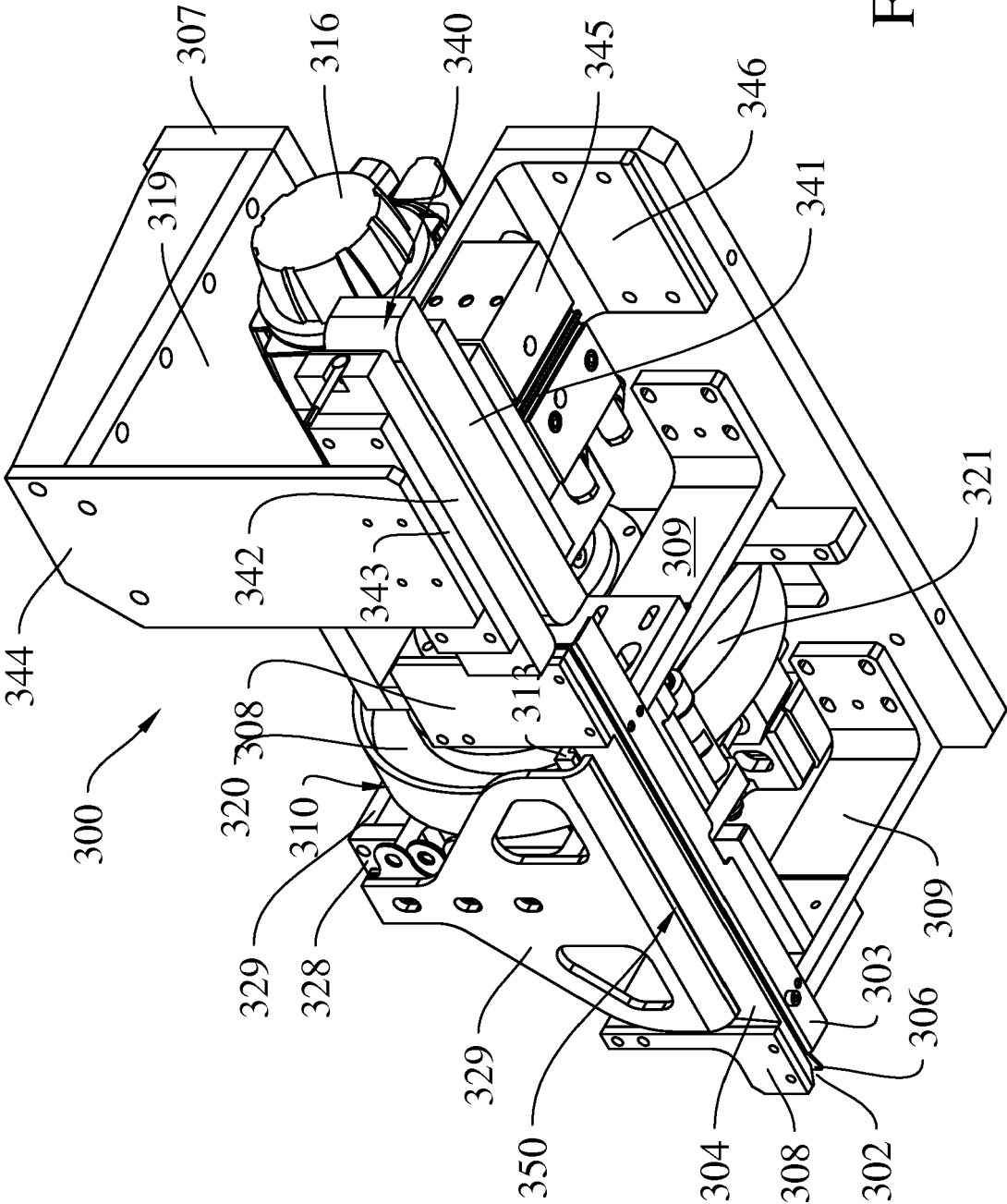


FIG. 2c

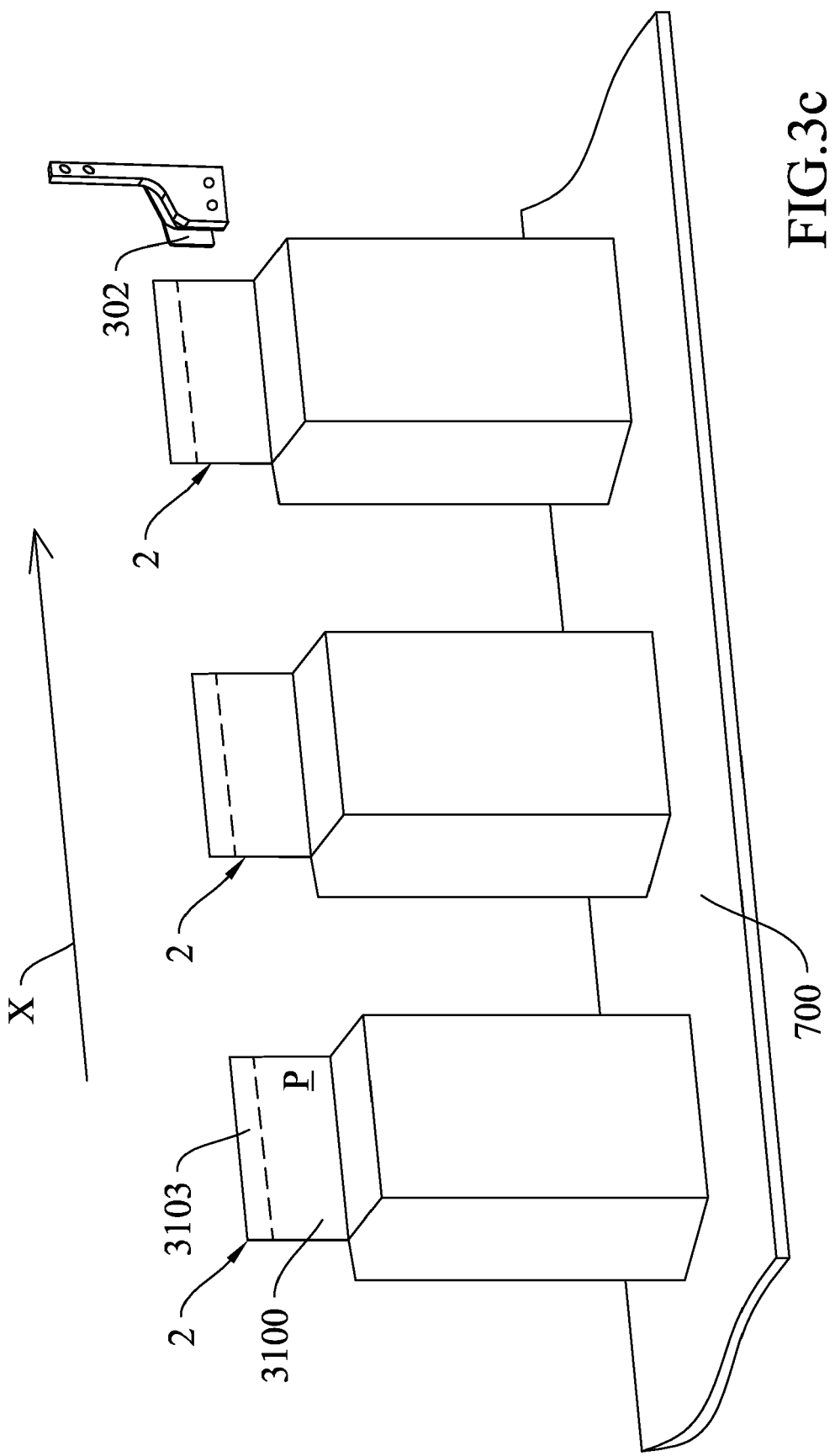
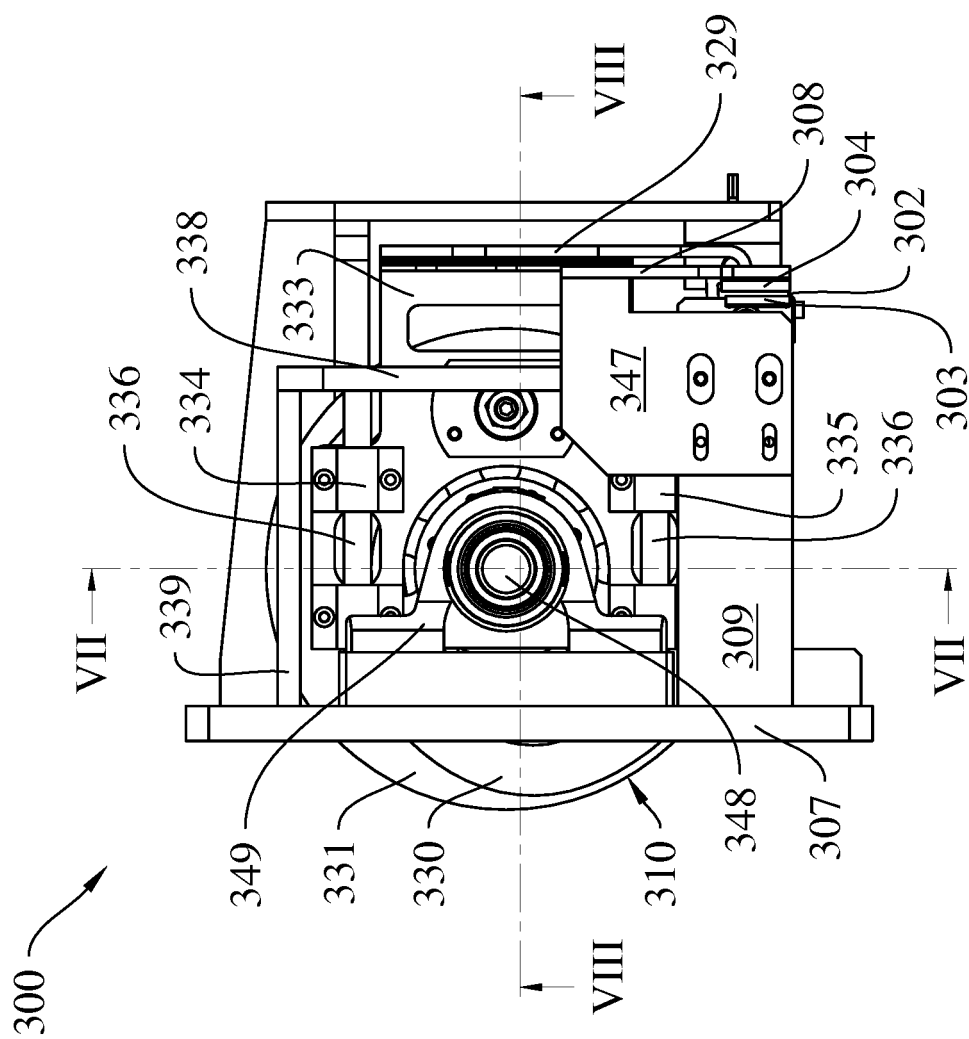
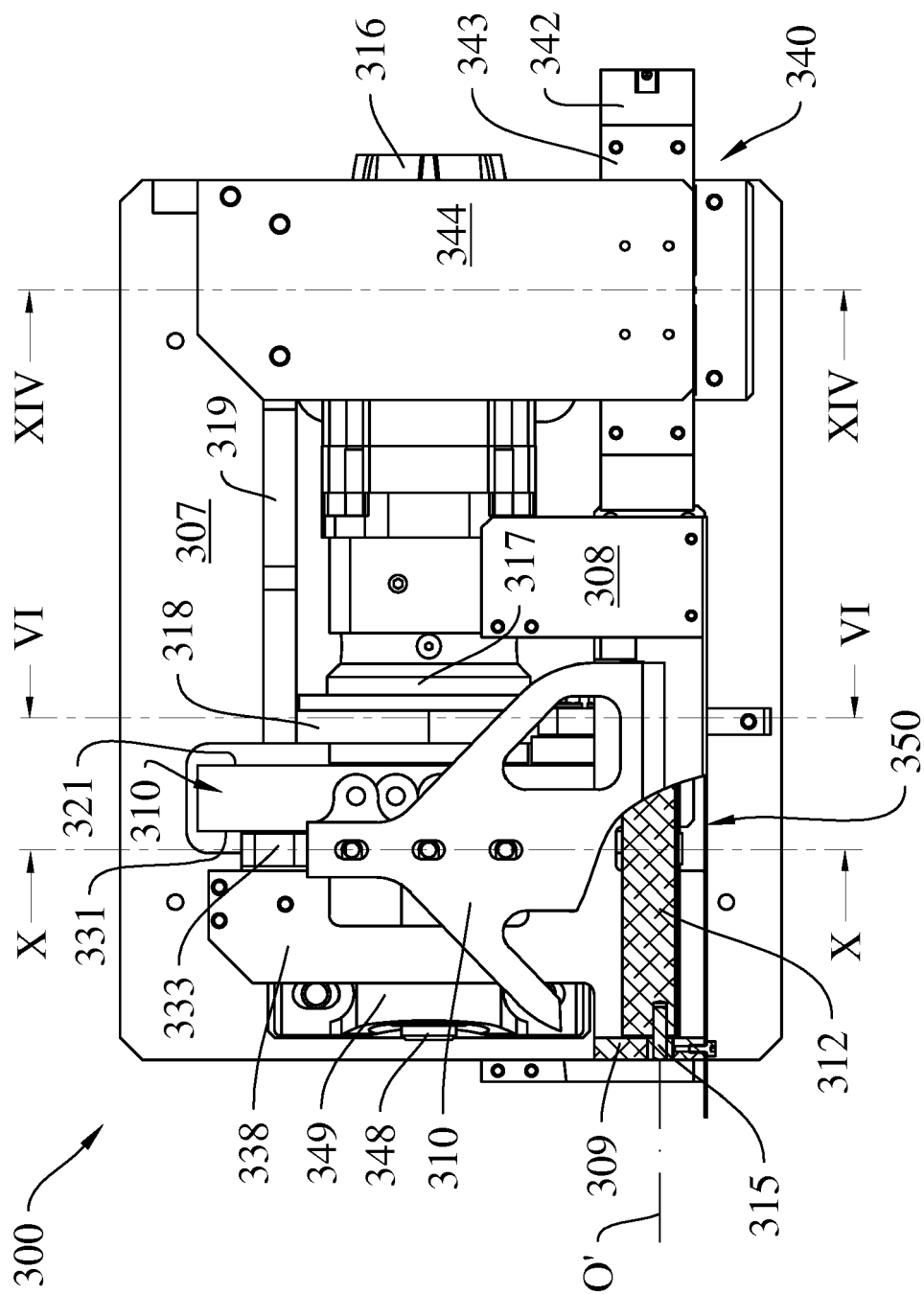


FIG.3c





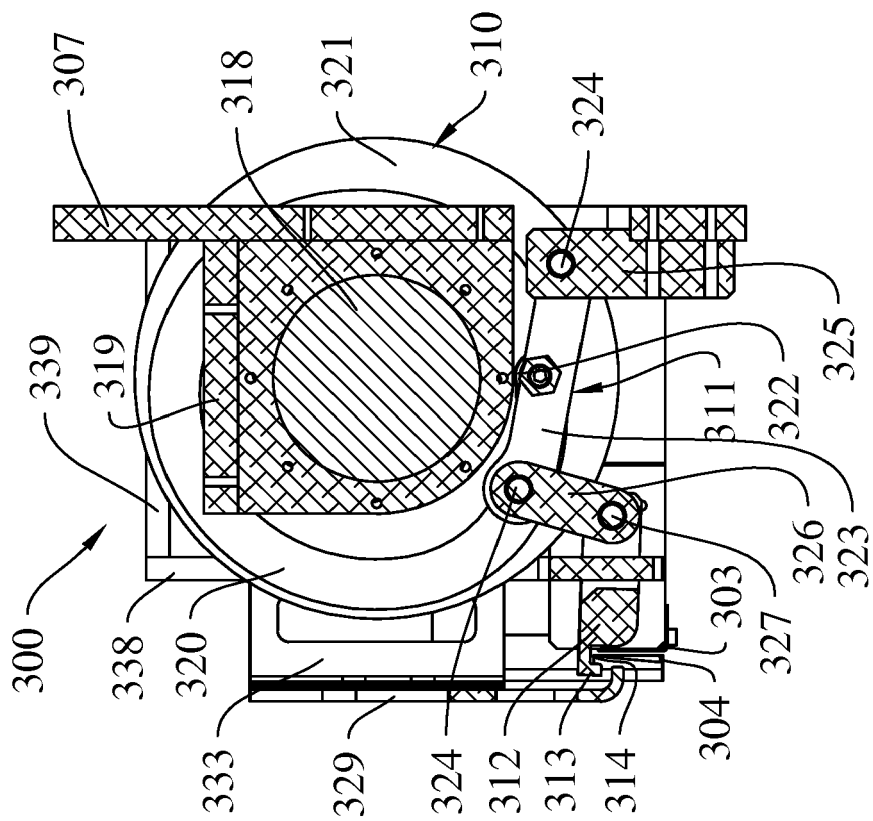


FIG.6c

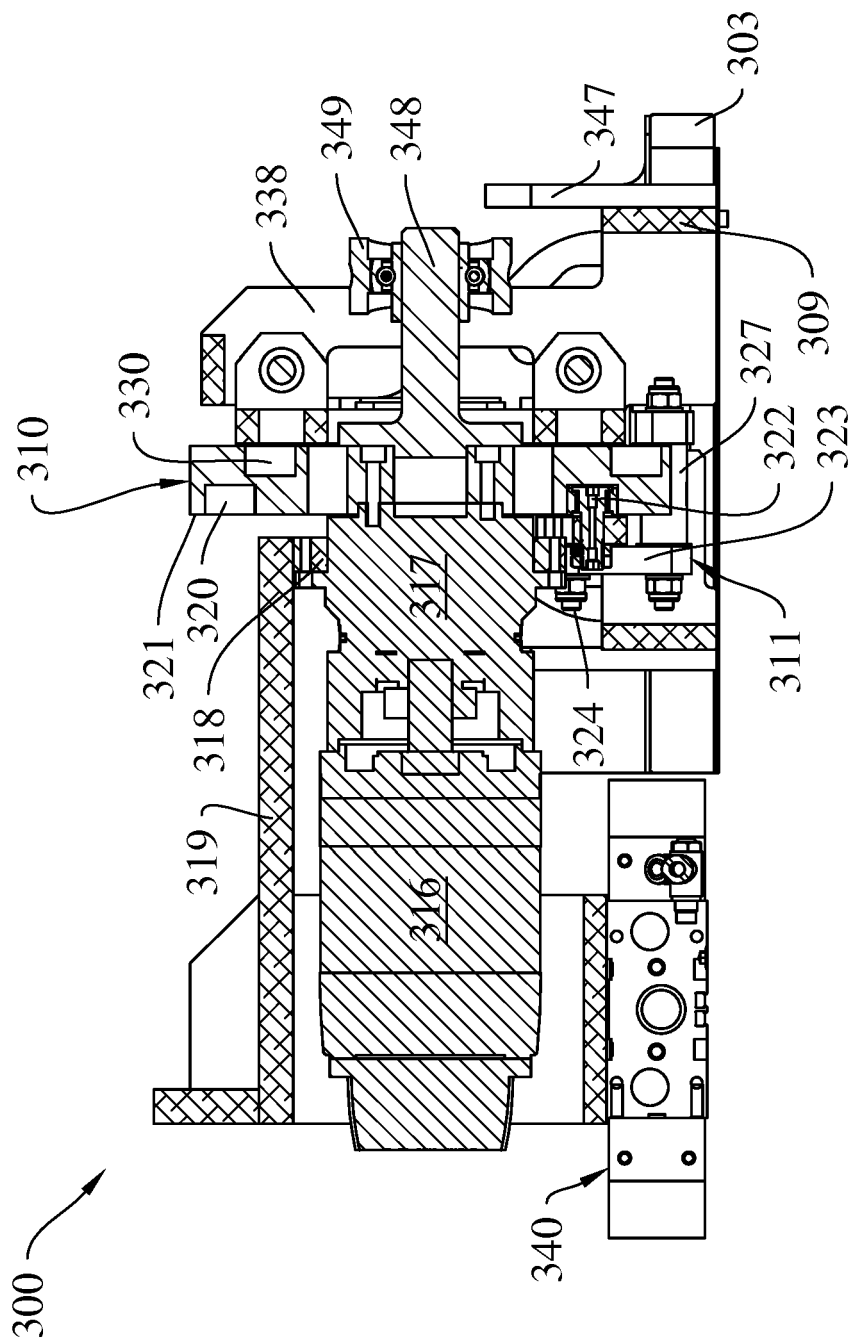


FIG.7c

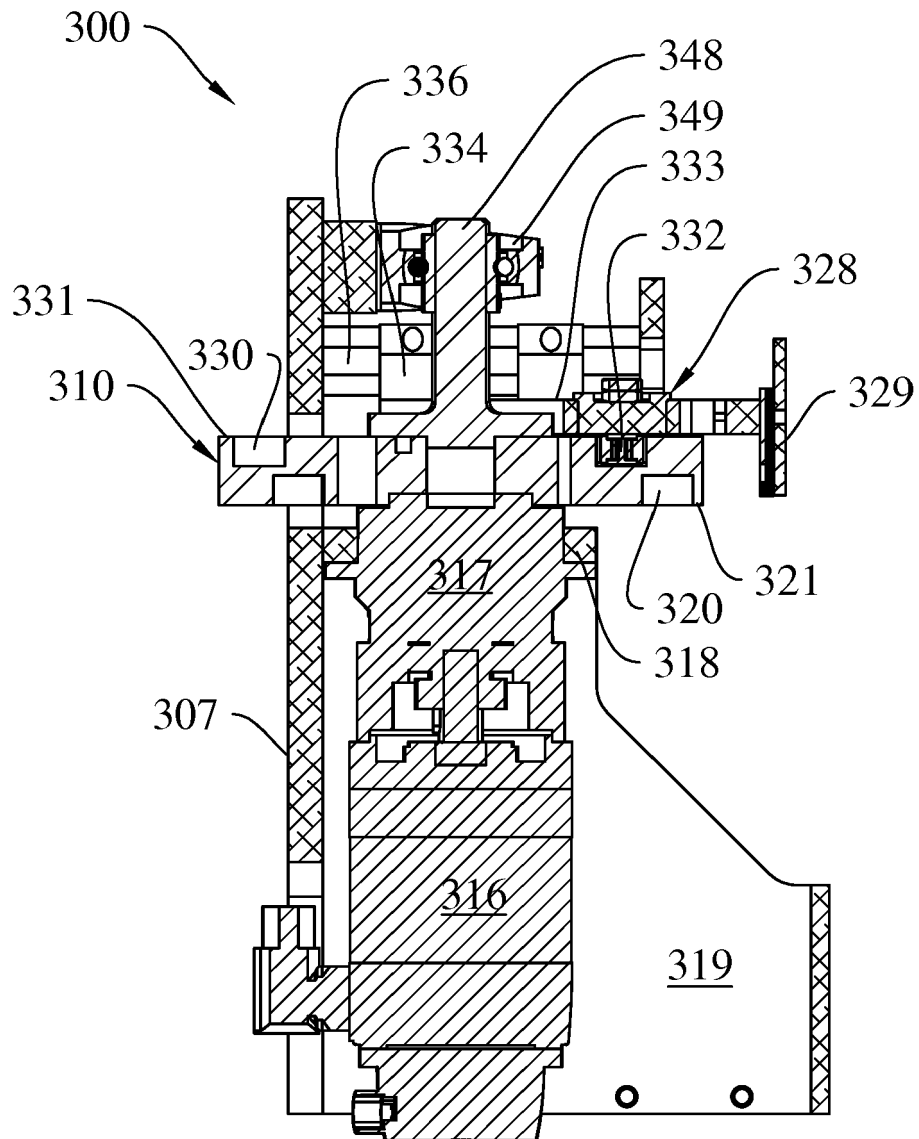


FIG.8c

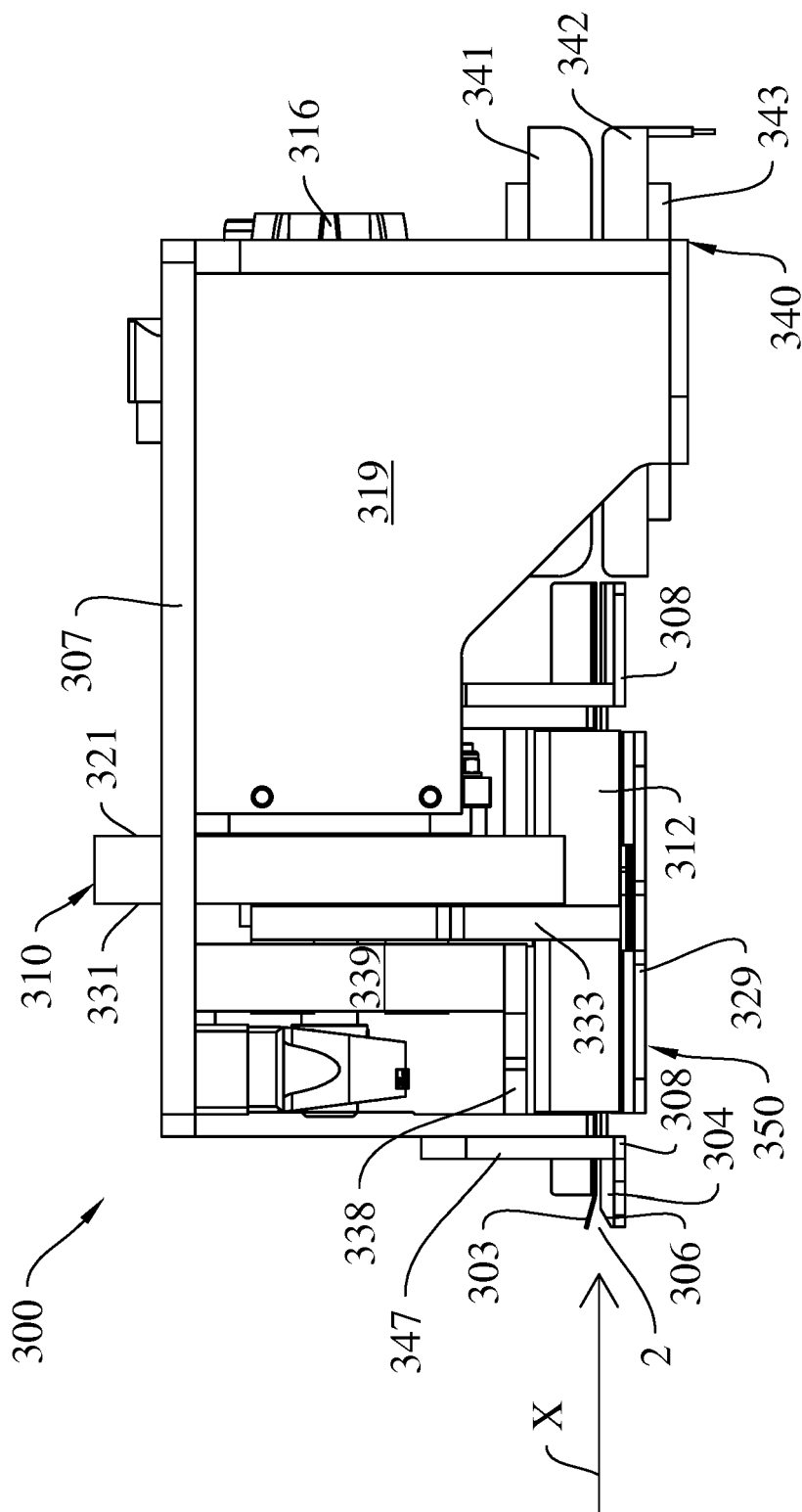


FIG.9c

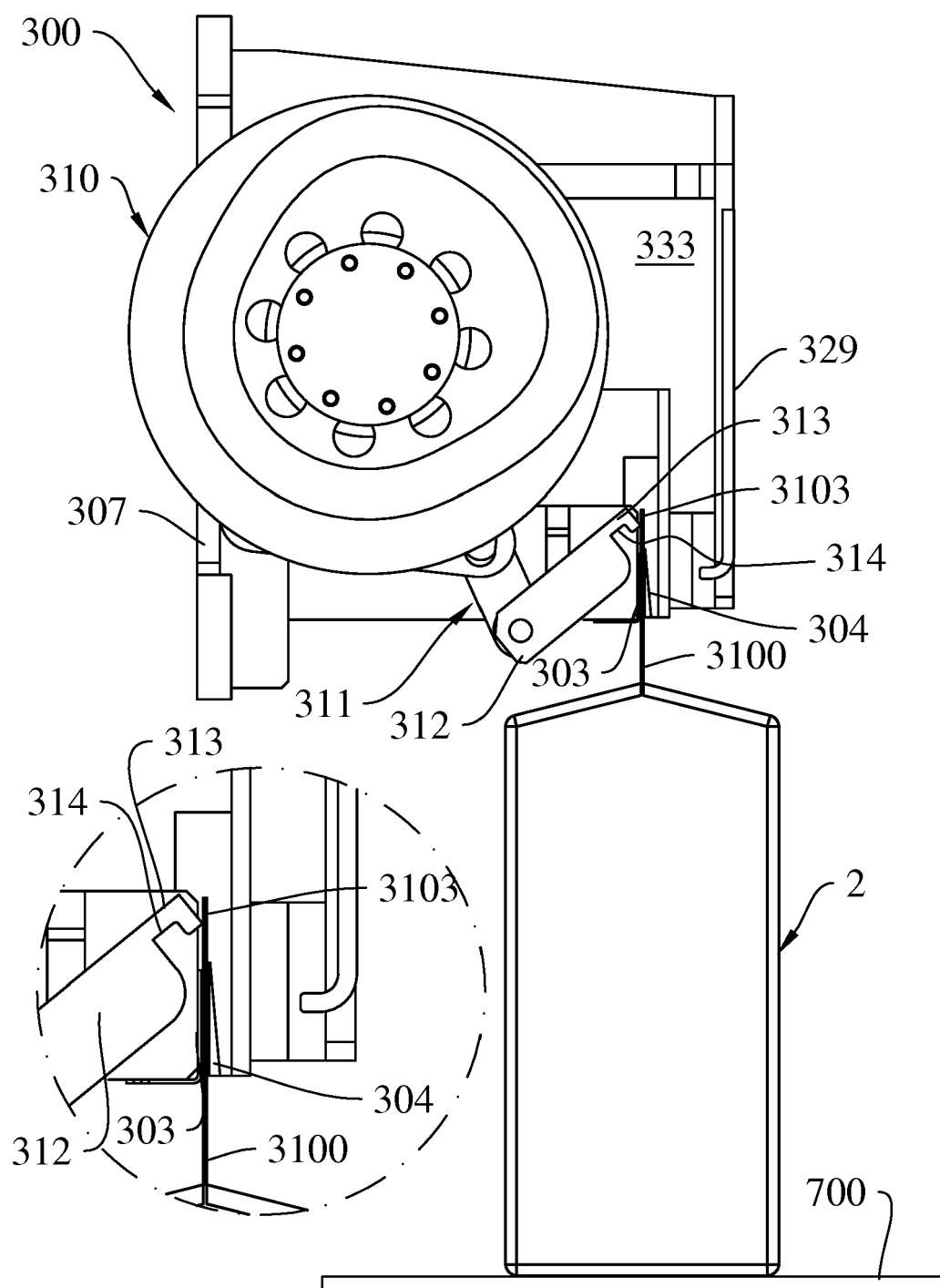


FIG.10c

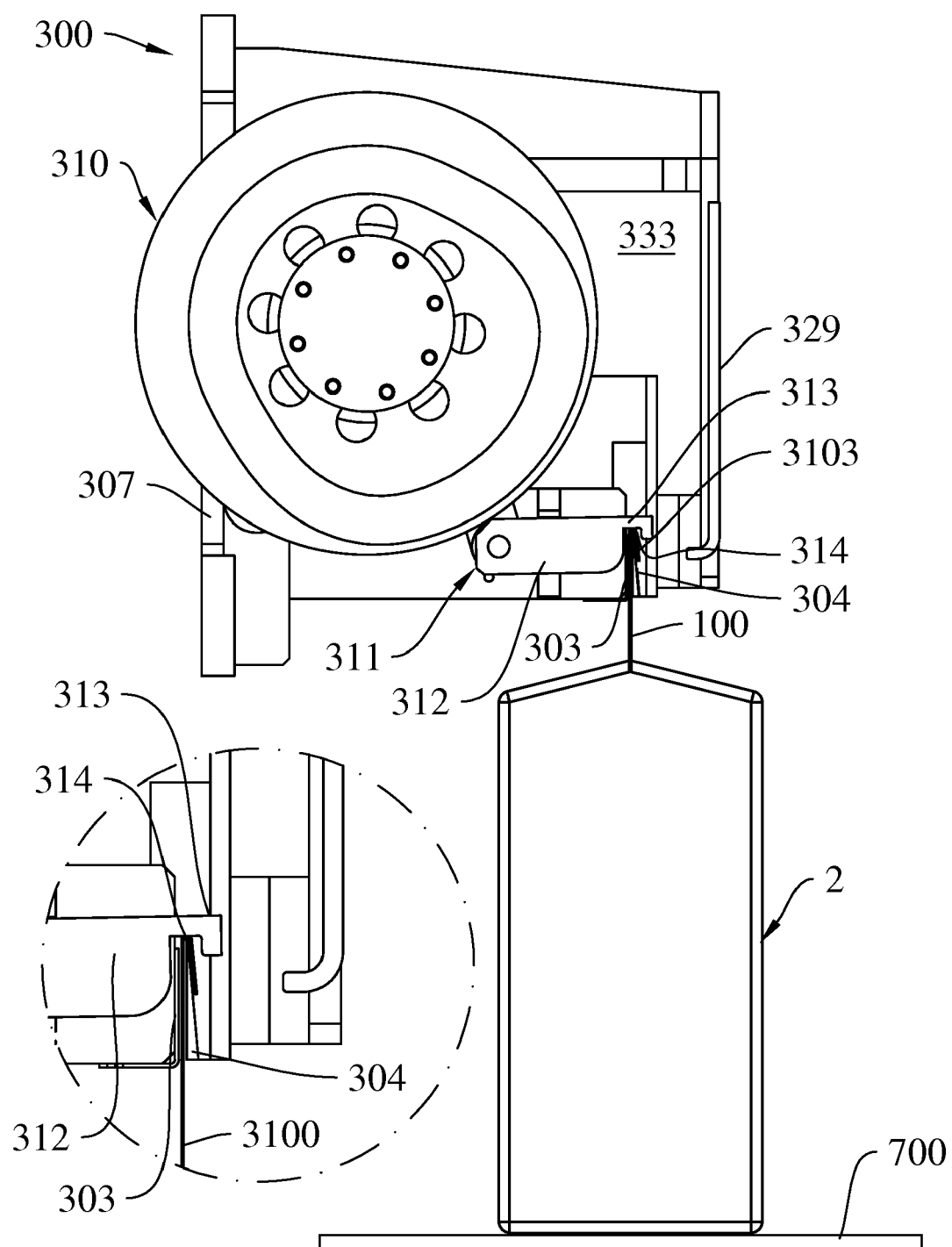


FIG.11c

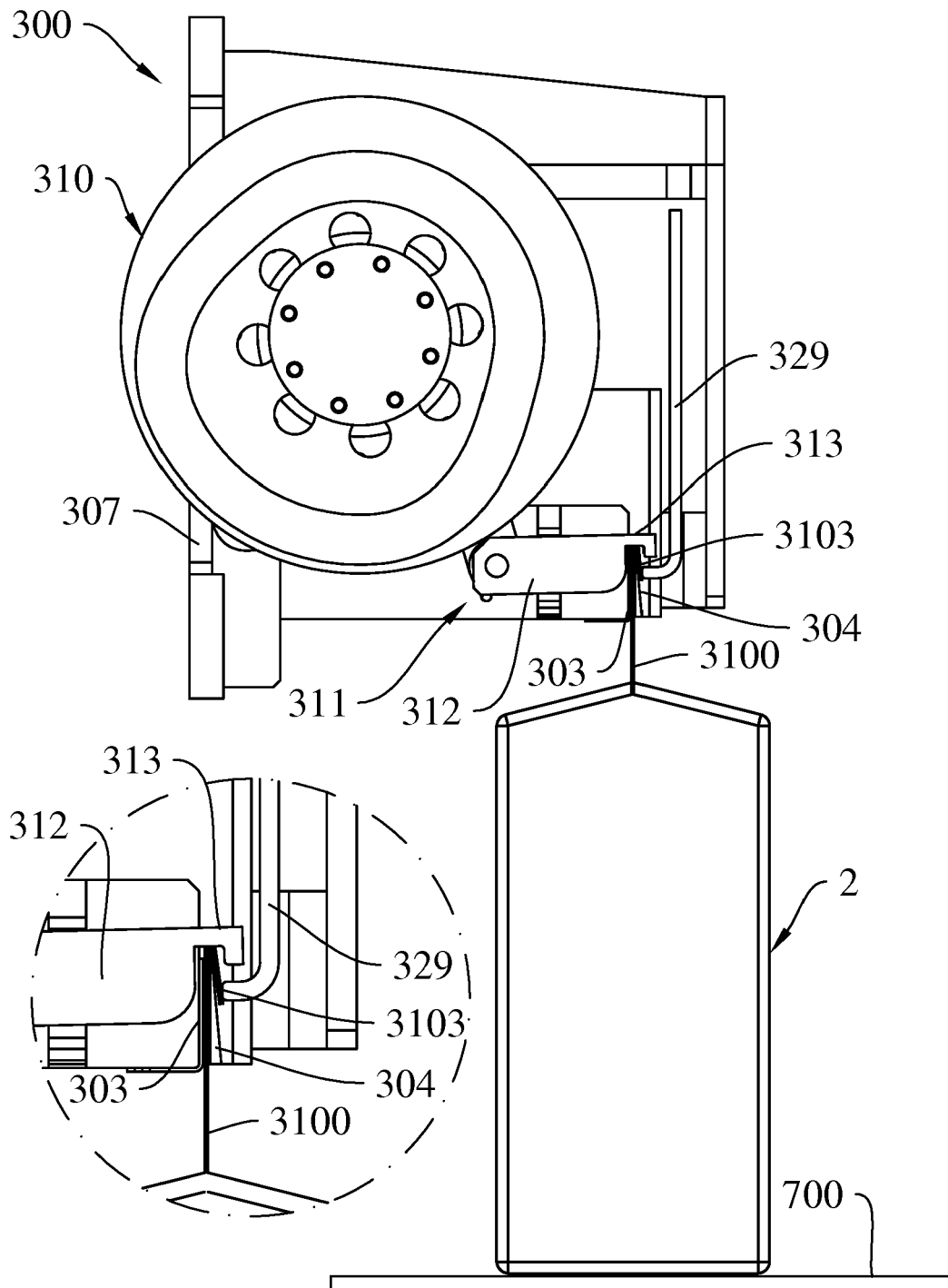


FIG.12c

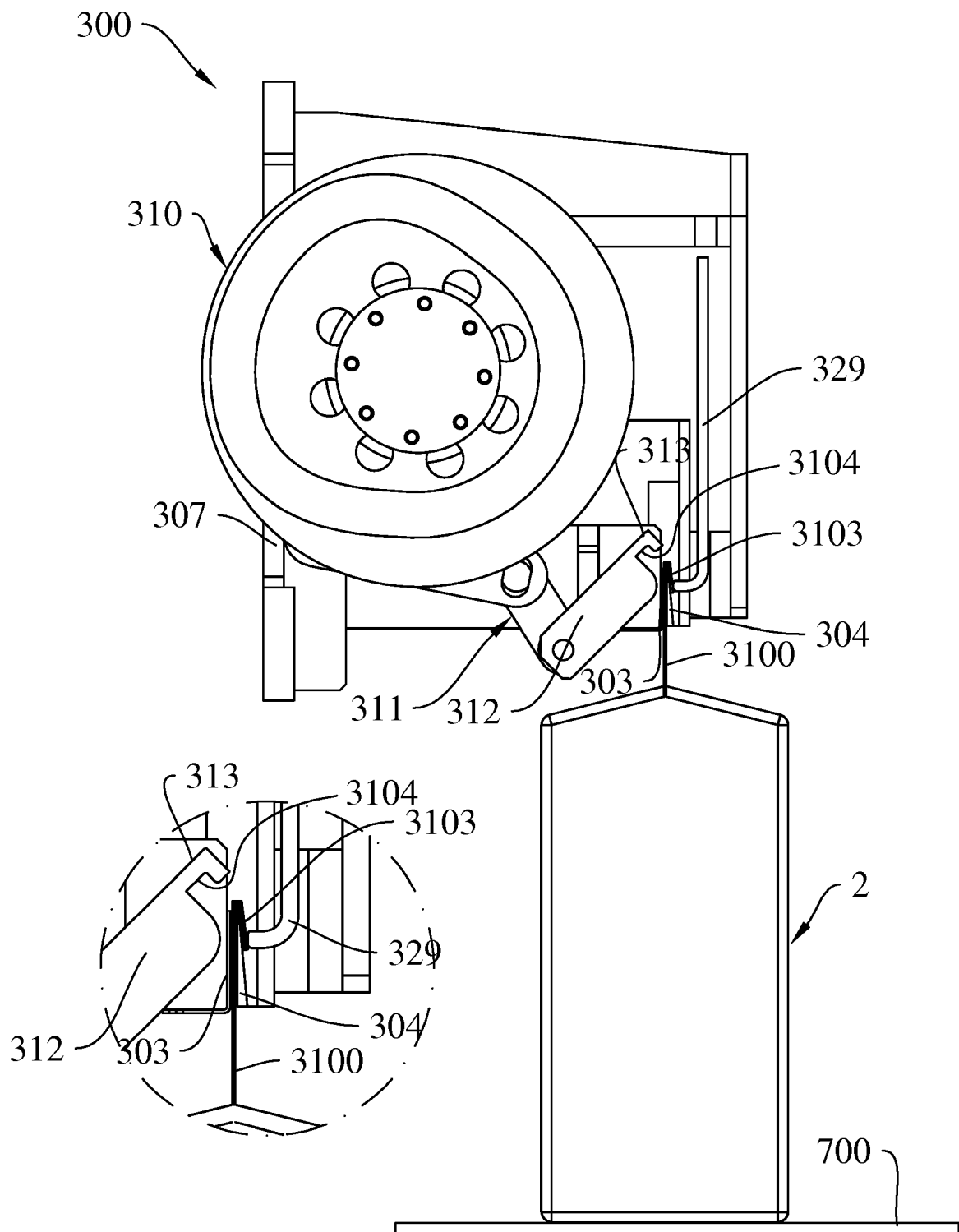


FIG.13c

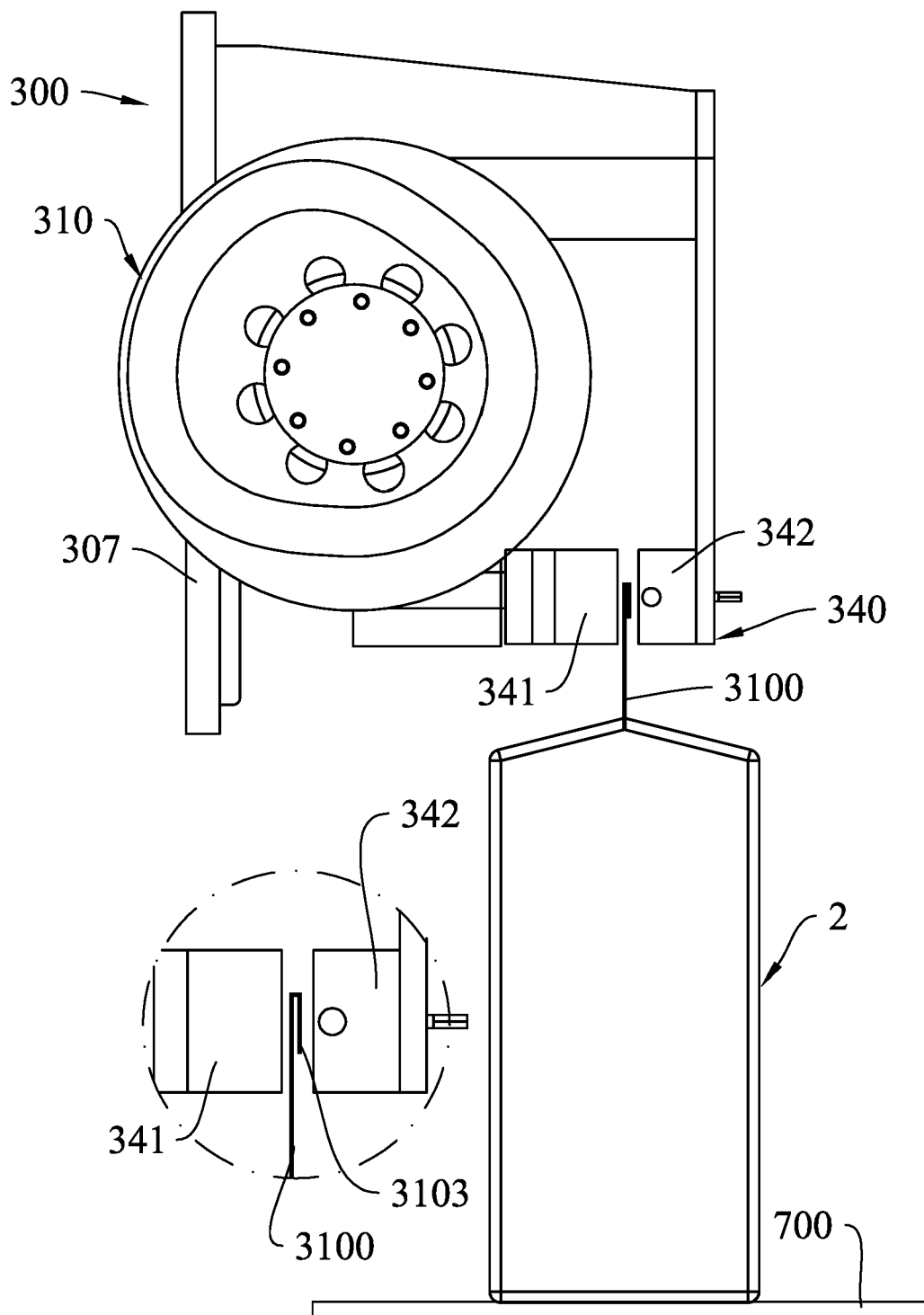


FIG.14c

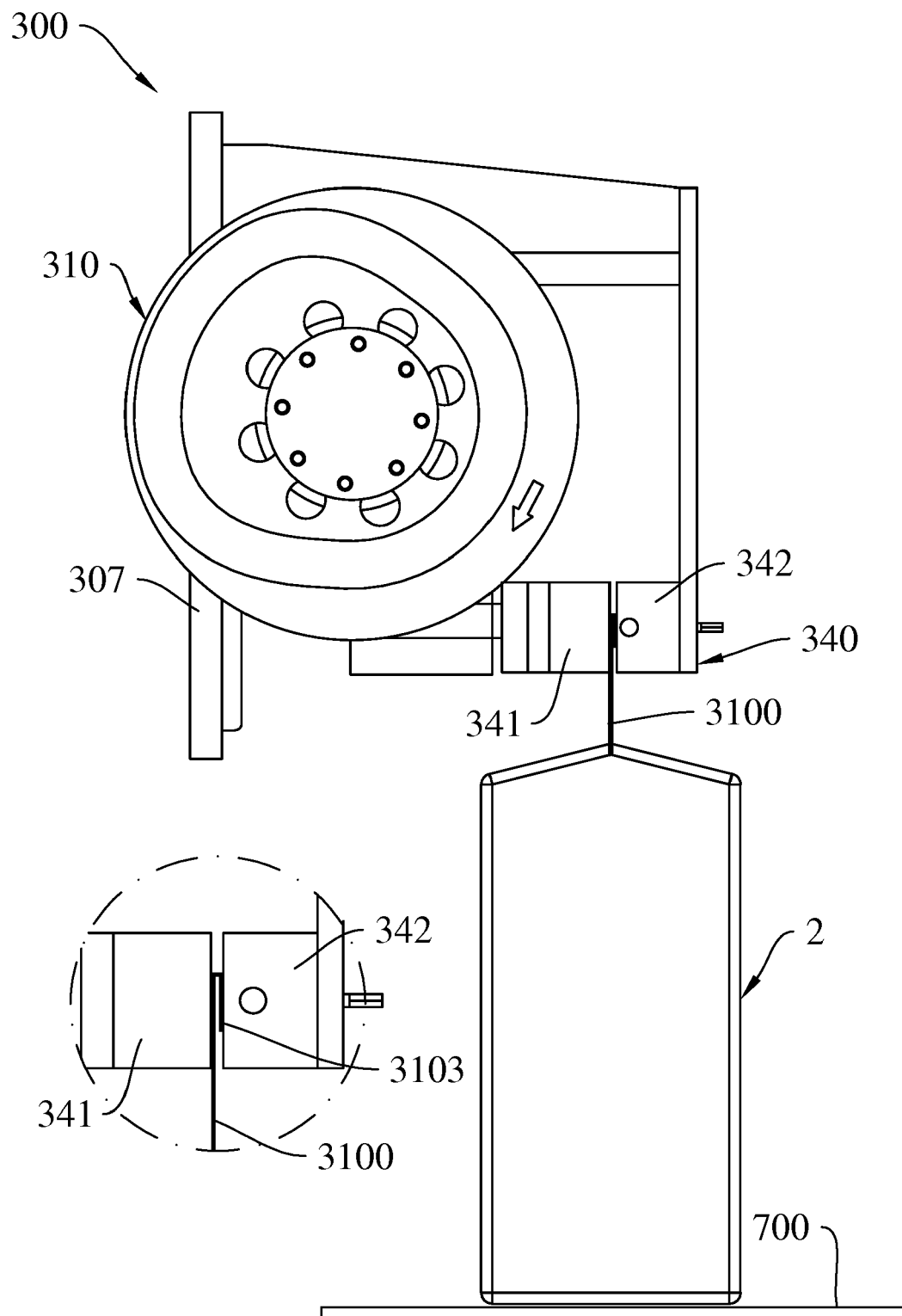


FIG.15c

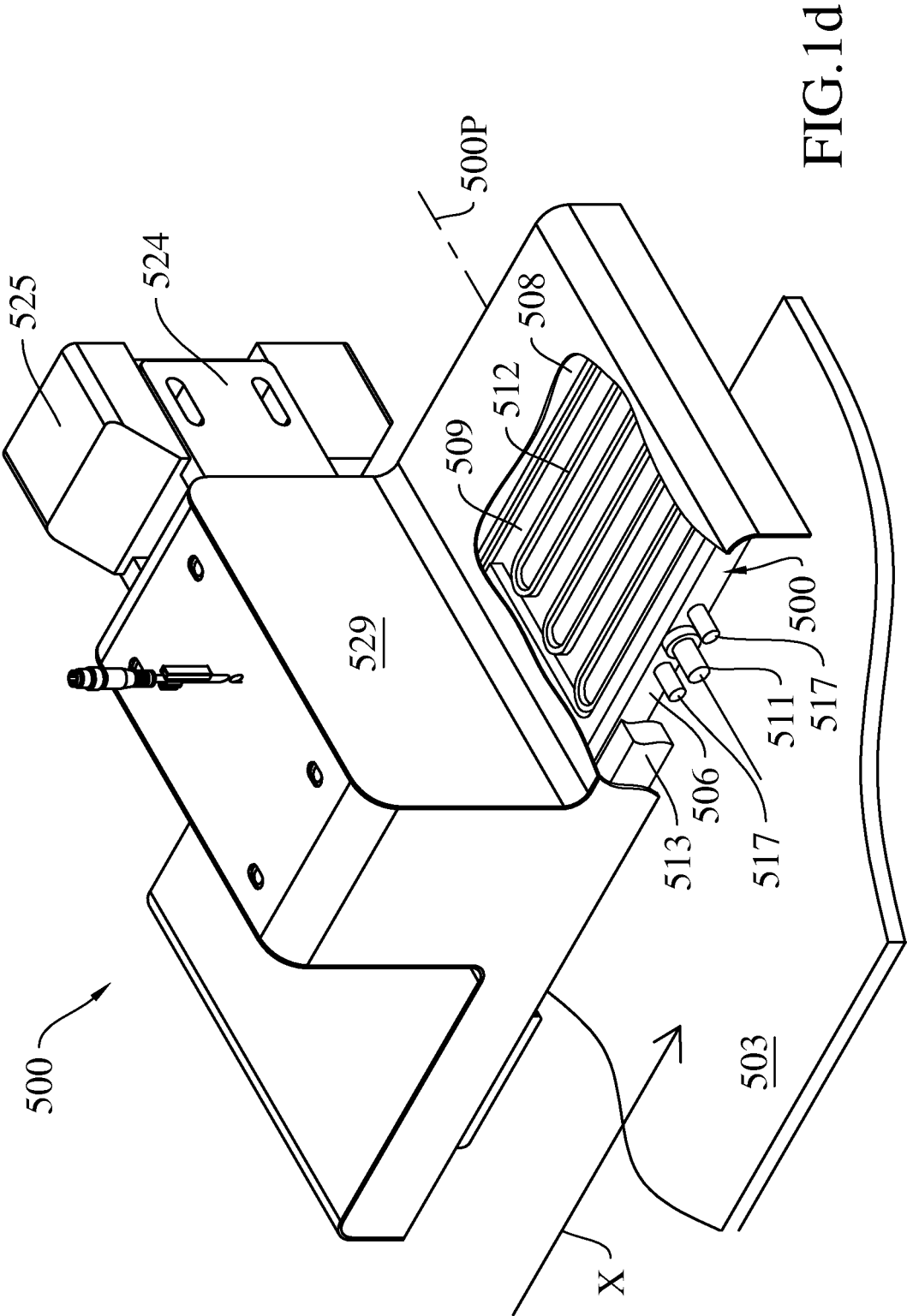


FIG. 1d

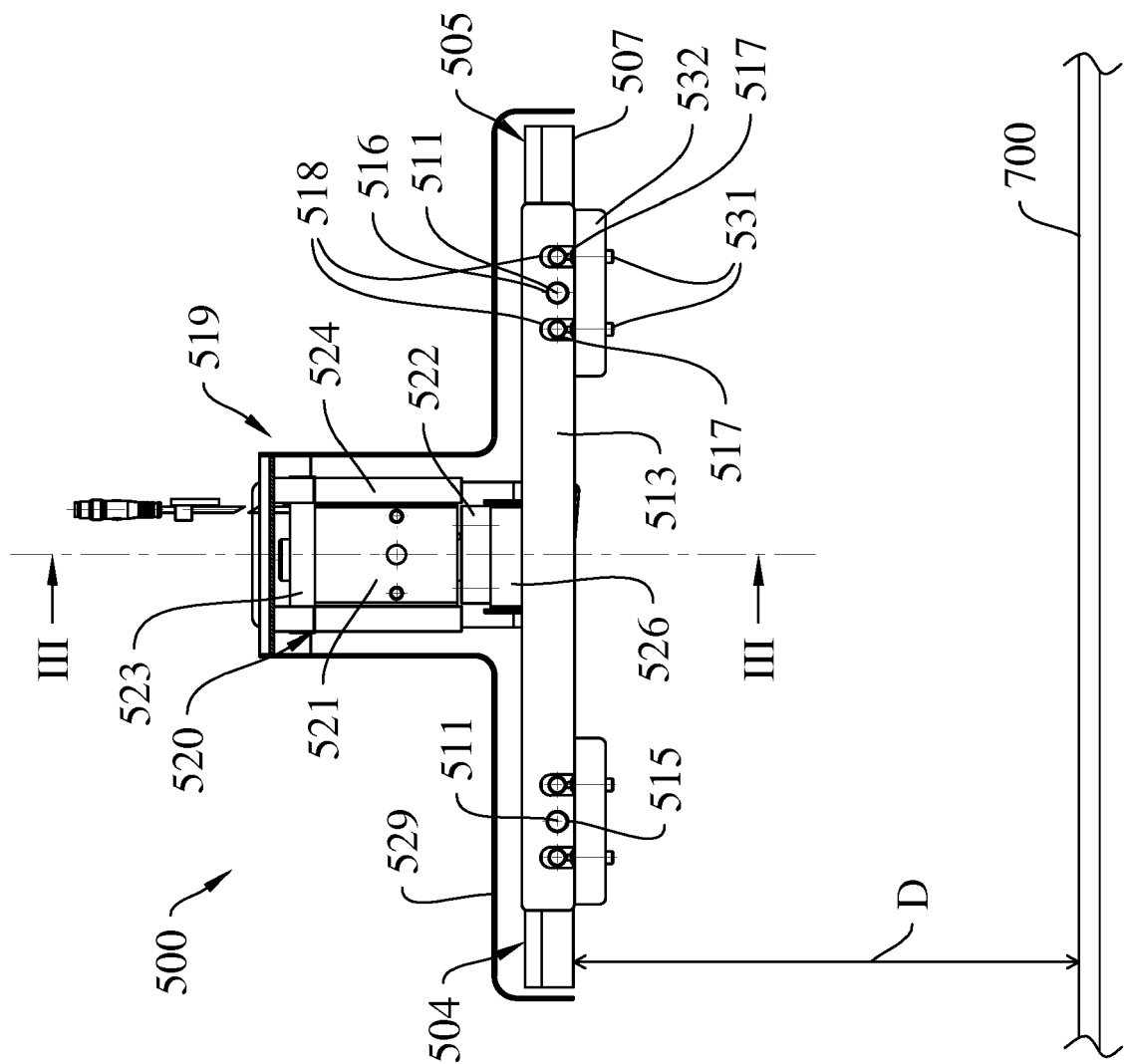


FIG.2d

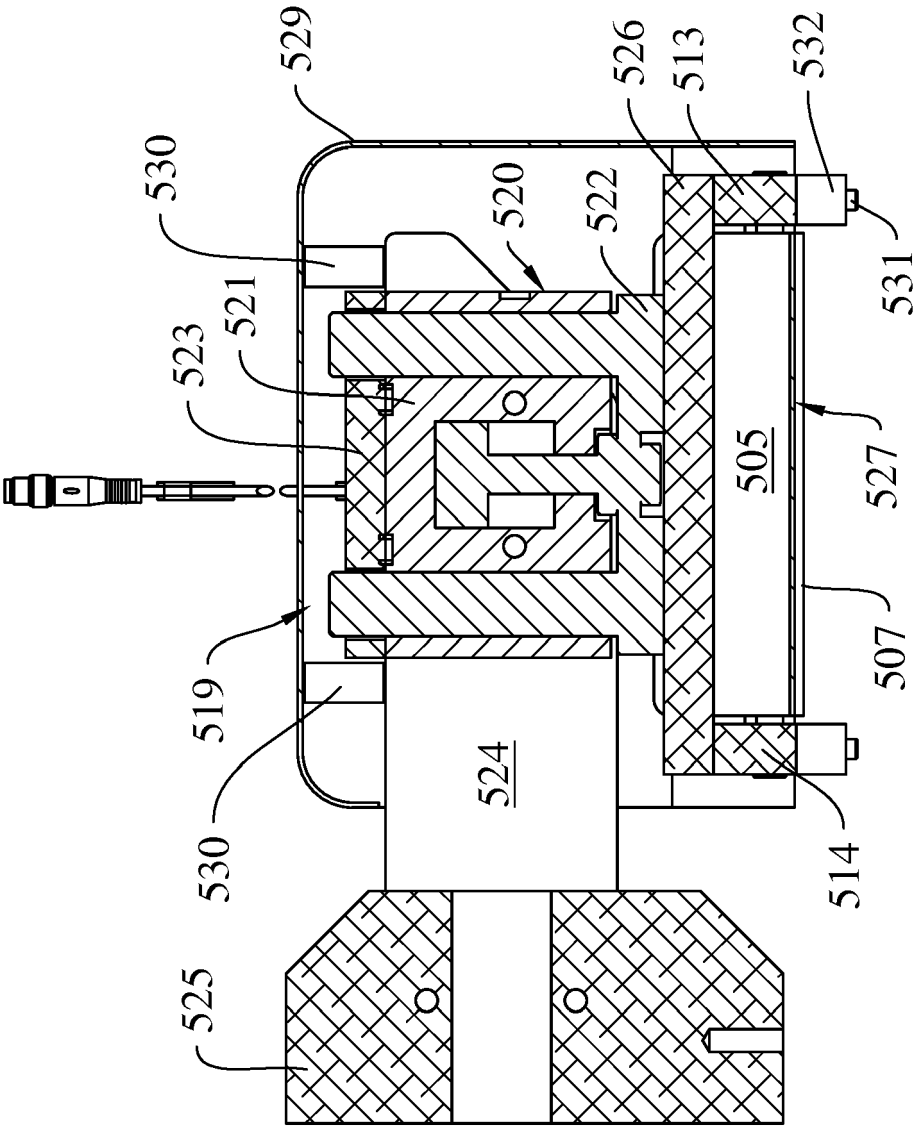
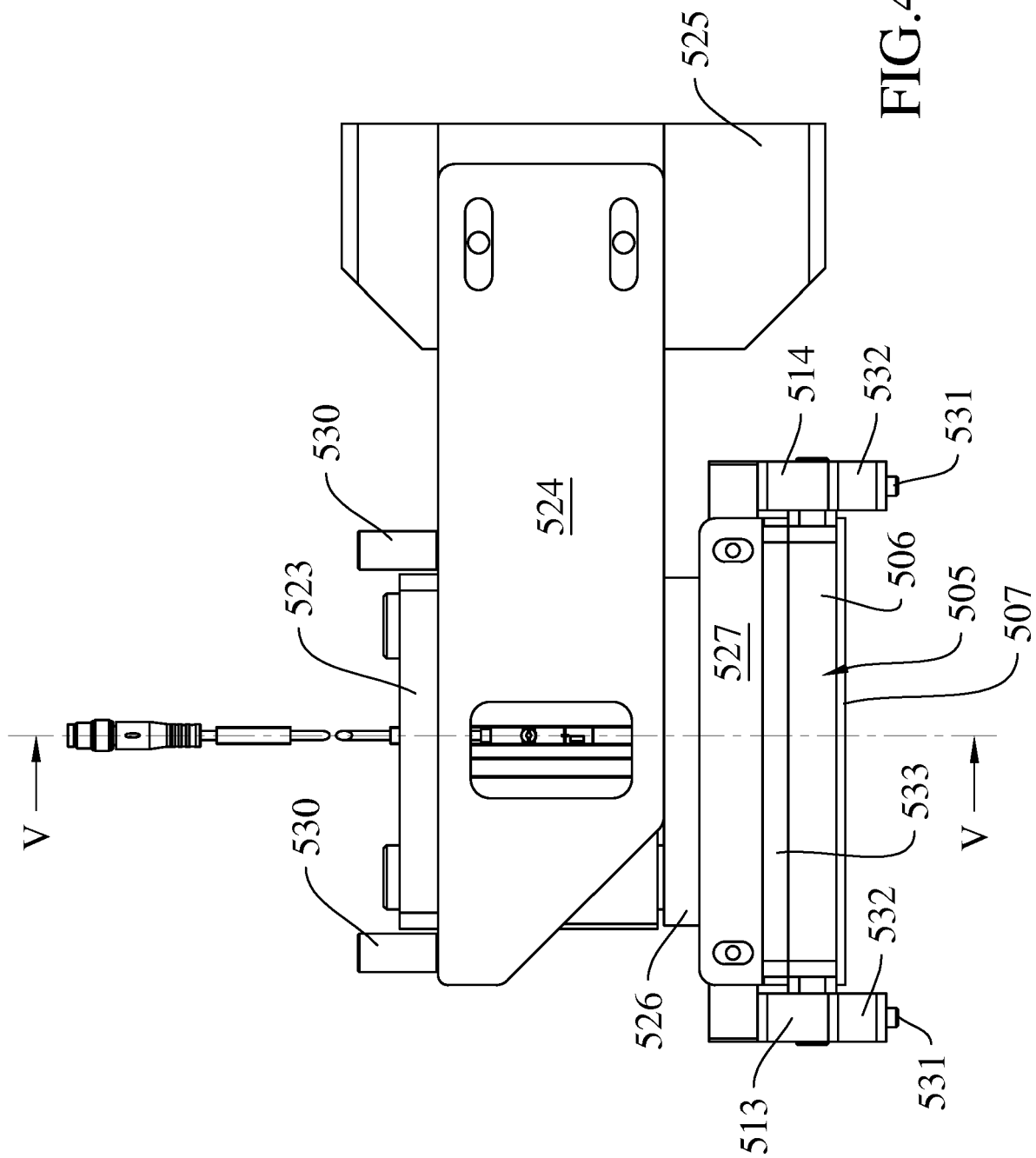


FIG.3d



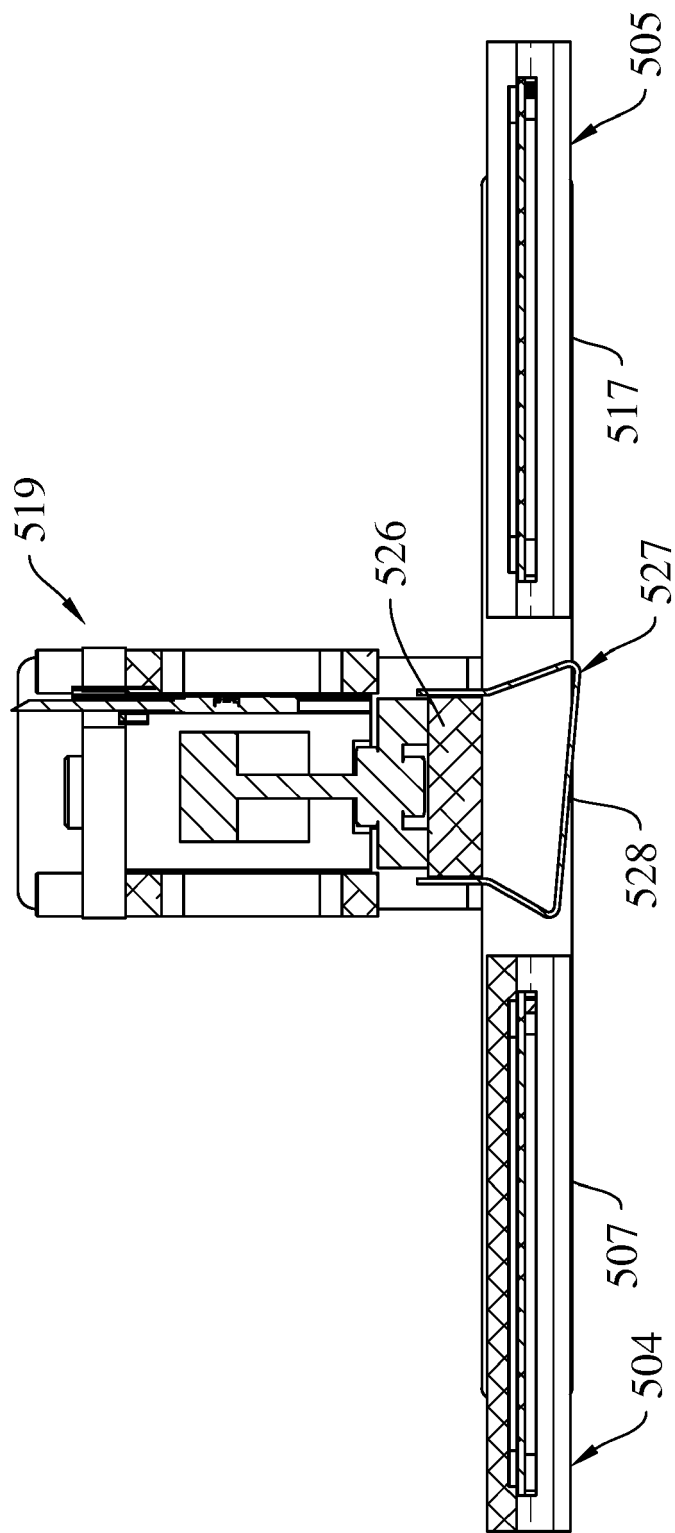


FIG.5d

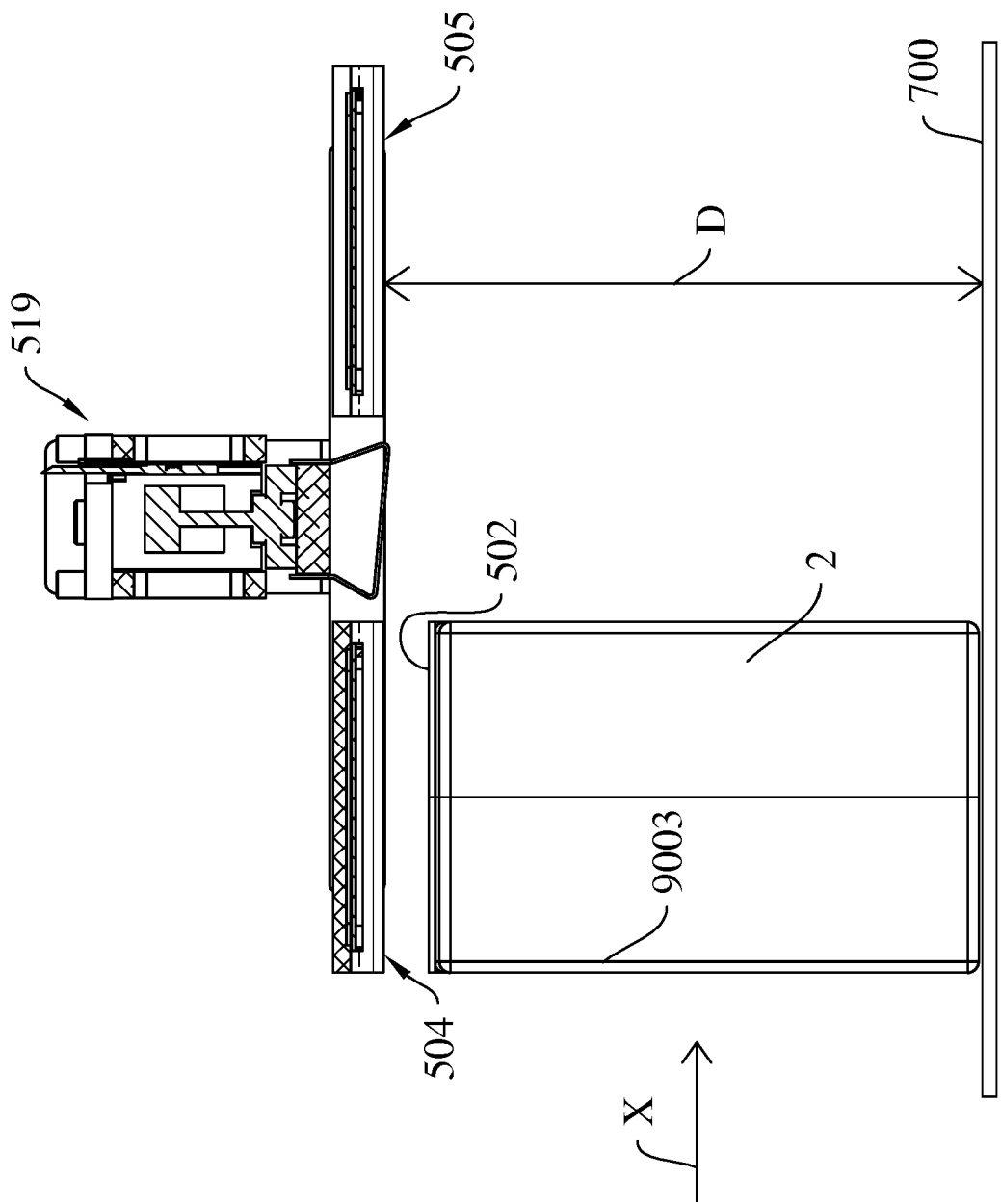


FIG. 6d

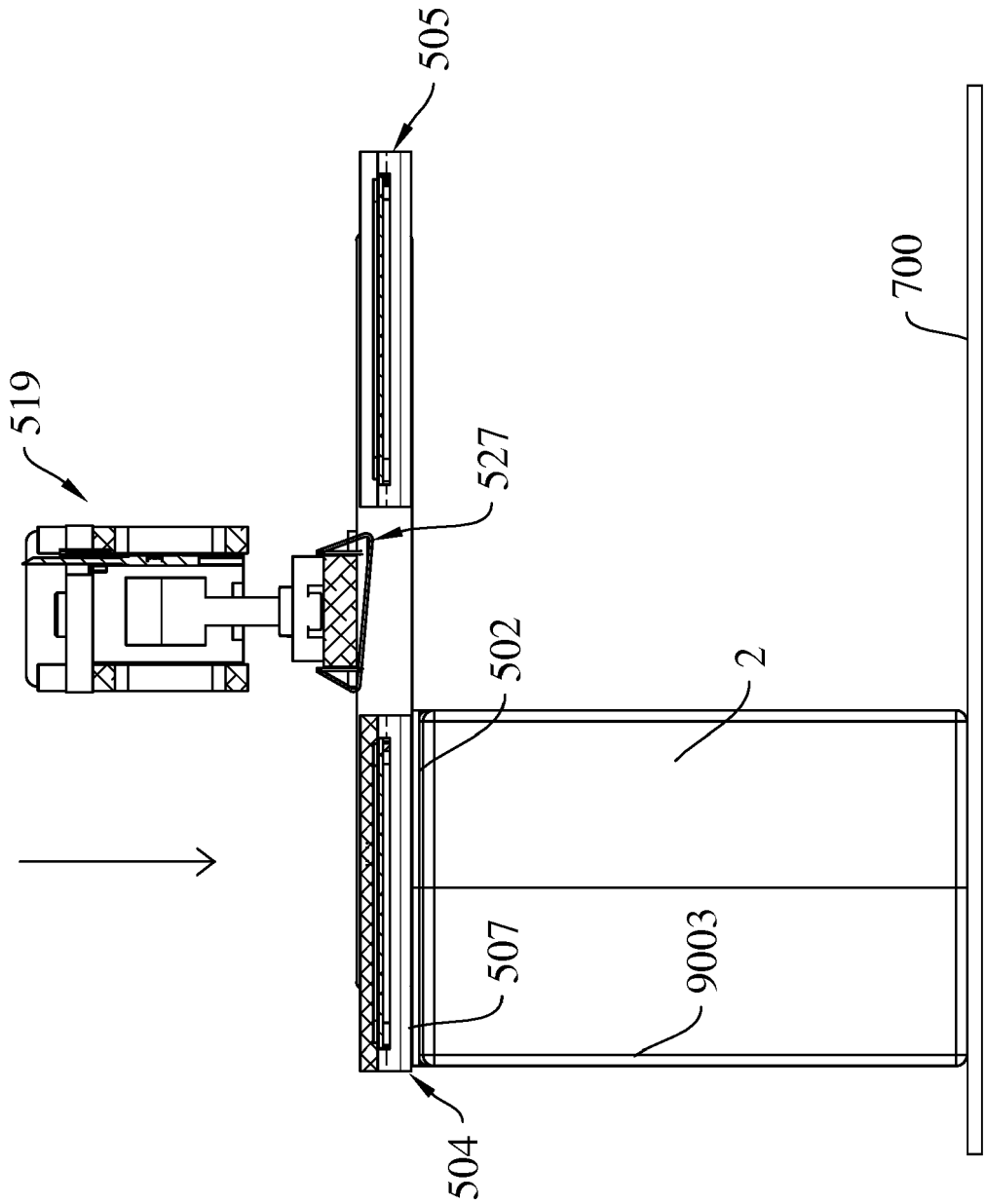


FIG. 7d

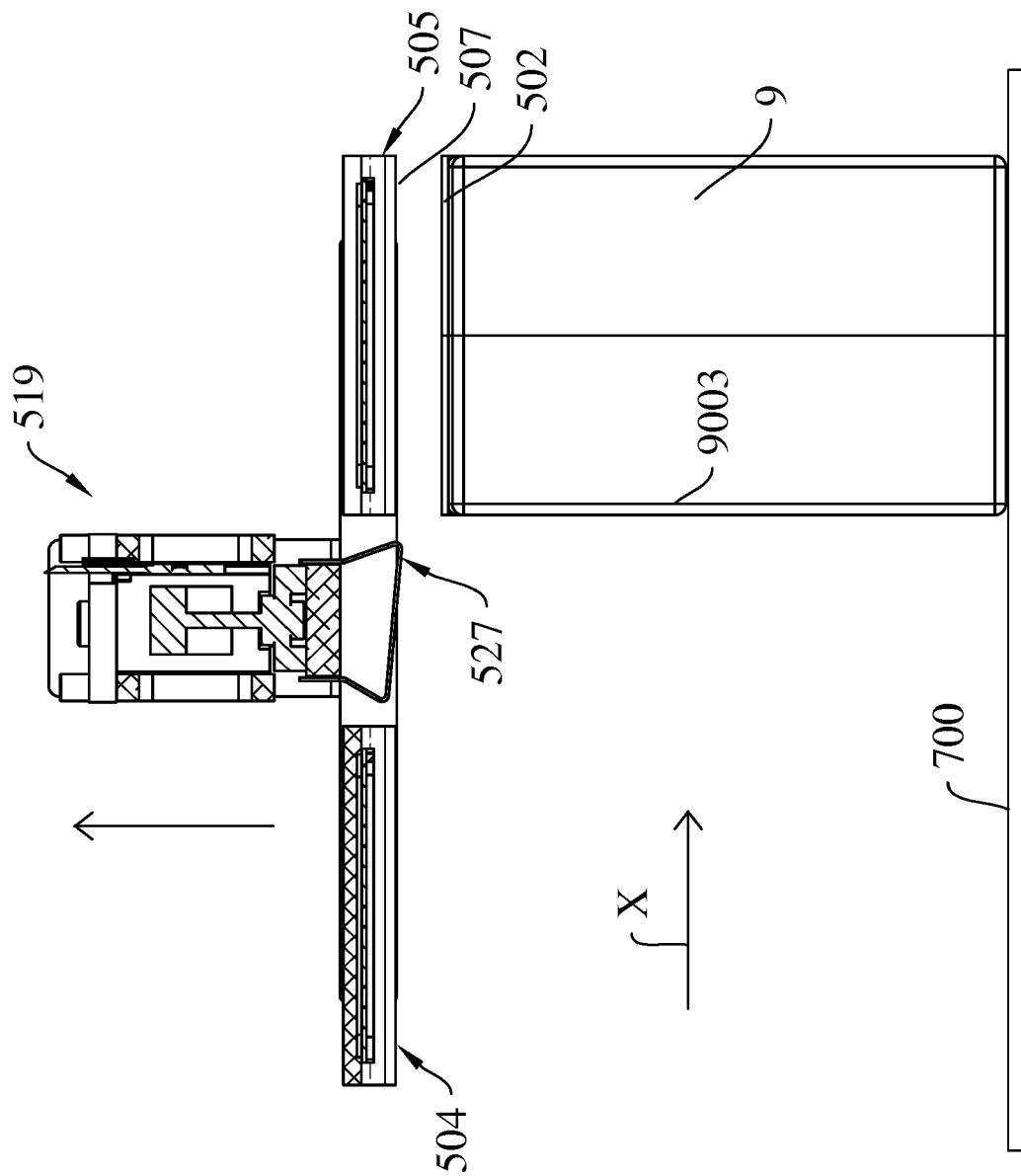


FIG. 8d

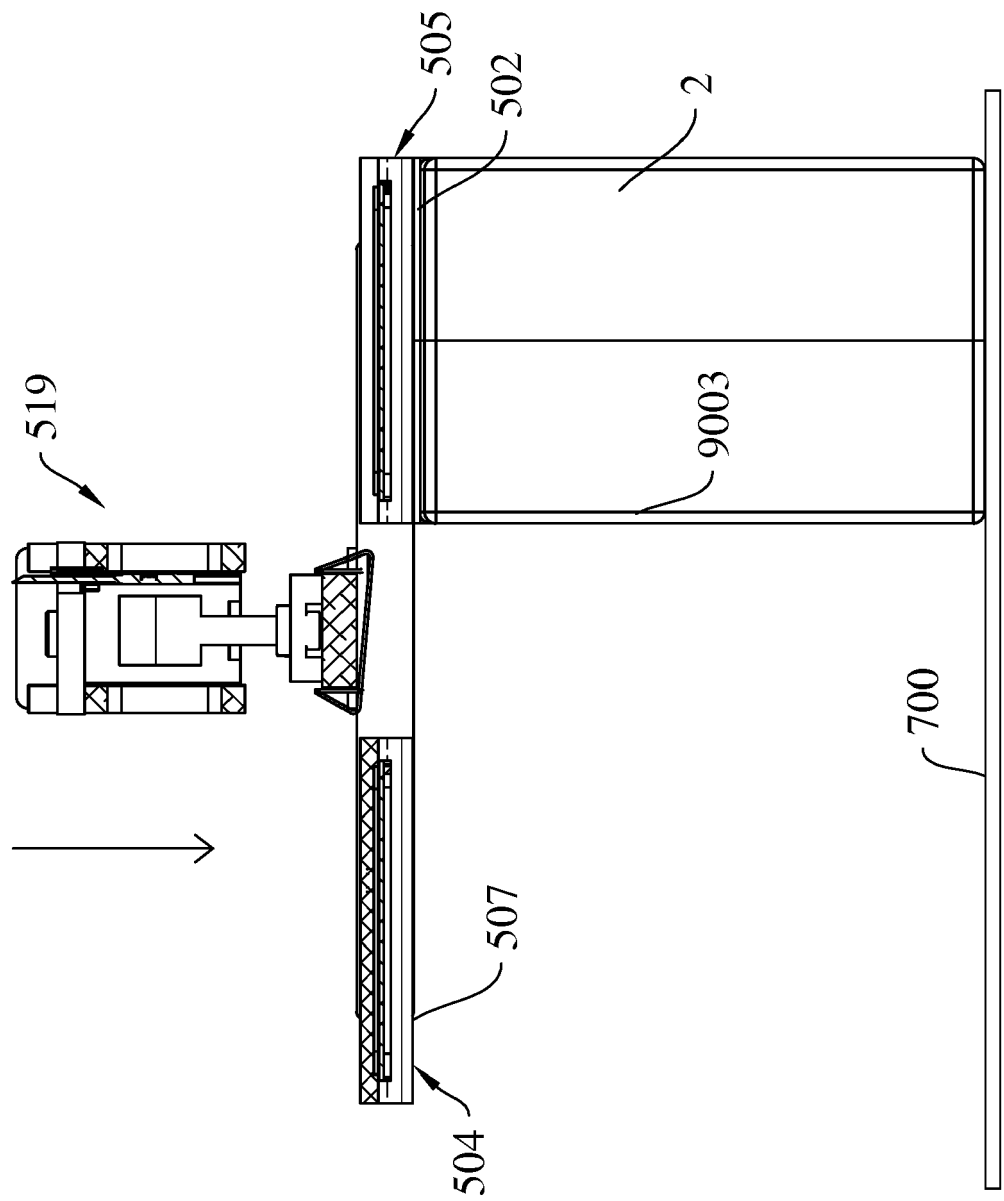


FIG. 9d

FIG.1e

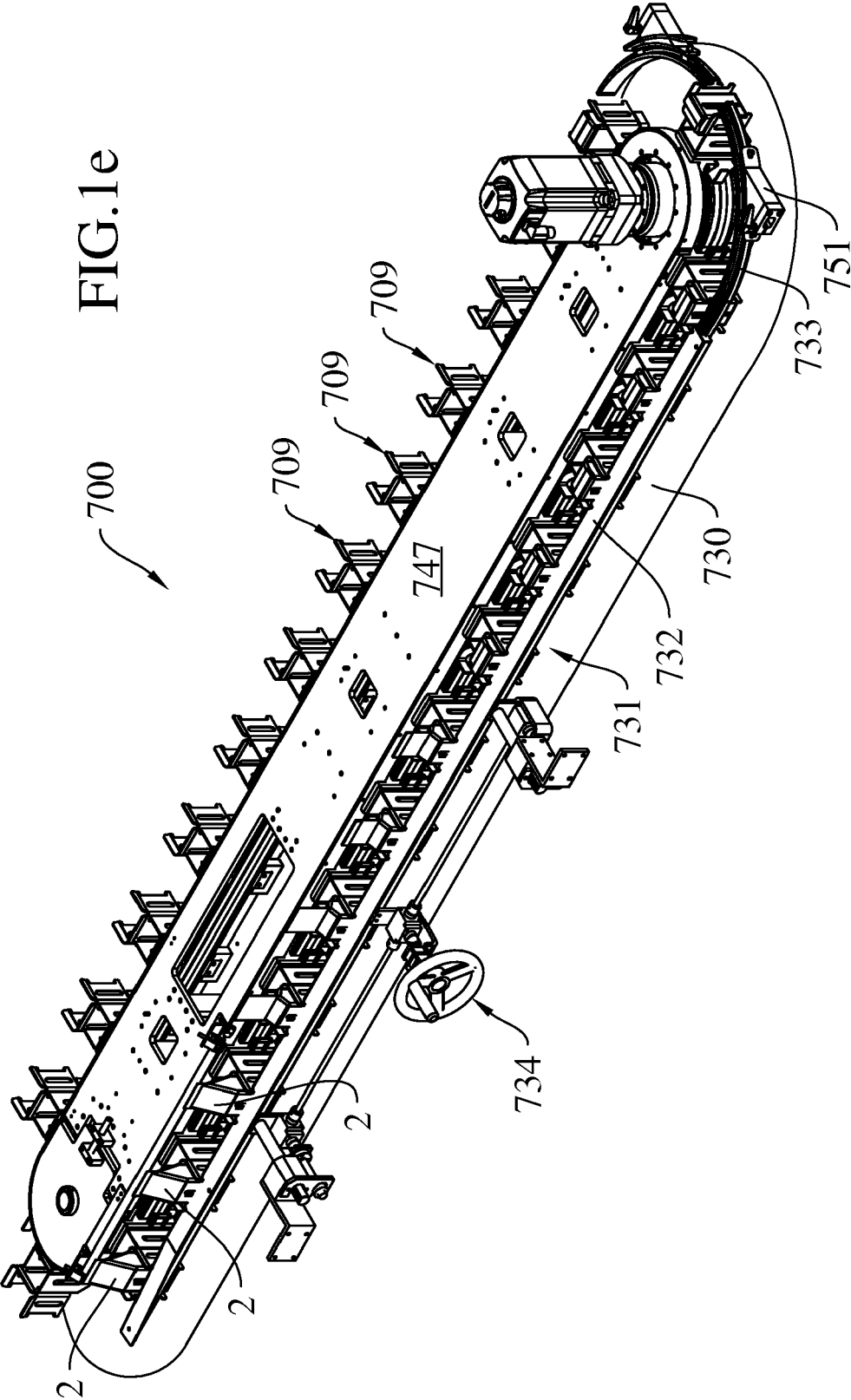
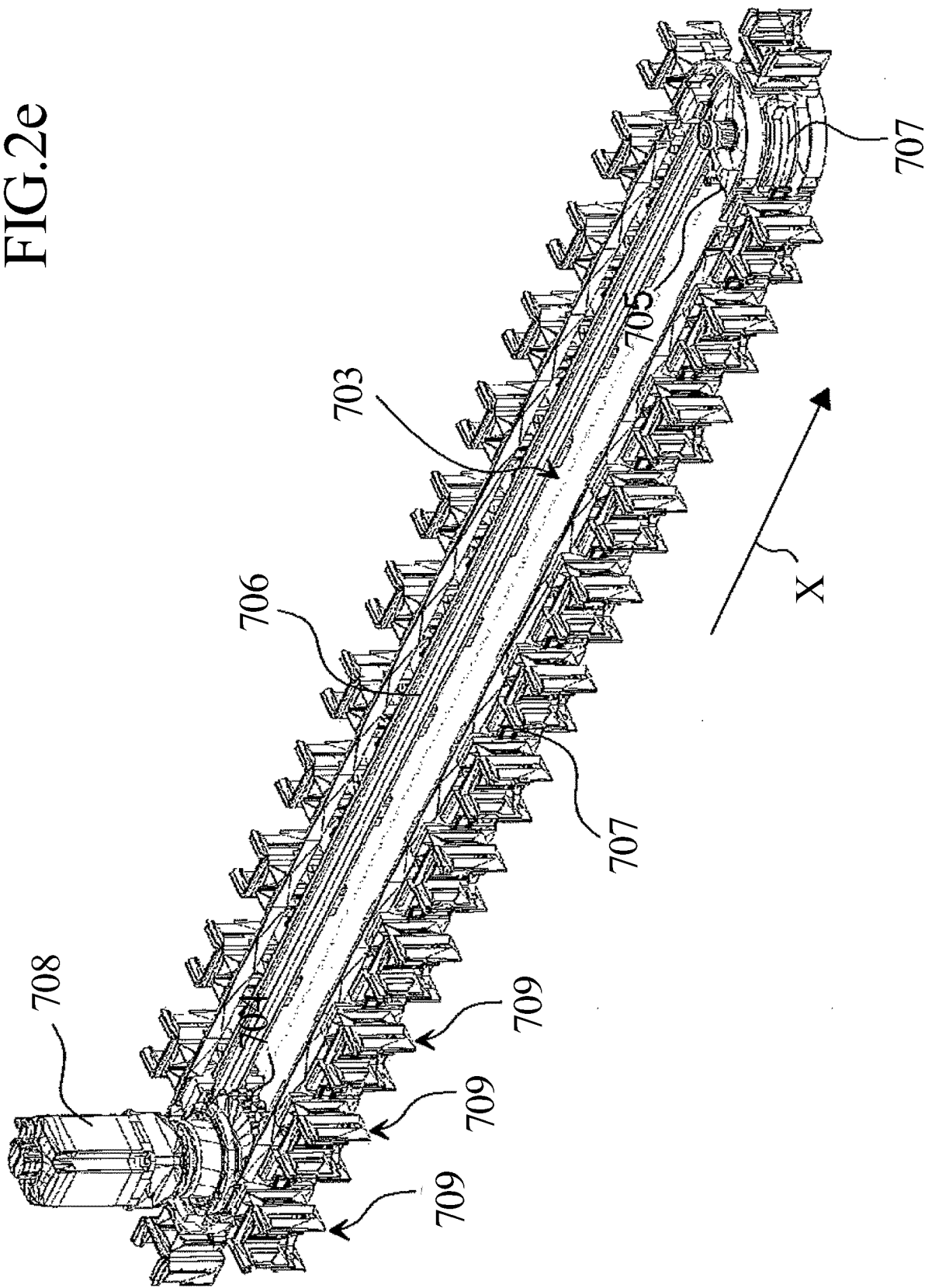


FIG.2e



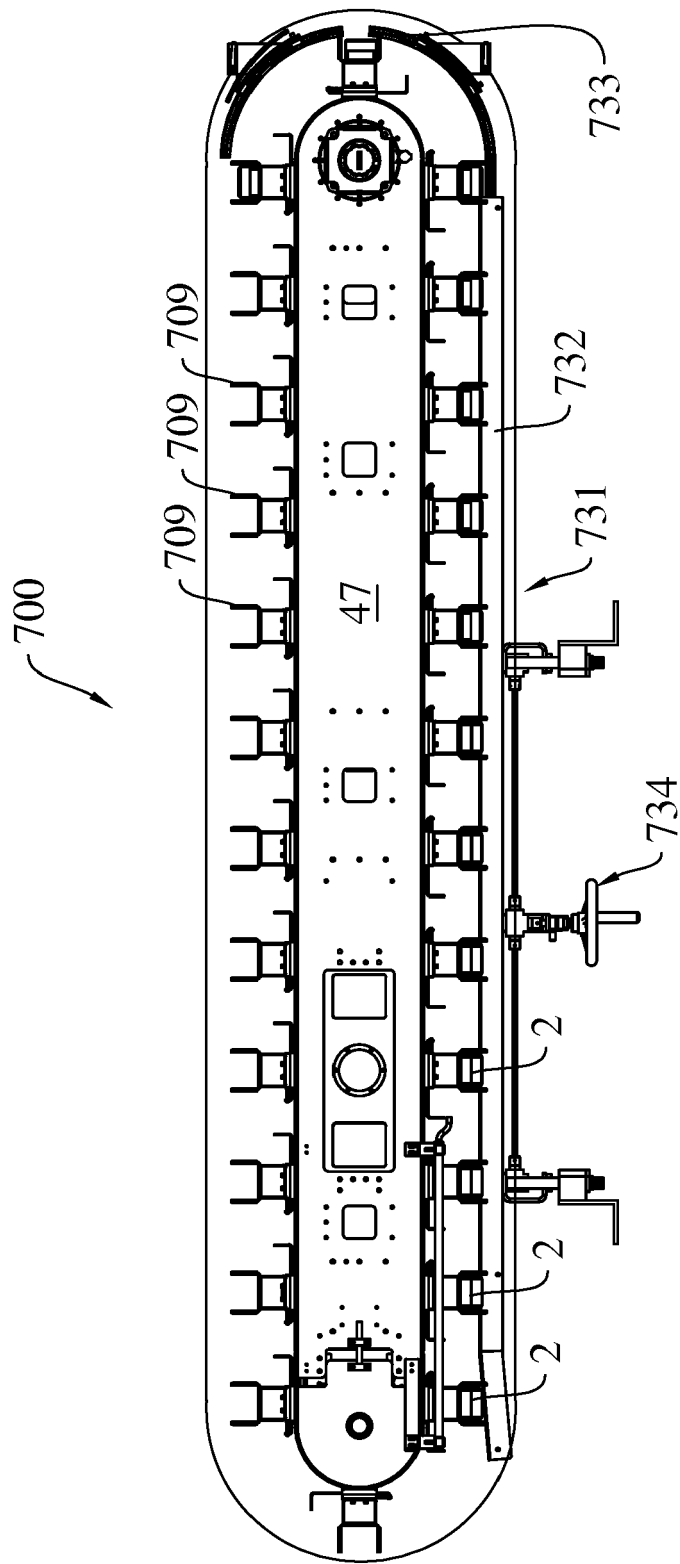


FIG. 3e

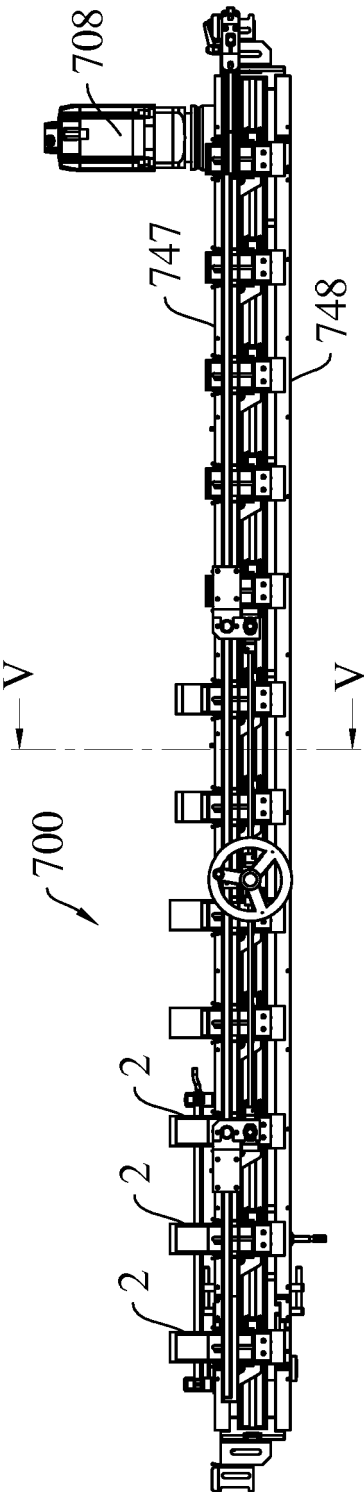


FIG.4e

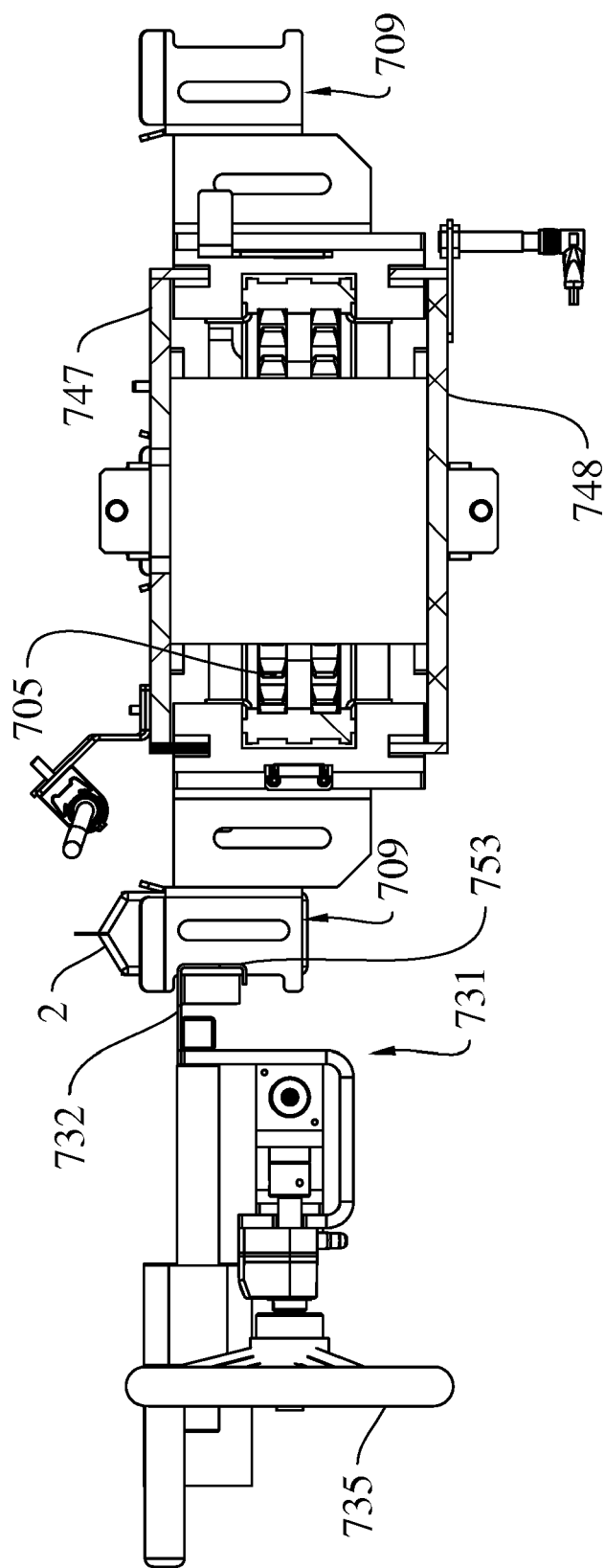


FIG.5e

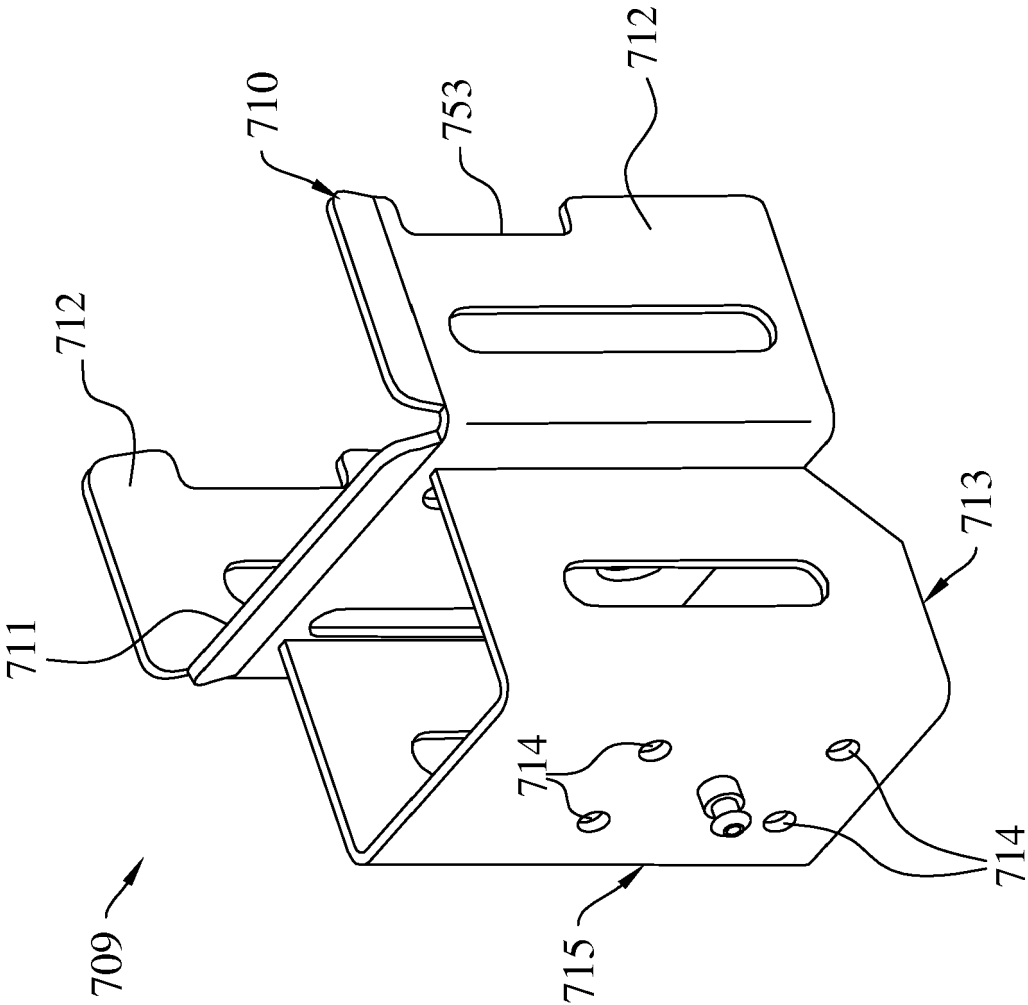


FIG. 6e

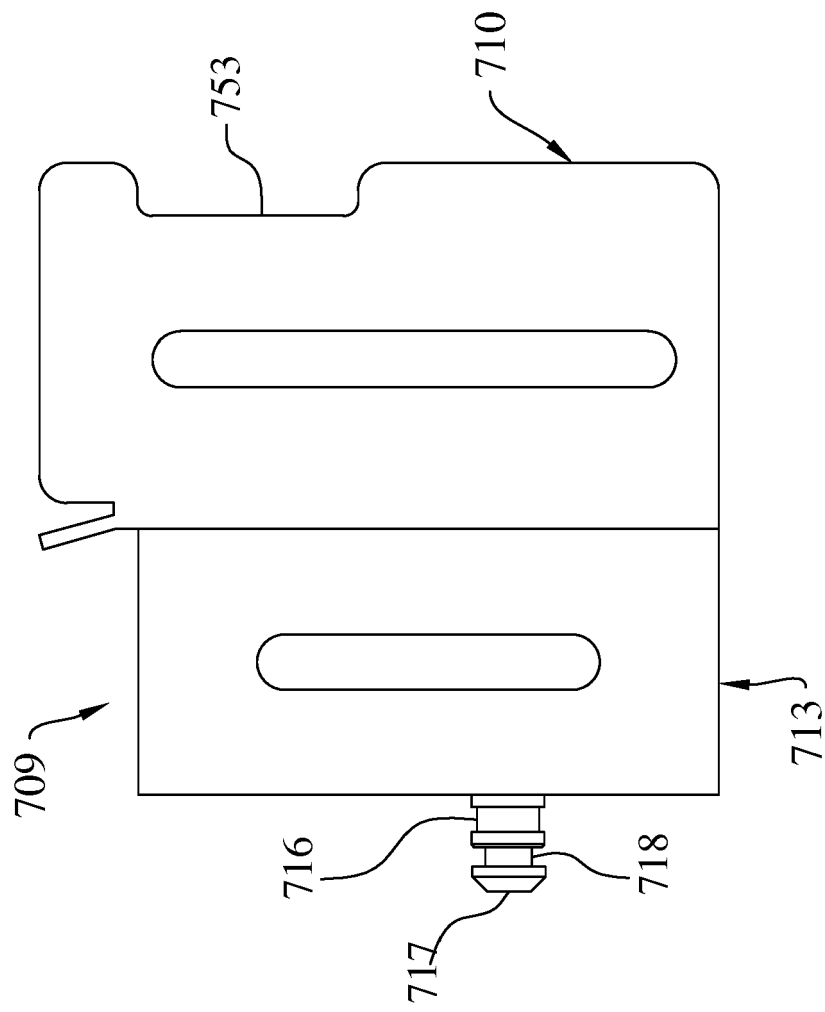


FIG. 7e

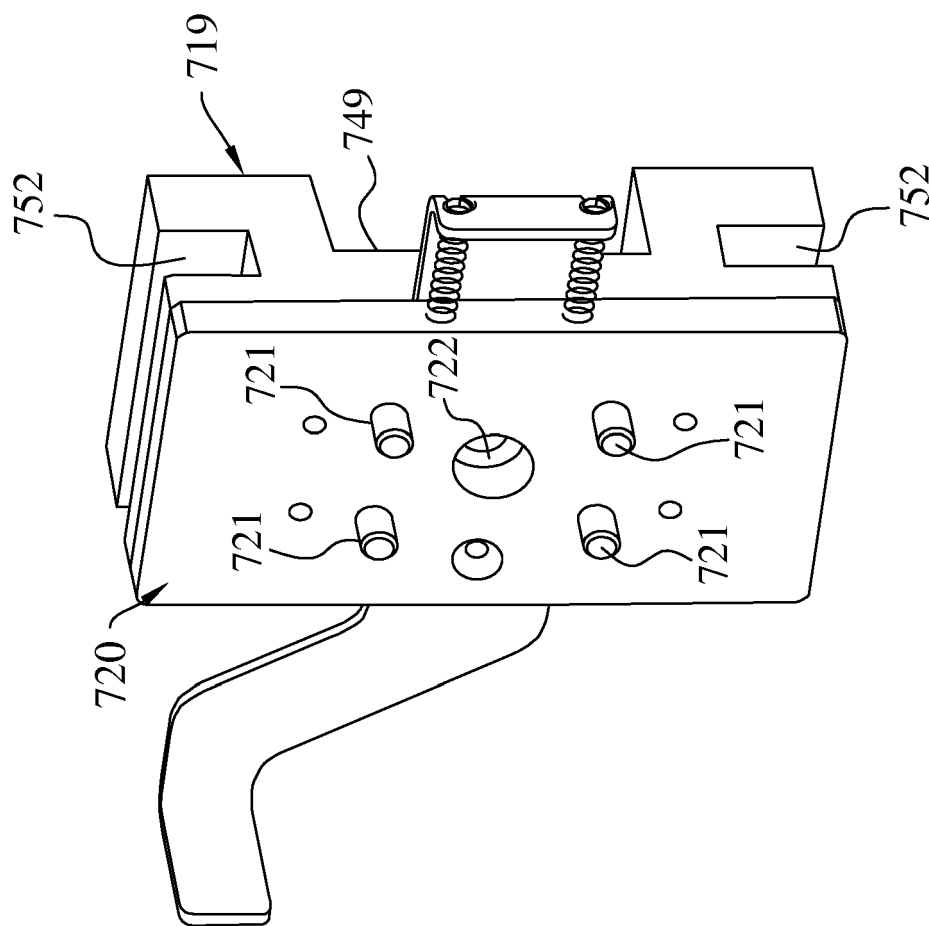


FIG. 8e

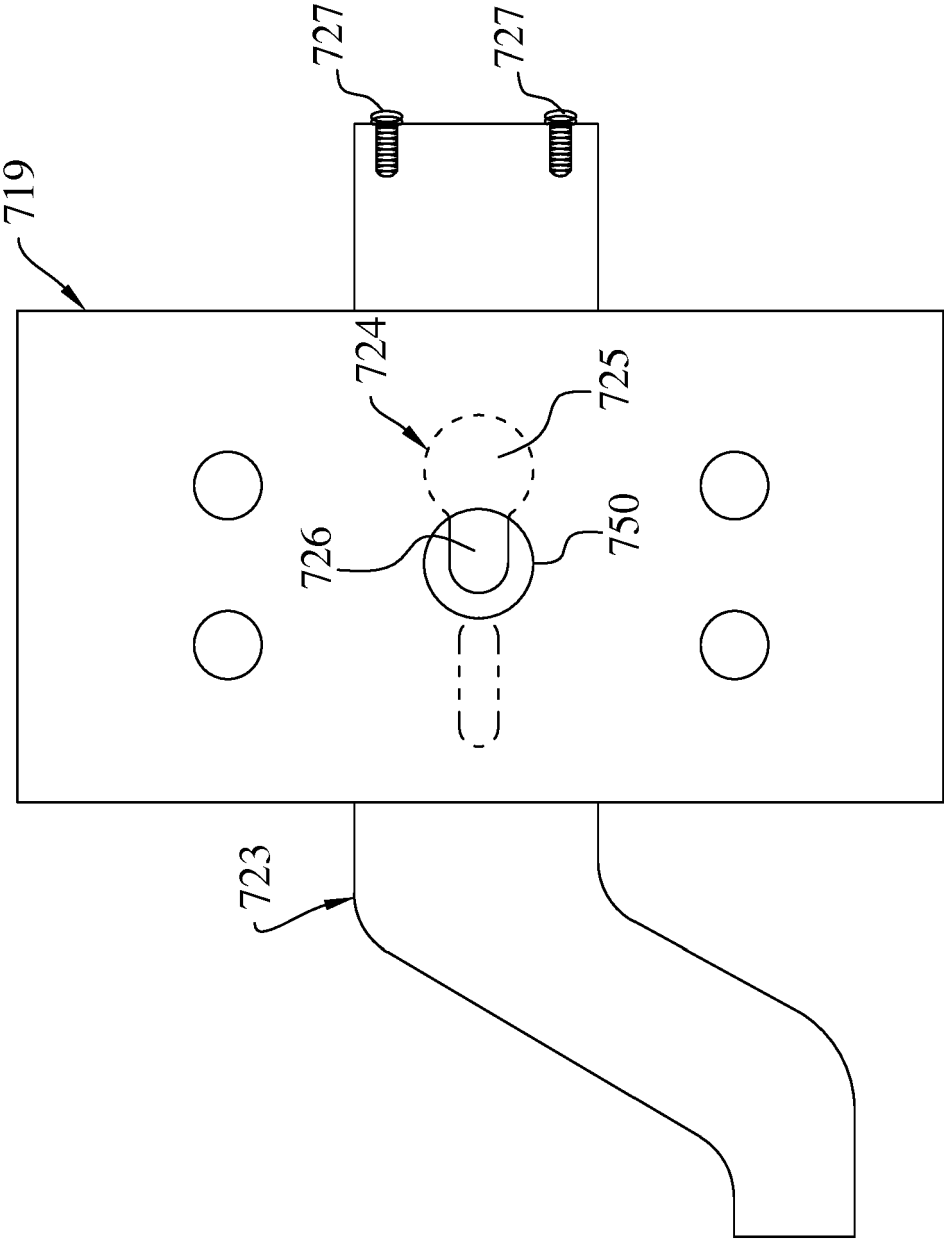


FIG. 9e

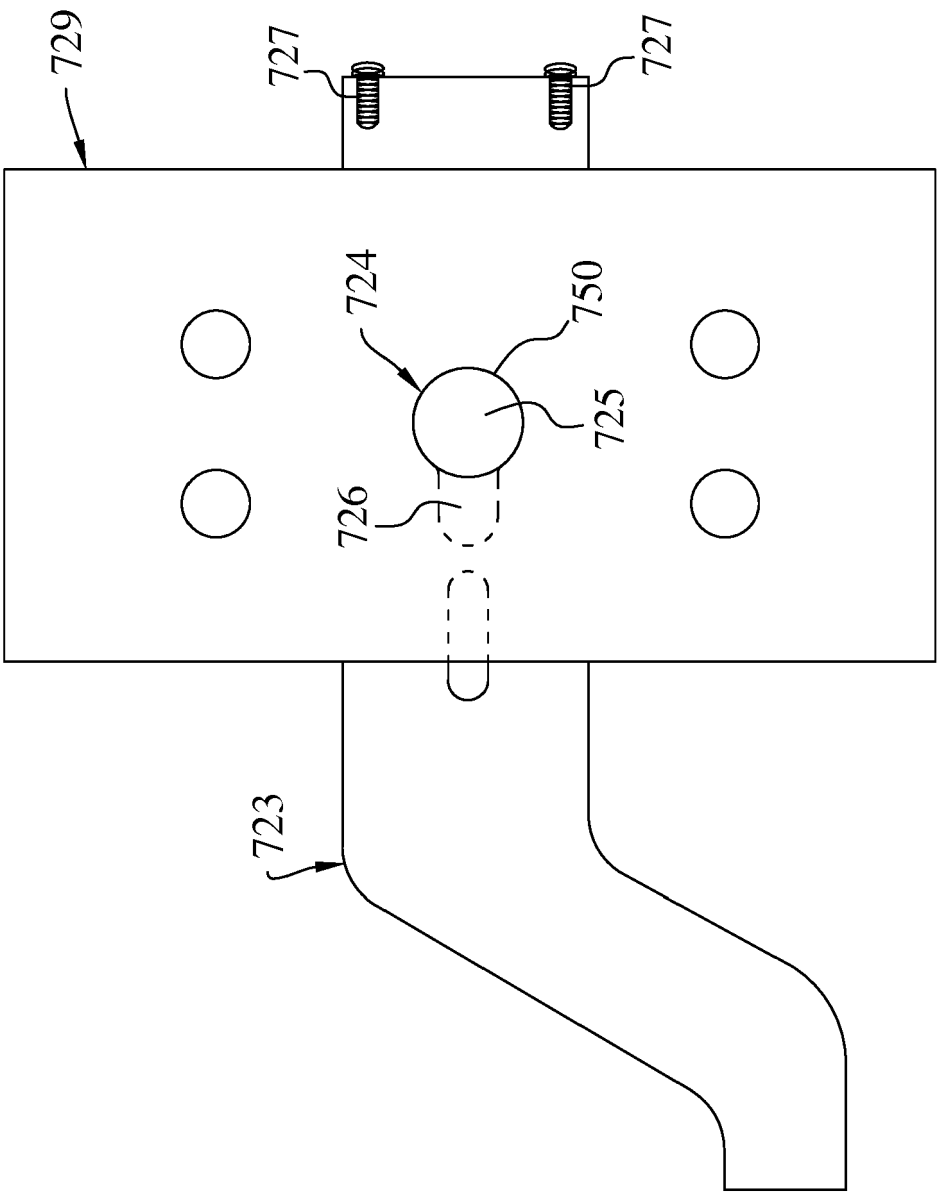
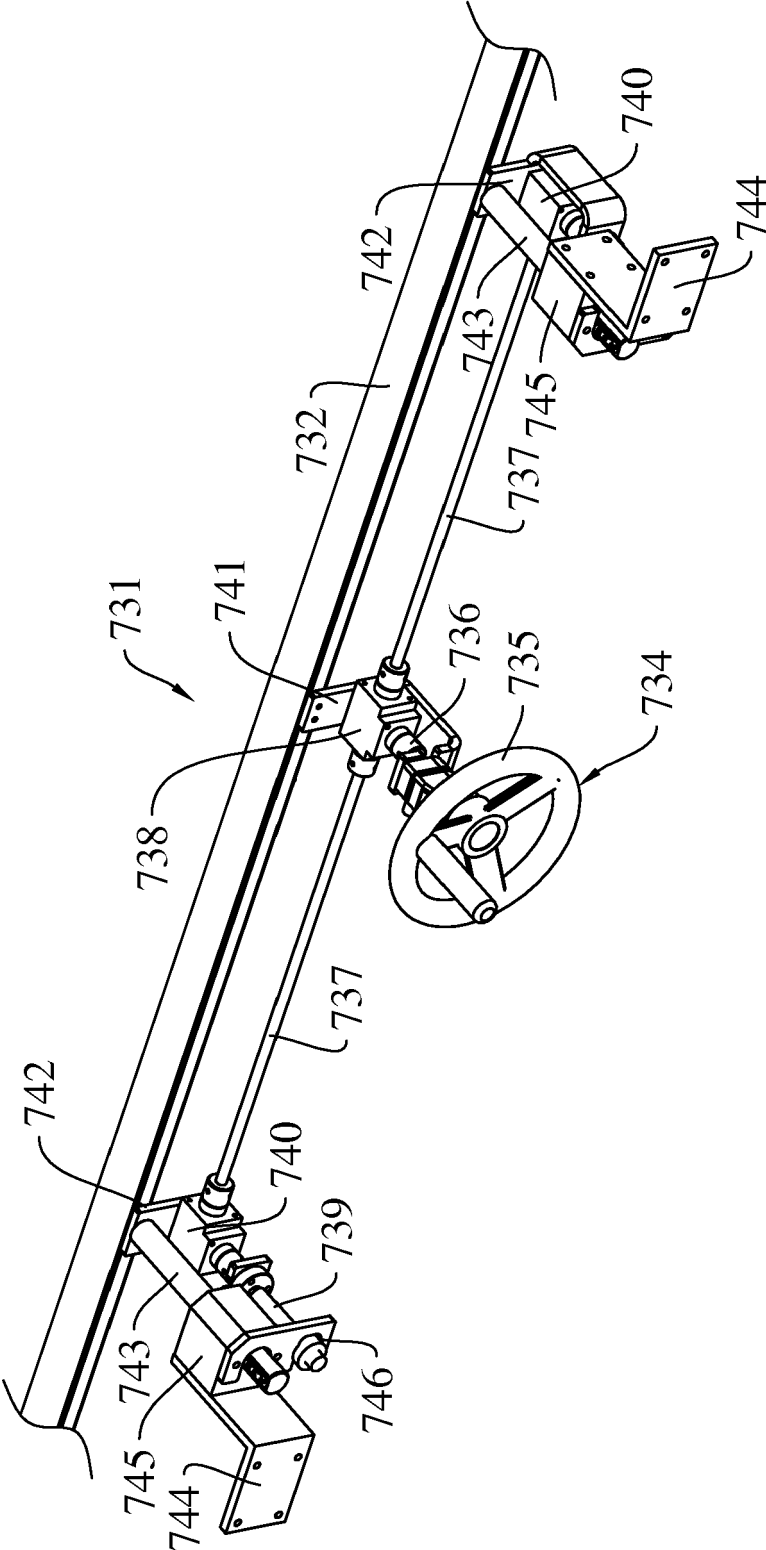


FIG.10e

FIG.11e



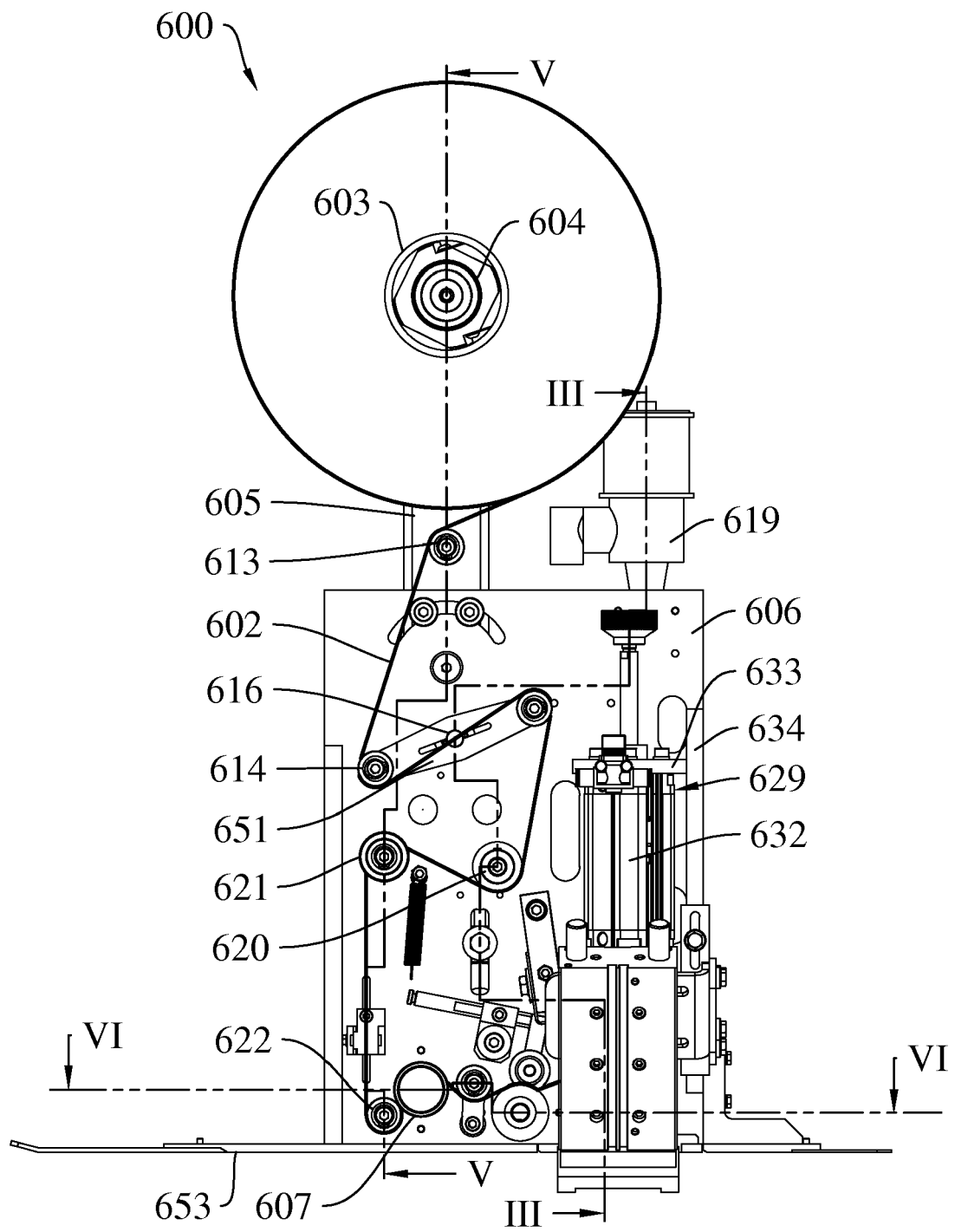


FIG.1f

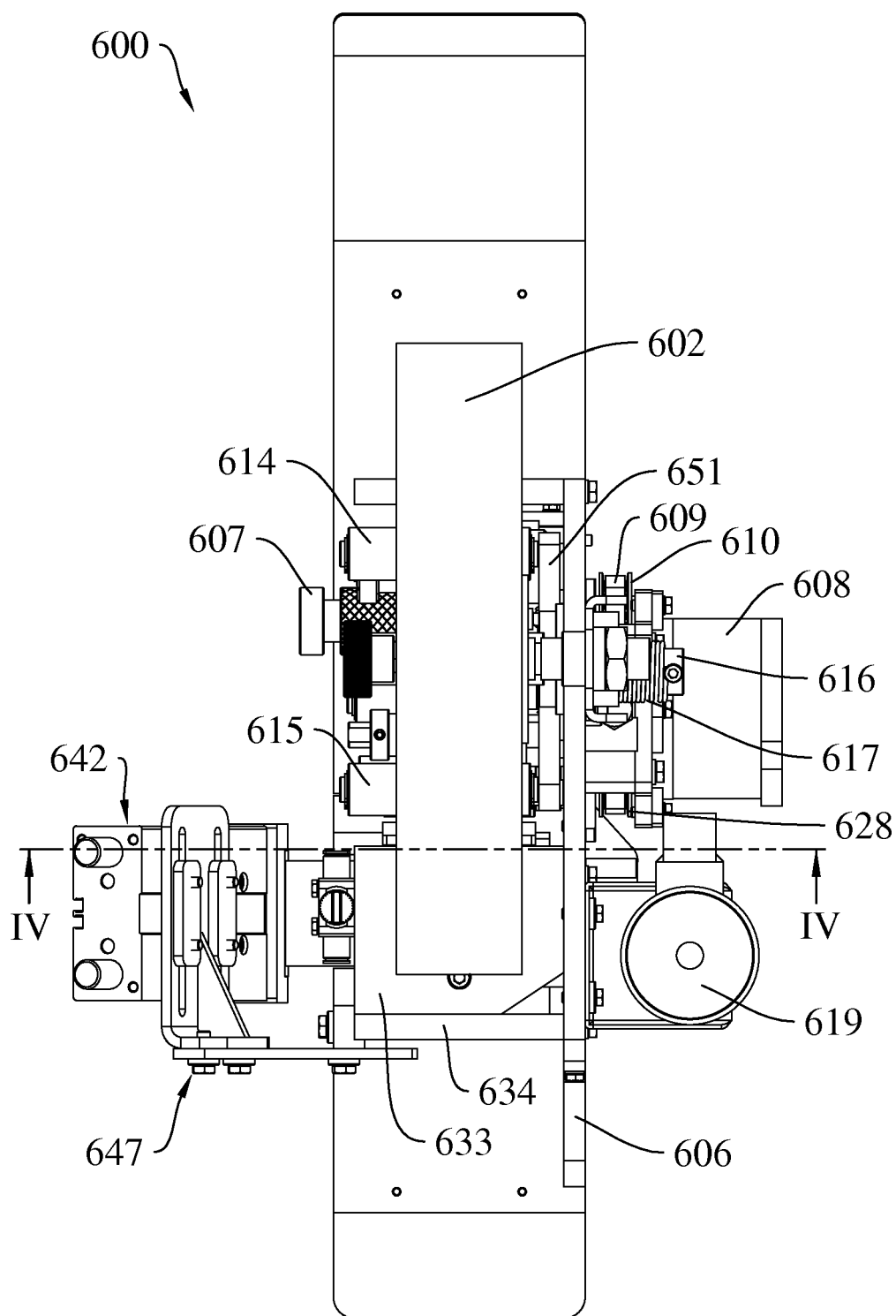
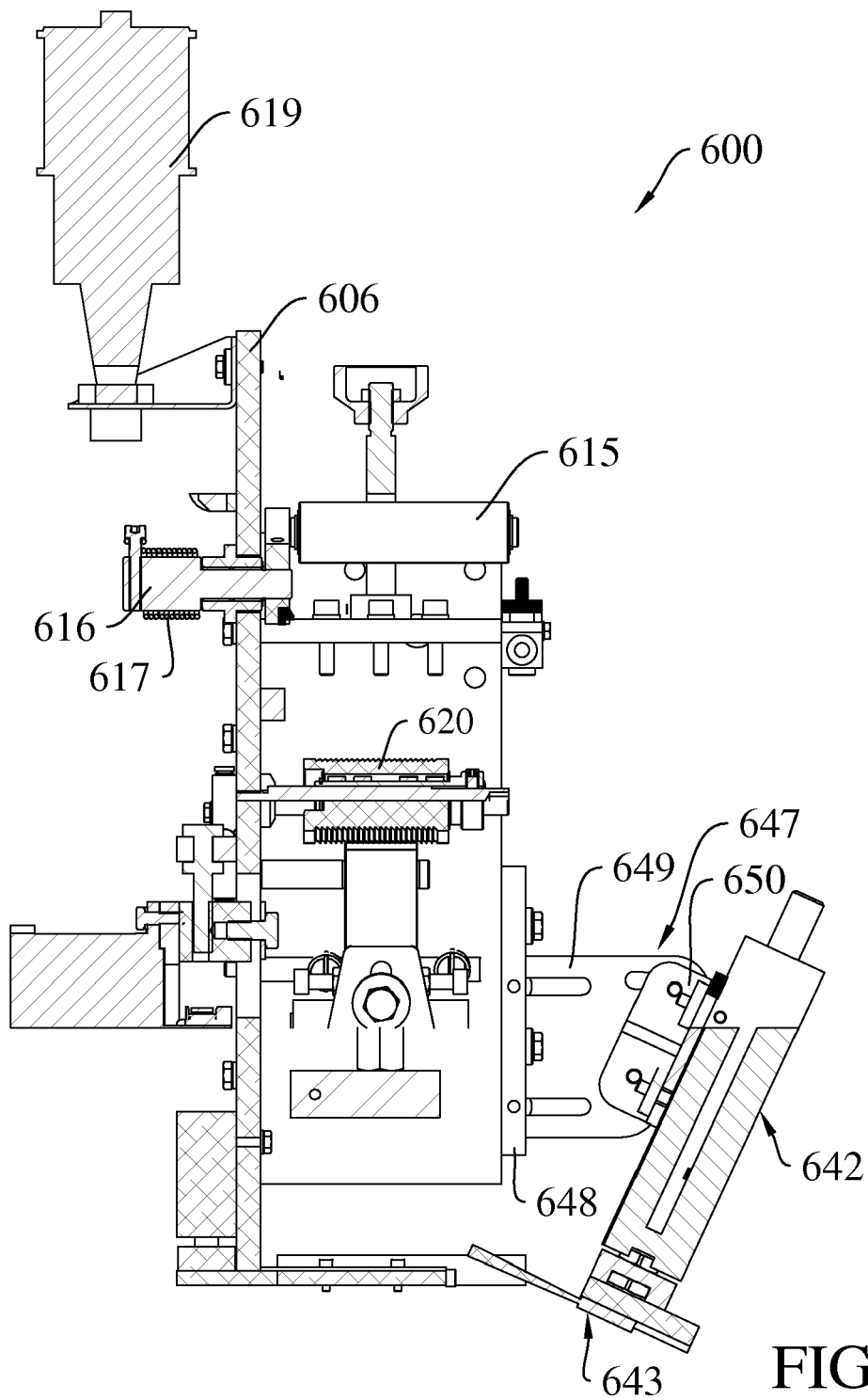


FIG.2f



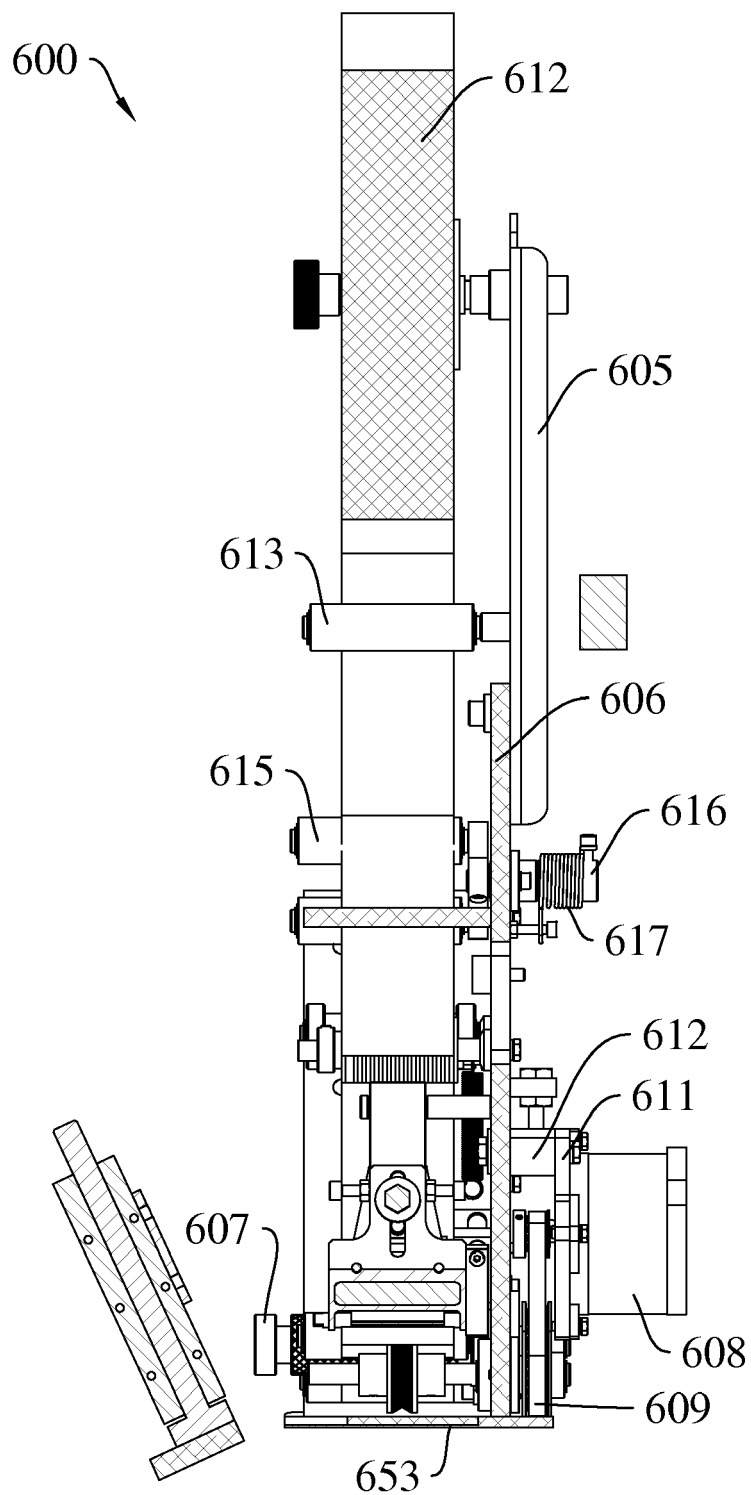


FIG.4f

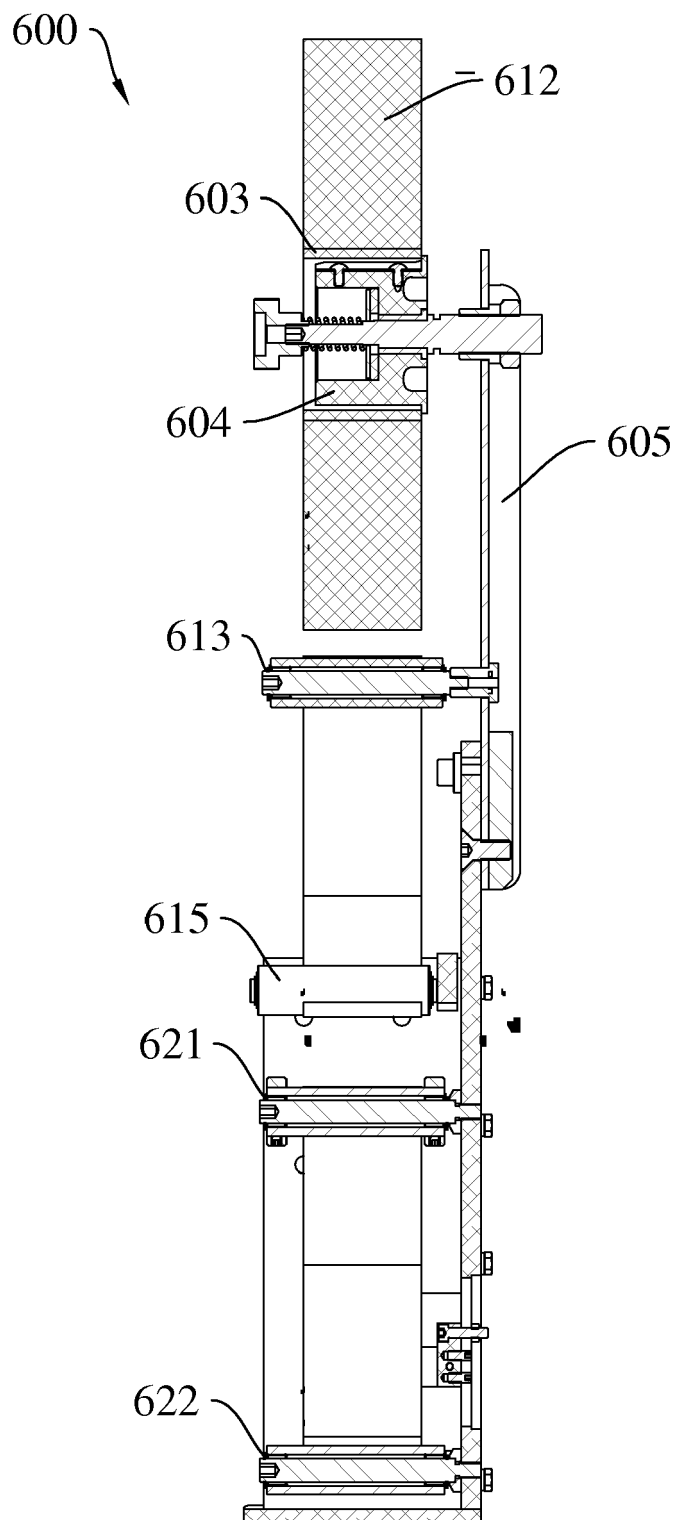


FIG.5f

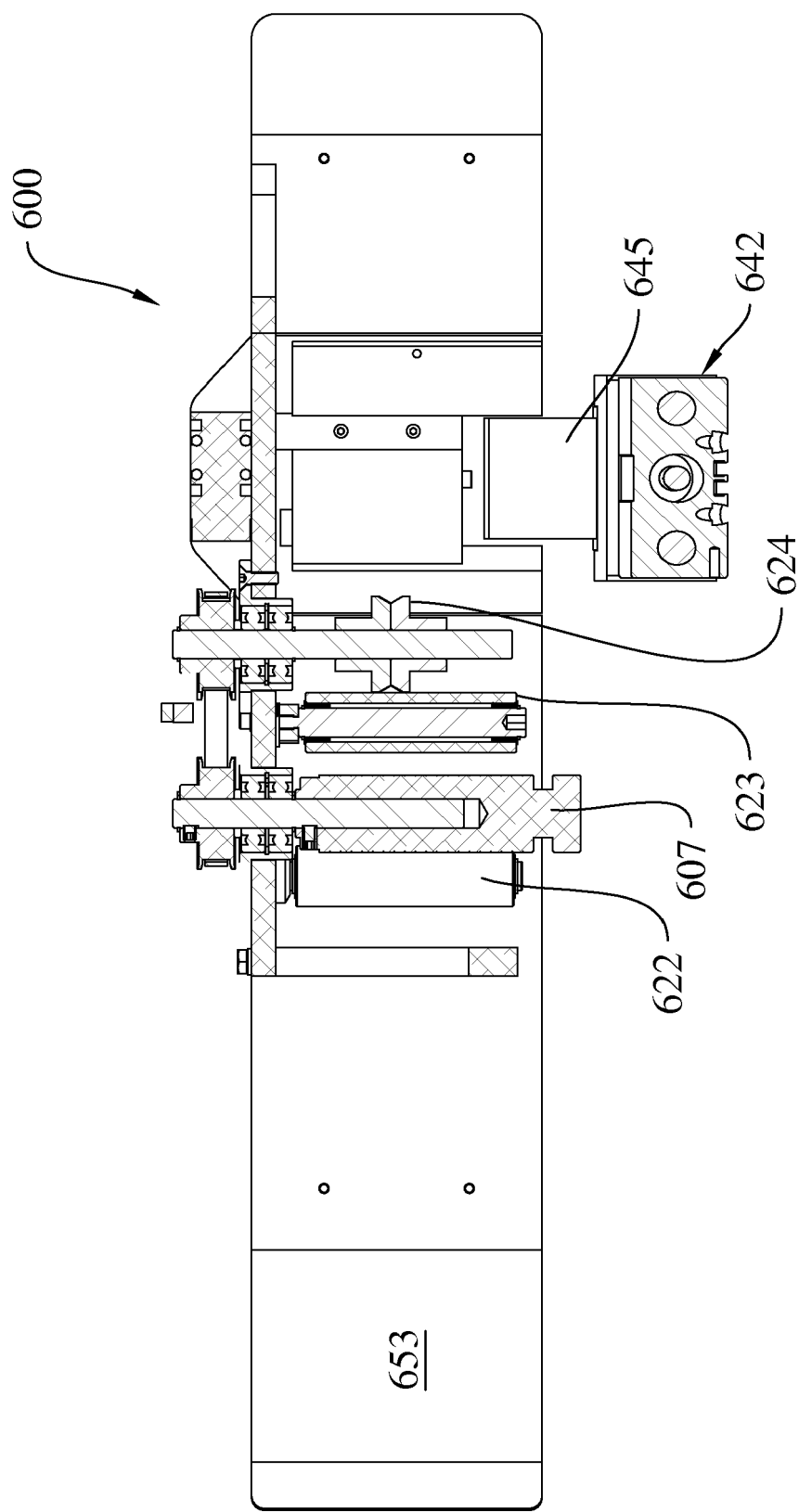
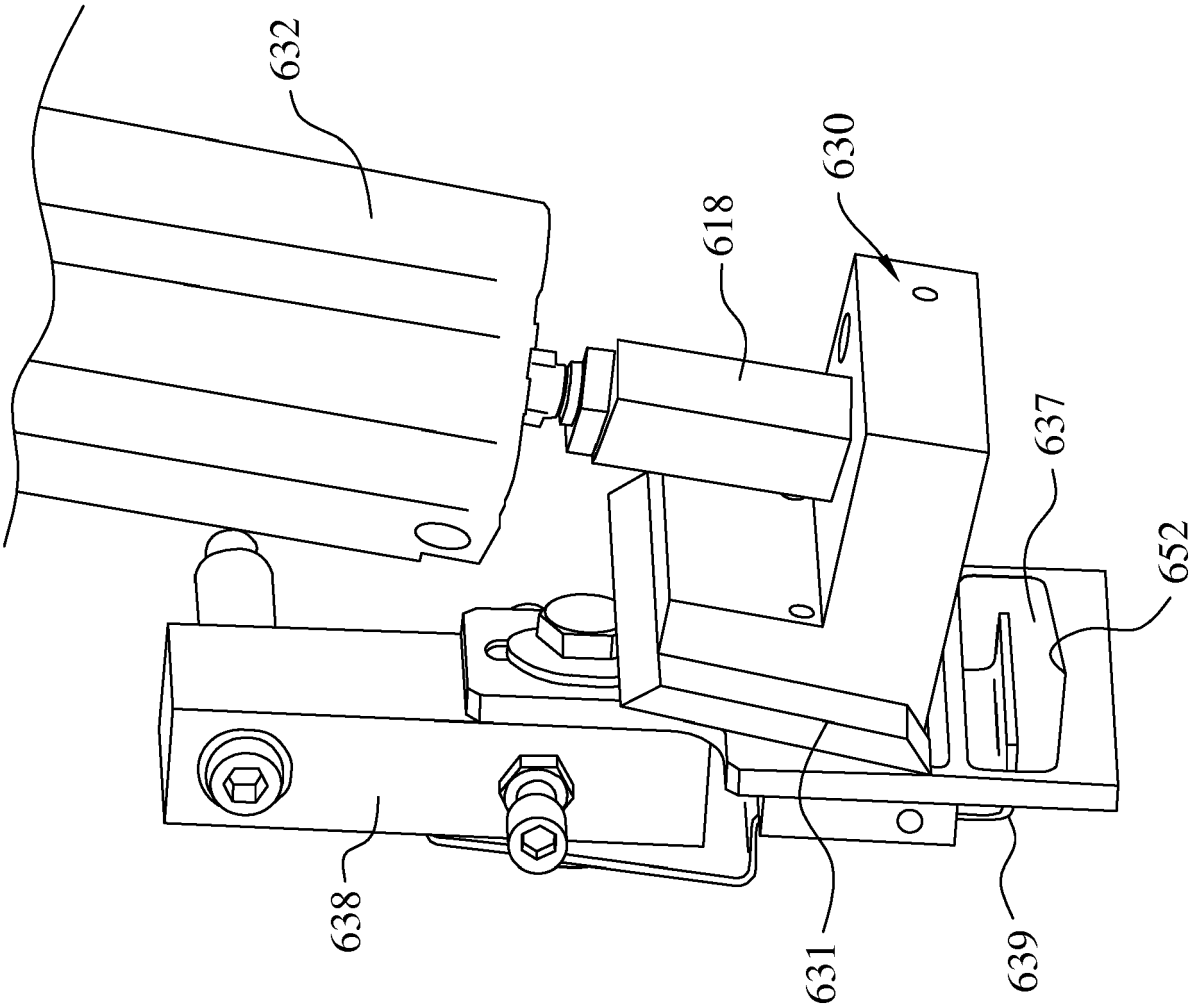


FIG.6f

FIG. 7f



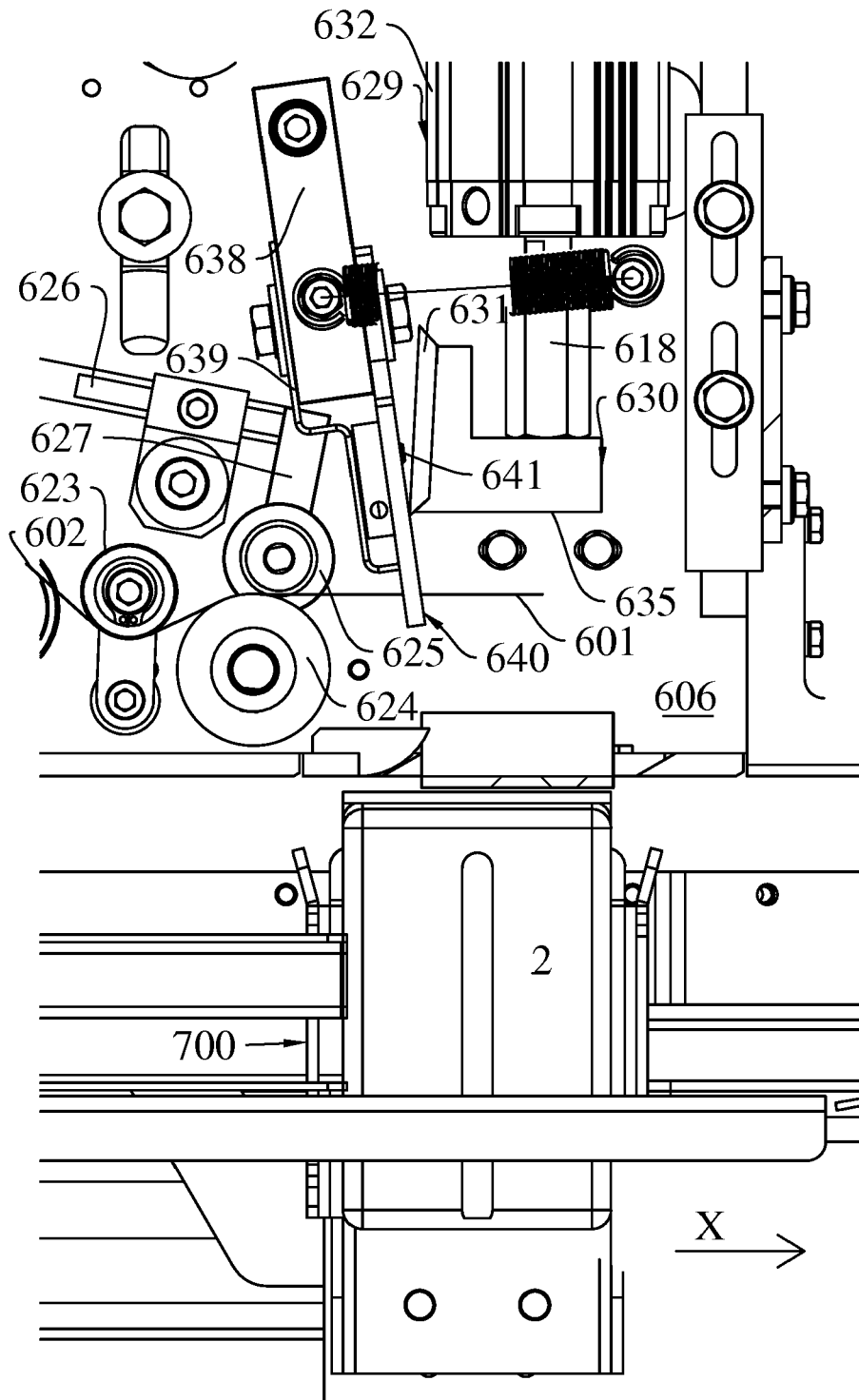


FIG. 8f

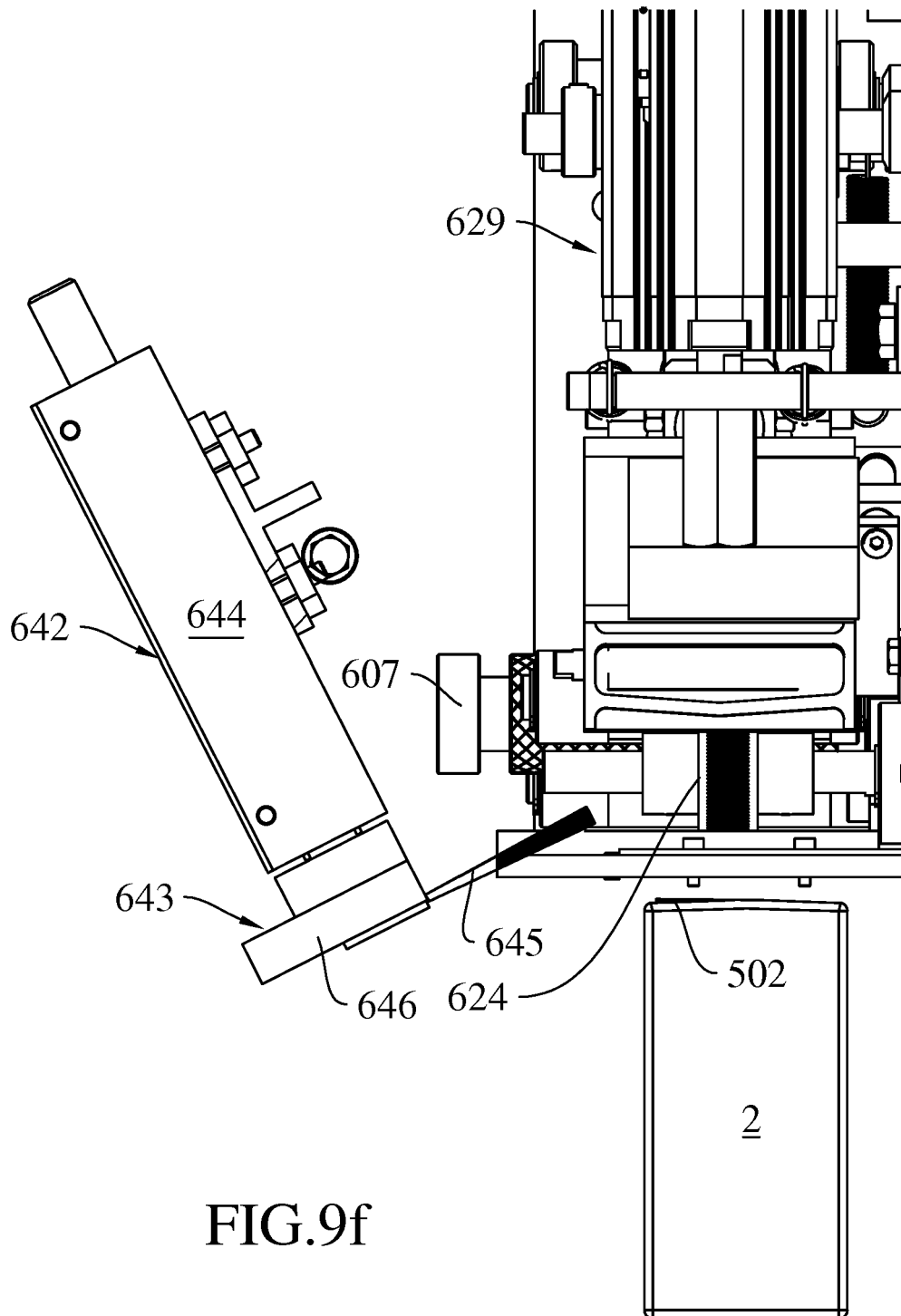


FIG. 9f

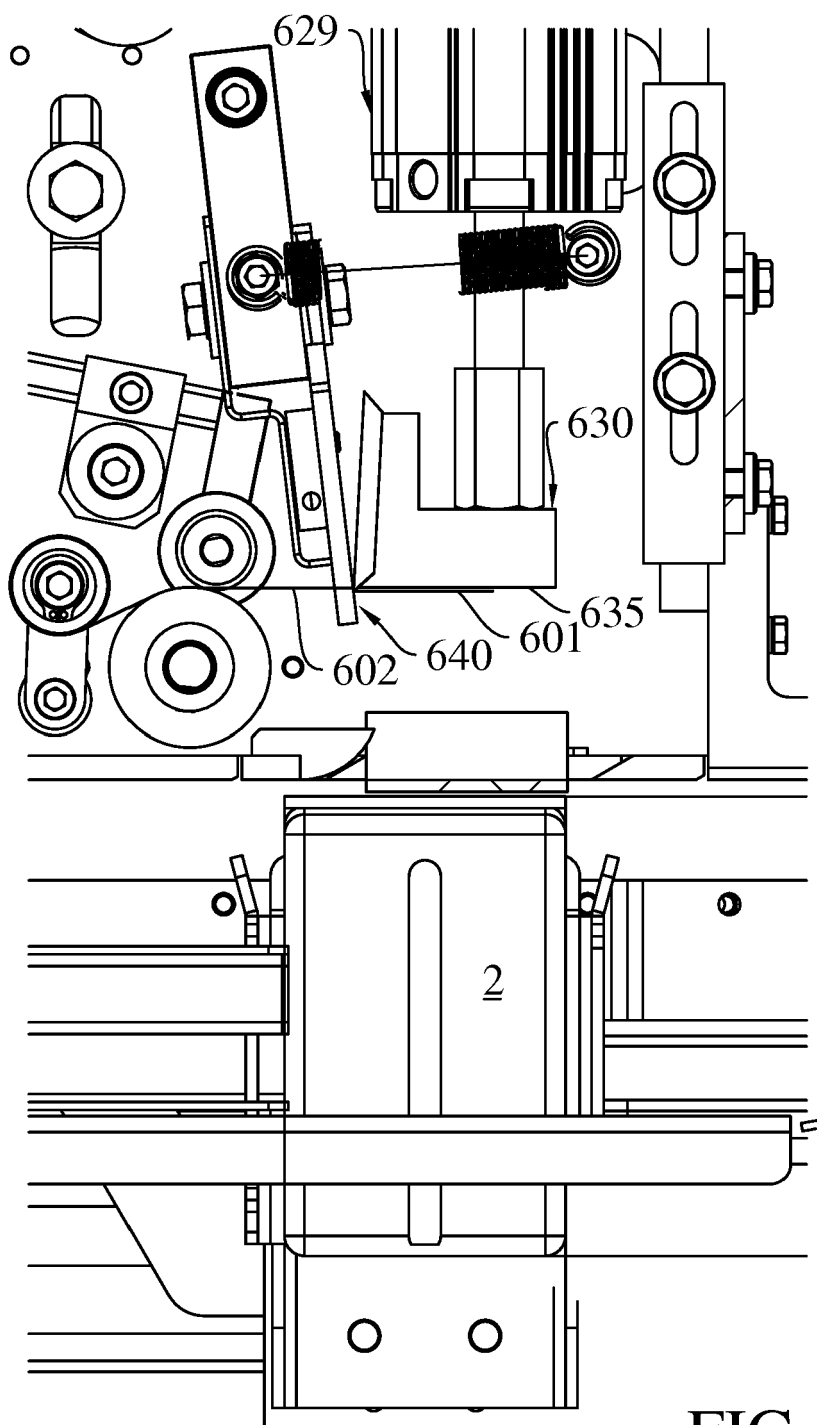


FIG.10f

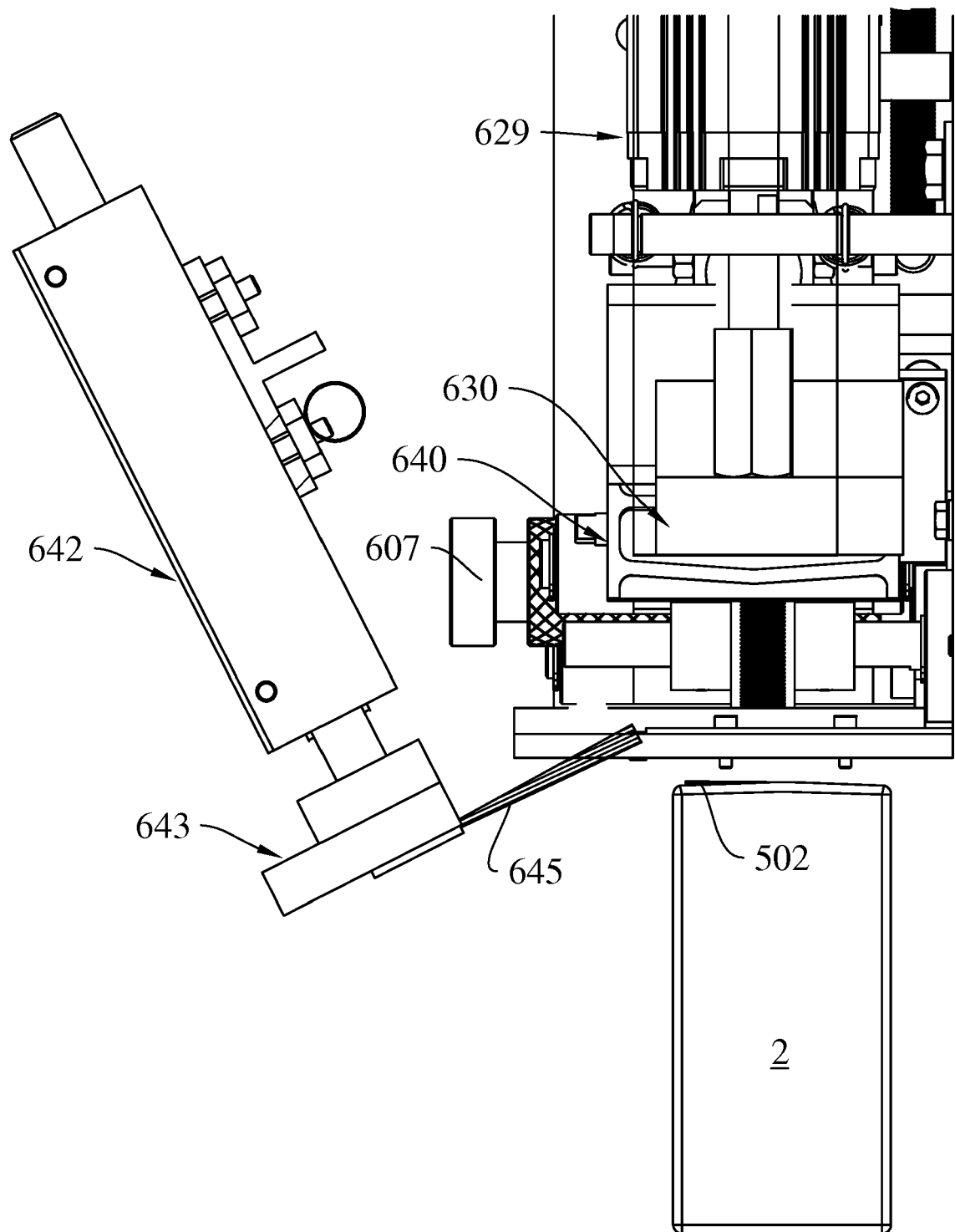


FIG.11f

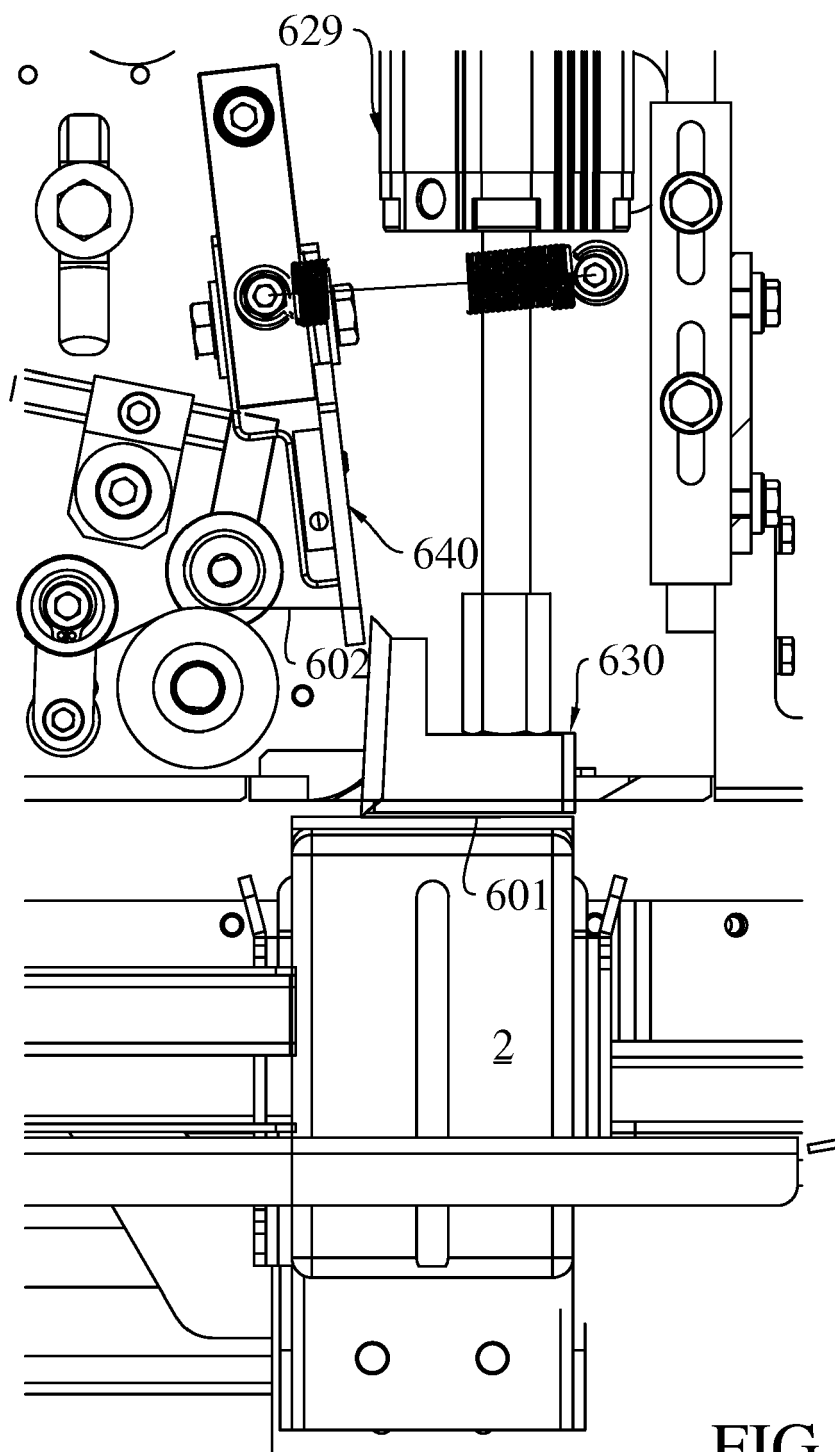


FIG.12f

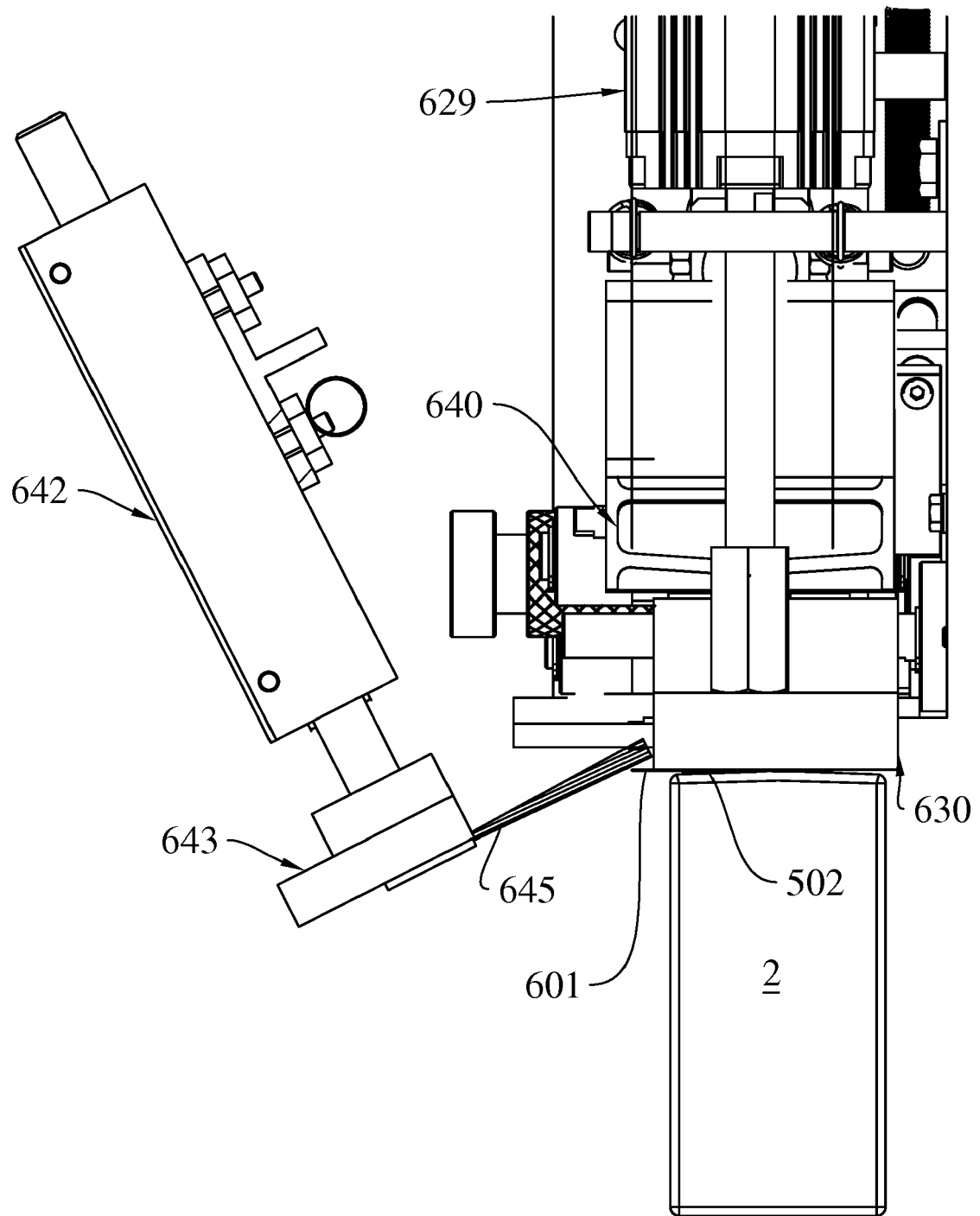


FIG.13f

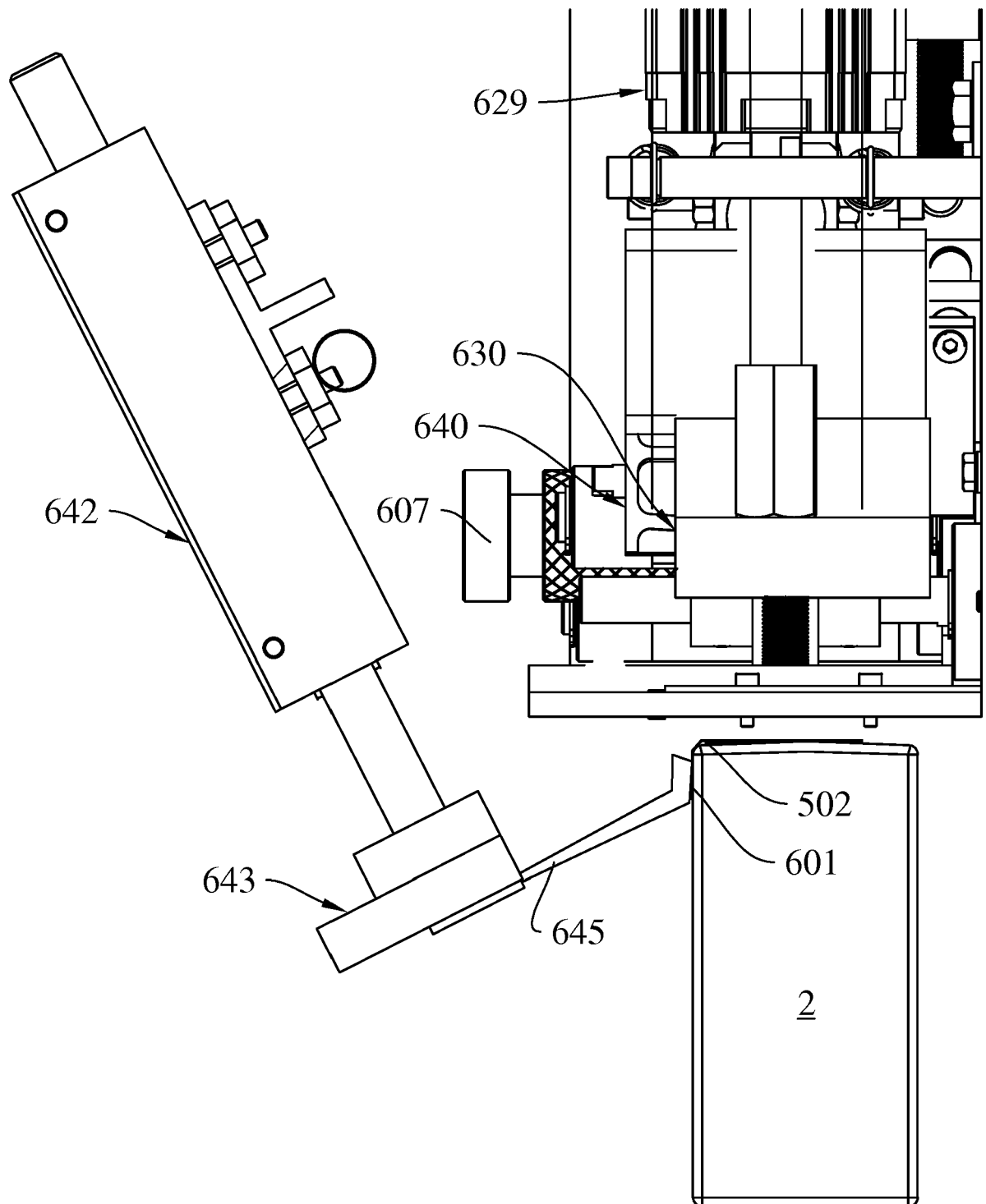


FIG.14f

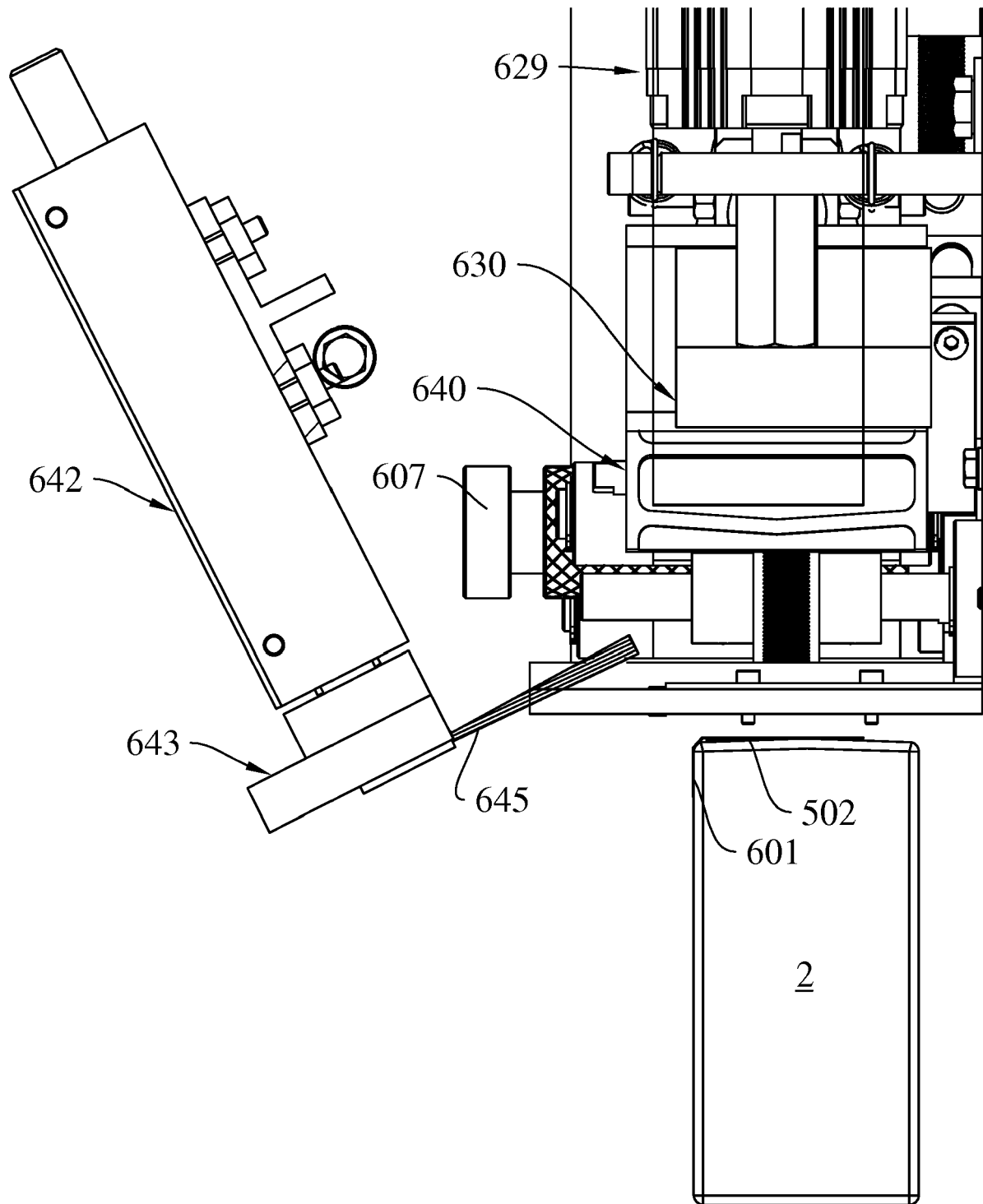


FIG.15f

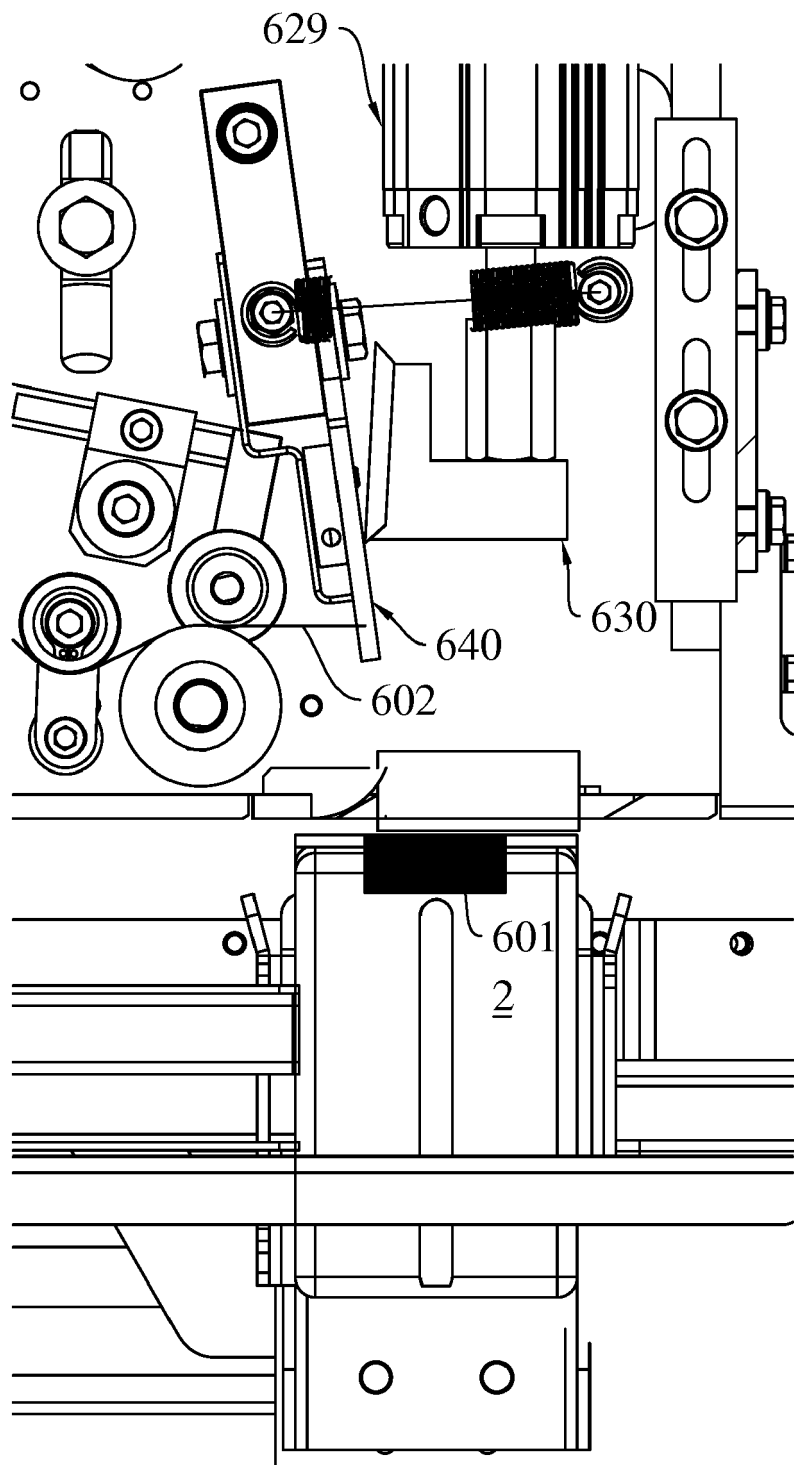


FIG.16f

FIG.17

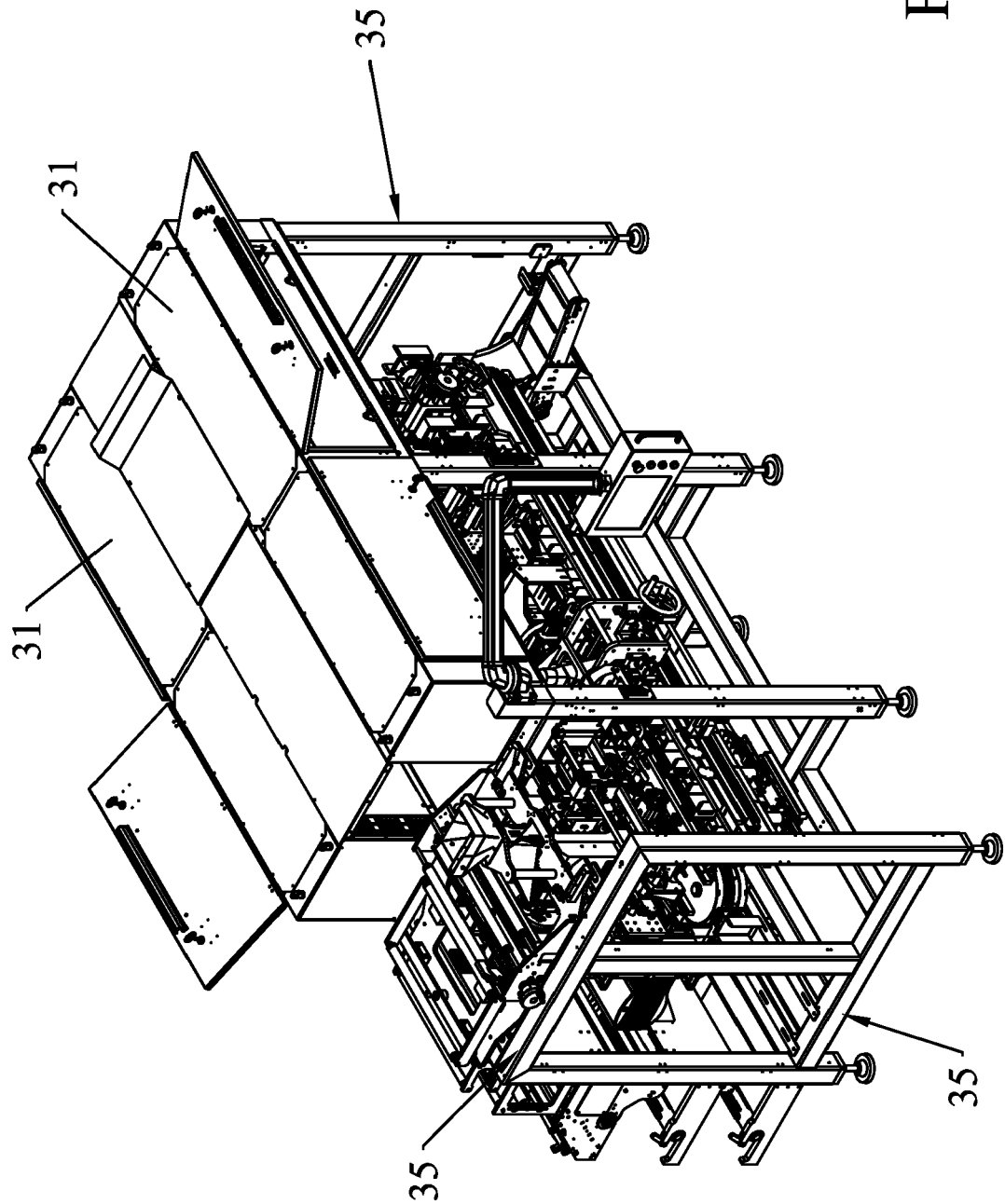
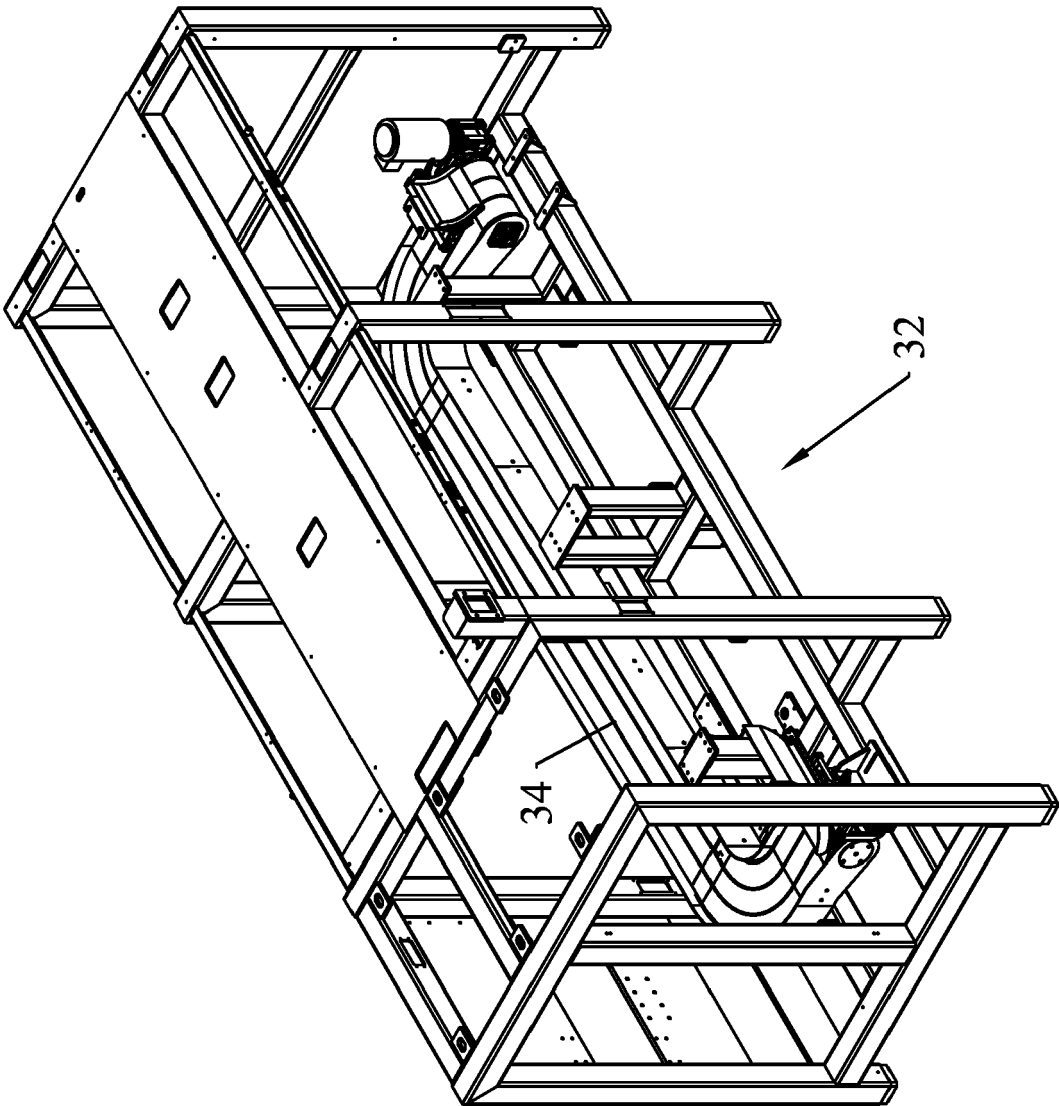


FIG.18





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A	* column 3, line 18 - column 5, line 29; figures 1a,1b *	2-10	
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



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