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(54) **DEVICE FOR INHIBITING FIRING OF SHELLS IN AN ELECTRIC GUN**

(57) [Problem] To provide a device for inhibiting the firing of shells which is capable of stopping the rotation of a motor when a bullet becomes a shell, without changing a conventional mechanical box. [Solution] This device for inhibiting the firing of shells is provided with: a switch which is provided in series with a contact point with which contact is made in order to pass a current through a motor when a trigger is pulled; and a current passage stopping part which receives an operation of a bullet detection device for detecting that a bullet has become a shell, and disconnects the switch to inhibit the passage of current through the motor.

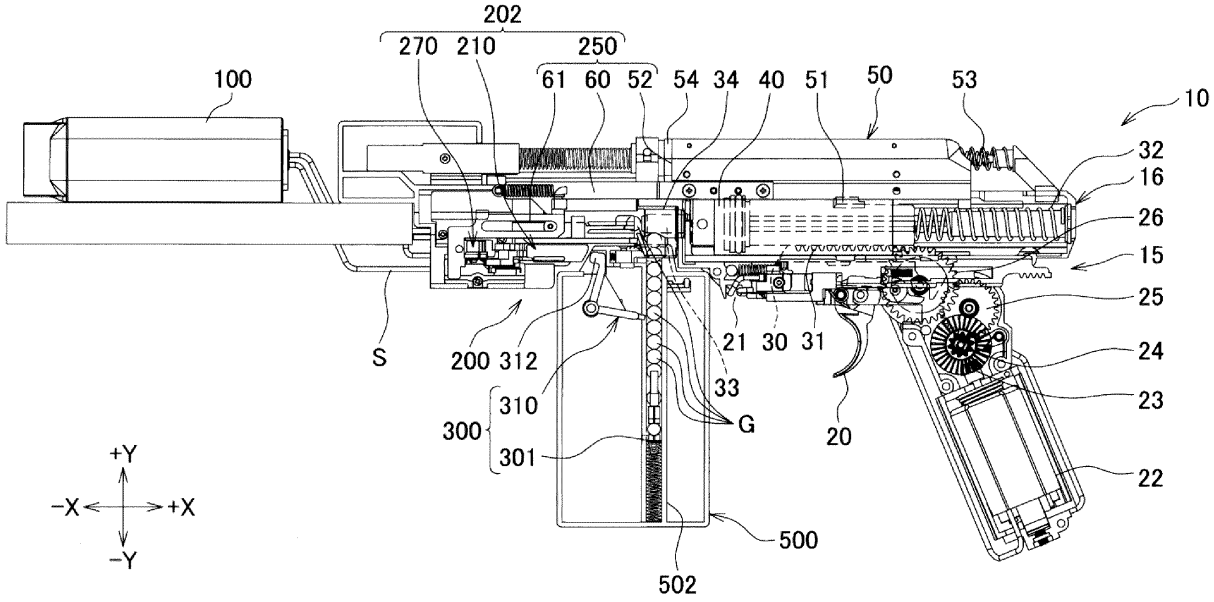

FIG. 1

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Description

Technical Field

[0001] The present invention relates to an empty shooting prevention device for an electric gun.

Background Art

[0002] In a so-called electric gun which uses a rotation of a motor to drive a piston in a cylinder, air in the cylinder is injected by a driving force of the piston to fire a bullet, and a trigger turns on an electric switch to drive the motor.

[0003] Therefore, while the trigger is kept being pulled, a state where the electric switch is turned on is maintained, and thus, the motor continues to be driven. Therefore, a movement of the piston does not stop, and even in a case where there is no bullet in a magazine, the air in the cylinder continues to be injected, and thus, so-called empty shooting is continued.

[0004] Therefore, Japanese Patent Application Laid-Open No. 2010-25501 filed by the present applicant discloses a mechanical power supply stopping device in an electric gun. The device is a device for cutting off a circuit of a drive portion for firing a bullet to stop power supply when there is no bullet in a bullet supply path leading to a bullet loading section in a rear section of a gun cavity. The device is configured to include a ball pushing member which is movably disposed in a bullet supply path and is biased to feed the bullet to the bullet loading section, a follower member which engages at an end portion with a portion of the ball pushing member side and is interlocked with a movement of the ball pushing member, a cut-off member which is movable from a position at the time of the power supply to a position at the time of power cut-off according to a movement of the follower member, engages with a tappet member in a process of moving to the position at the time of the power cut-off, and turns off a switch according to a movement of the tappet member, the tappet member which includes a portion which moves rearward according to a movement of a piston of the drive portion to open a bullet supply port of the bullet supply path leading to the bullet loading section and moves the cut-off member by a biasing force in a direction in which the bullet supply port is closed, and the switch which is moved by the engagement with the cut-off member to open a contact and closes the contact by a reset operation.

[0005] However, engine portions such as a cylinder, a piston, and a gear for driving the piston in the electric gun are disposed in a predetermined housing and are unitized. The unitized portion is referred to as a mechanical box, and it is necessary to incorporate the above-described devices into the unitized mechanical box.

[0006] In addition, in the related art, there is no space in the mechanical box for incorporating the above-described devices. Accordingly, the mechanical box itself should be newly manufactured. Moreover, even when mechanical box is newly manufactured, according to a type of the electric gun, there may not be enough space in the mechanical box to accommodate the above-described devices, and it is not practical to apply the above-described mechanical power supply stopping device to all mechanical boxes.

Citation List

Patent Literature

[0007] [PTL 1] Japanese Patent Application Laid-Open No. 2010-25501

Summary of Invention

Technical Problem

[0008] The present invention is made in view of the above-described circumstances, and an object thereof is to provide an empty shooting prevention device capable of stopping a rotation of a motor in a case where there is no bullet without changing a mechanical box of the related art.

Solution to problem

[0009] According to a first aspect, there is provided an empty shooting prevention device including: a switch which is disposed in series with a contact which comes into contact with the switch to supply power to a motor when a trigger is pulled; and a power supply stop portion which disconnects the switch to prevent power supply to the motor in response to an operation of a bullet detection device which detects that there is no bullet. Moreover, note that the disconnecting of the switch means to turn off the switch or does not supply power. The same applies hereinafter.

[0010] According to a second aspect, in the empty shooting prevention device of the first aspect, the power supply stop portion includes a detection receiving portion which receives the operation of the bullet detection device which detects that there is no bullet, a piston interlocking portion which is interlocked with a movement of a piston driven by the motor, and a switch disconnecting portion which separates a contact of the switch, in which the detection receiving portion engages with the piston interlocking portion, and thus, the piston interlocking portion operates the switch disconnecting portion, and the switch disconnecting portion disconnects the switch.

[0011] According to a third aspect, in the empty shooting prevention device of the first or second aspect, the contact which comes into contact with the switch to supply power to the motor when the trigger is pulled is provided inside a housing, and both the switch and the power supply stop portion are provided outside the housing.

[0012] According to a fourth aspect, there is provided an electric gun including: the empty shooting prevention

device according to the first to third aspects. Advantageous Effects of Invention

[0013] According to the present invention, it is possible to provide an empty shooting prevention device capable of stopping a rotation of a motor in a case where there is no bullet without changing a mechanical box of the related art.

Brief Description of Drawings

[0014]

Fig. 1 is a side view of an electric gun in a state where a muzzle faces left.
Fig. 2 is a side view of the electric gun with a muzzle facing right.
Fig. 3 is a left-side view of a magazine portion having a plurality of bullets in a magazine.
Fig. 4 is a left-side view of the magazine portion in a state where there is no bullet in the magazine.
Fig. 5A is a left-side view of the magazine portion in a state where there is no bullet in the magazine and an empty shooting prevention function stopping device is moved in a -x direction.
Fig. 5B is a right-side view of Fig. 5A.
Fig. 6 is a side view of the electric gun in a state where the muzzle faces left.
Fig. 7A is an enlarged view of Fig. 6.
Fig. 7B is a conceptual view of Fig. 7A.
Fig. 8A is an enlarged bottom view of Fig. 6.
Fig. 8B is a conceptual view of Fig. 8A.
Fig. 9 is an enlarged side view of the electric gun in the state where the muzzle faces right.
Fig. 10A is an enlarged bottom view of the electric gun with the muzzle facing left in a state where power supply to the motor is stopped.
Fig. 10B is a conceptual view of Fig. 10A.
Fig. 11 is a side view of the electric gun with the muzzle facing right in the state where the power supply to the motor is stopped.
Fig. 12 is a side view of the electric gun with the muzzle facing right in a state where the power is supplied to the motor again.
Fig. 13 is an enlarged bottom view of the electric gun with the muzzle facing left in the state where the power is supplied to the motor again.

Description of Embodiments

[0015] An electric gun 10 having an empty shooting prevention device 200 in the present embodiment will be described. In the electric gun 10, separately from a first contact 21 which comes into contact with a trigger 20 described later to supply power when the trigger 20 is pulled, a switch 201 is provided outside a housing 16 in a mechanical box described later, a power supply stop portion 202 is disposed to prevent so-called empty shooting when there is no bullet G in a magazine portion 500, and the power supply stop portion 202 disconnects the switch 201 (refer to Figs. 1 and 2).

[0016] The first contact 21 and the switch 201 are connected to each other in series by a wire S. When power is supplied to any one of the first contact 21 and the switch 201, a bullet G is fired. Moreover, in a case where there is no bullet G, it is possible to prevent the empty shooting by one or both of the power supply stop portion 202 stopping power supply to the switch 201 and returning the pulled trigger 20 (refer to Figs. 1 and 2).

[0017] First, a structure of an engine portion 15 for firing the bullet G in the electric gun 10 will be described. The engine portion 15 is disposed in the housing 16. Moreover, the engine portion 15 includes the trigger 20, the first contact 21, a motor 22, a motor gear 23, a bevel gear 24, a gear 25, a sector gear 26, a piston 30, a rack portion 31 of the piston 30, and a spring 32 which biases the piston 30 in a -x direction. Here, the housing 16 having the engine portion 15 may be referred to the mechanical box.

[0018] When a user (not illustrated) pulls the trigger 20, the first contact 21 comes into contact with the trigger 20 and electricity from the battery 100 flows to the motor 22. Therefore, the motor 22 rotates. The motor gear 23 disposed in an output shaft of the motor 22 is rotated by the rotation of the motor 22, the bevel gear 24 meshing with the motor gear 23 is rotated, the gear 25 meshing with the bevel gear 24 is rotated, and the sector gear 26 meshing with the gear 25 is rotated.

[0019] When the sector gear 26 meshes with the rack portion 31 of the piston 30, the piston 30 moves in a +x direction. Accordingly, the piston 30 compresses the spring 32.

[0020] The sector gear 26 has a toothless portion which does not partially include gear teeth. Accordingly, when the toothless portion of the sector gear 26 rotates to a position facing the rack portion 31, the rack portion 31 and the sector gear 26 disengage from each other, and a force of the spring 32 to return to a natural length of the spring 32 causes the piston 30 disposed in the cylinder 40 to rapidly move in the -x direction. Therefore, the air in the cylinder 40 is injected to the bullet G which is disposed in advance at a tip of a nozzle 33, and the bullet G is fired by the air.

[0021] Further, the electric gun 10 includes a recoil shock generating mechanism 50 for generating a so-called recoil shock for simulating an impact generated by a reaction at the time of firing a bullet in an actual gun. Therefore, this will also be described. The recoil shock generating mechanism 50 includes a piston engagement portion 51 of the piston 30 and a recoil weight 52 which engages with the piston engagement portion 51. The recoil weight 52 is biased in the -x direction by a recoil spring 53. Preferably, the recoil weight 52 has a predetermined mass in order to simulate the impact.

[0022] As described above, the piston 30 disposed in the cylinder 40 rapidly moves in the -x direction, and the air in the cylinder 40 is injected to the bullet G which is

disposed in advance at the tip of the nozzle 33. Accordingly, the bullet G is fired by the air. In this case, the piston engagement portion 51 of the piston 30 and the recoil weight 52 engaging with the piston engagement portion 51 rapidly move in the -x direction in the same manner as the piston 30 by a force of the compressed recoil spring 53 to return to the natural length of the recoil spring 53. Accordingly, the recoil spring 52 collides with a tip portion 54 to generate an impact, and thus, a so-called recoil shock is obtained.

[0023] Thereafter, as the piston 30 moves in the +x direction again, the recoil weight 52 engaging with the piston engagement portion 51 of the piston 30 also moves in the +x direction, and compresses the recoil spring 53.

[0024] Thereafter, again, in the same manner as described above, the piston 30 disposed in the cylinder 40 rapidly moves in the -x direction, and the recoil shock is obtained by the force of the compressed recoil spring 53 to return to the natural length of the recoil spring 53. Accordingly, when the trigger 20 is pulled, the so-called recoil shock is obtained every time the bullet G is fired. Further, a recoil bar 60 connected to the recoil weight 52 is provided. Moreover, the electric gun 10 has the recoil weight 52, the recoil bar 60, and the recoil plate 61 which is connected to the recoil bar 60. The recoil weight 52, the recoil bar 60, and the recoil plate 61 may be collectively referred to as a piston interlocking portion 250. The piston interlocking portion 250 is literally interlocked with the movement of the piston 30, and reciprocates in the -x direction and the +x direction according to the firing of the bullet G.

[0025] As described above, in the present embodiment, the empty shooting prevention device 200 has the switch 201, which is connected to the first contact 21 in series by the wire S and is separated from the first contact 21, outside the housing 16 of the mechanical box as described above. Moreover, the bullet detection device 300 of the present embodiment detects that the shooting of the bullet G ends and the bullet G in the magazine portion 500 runs out, the switch 201 is disconnected by a switch disconnecting portion 270 of the power supply stop portion 202, and thus, the power supply to the motor 22 stops. Moreover, the switch disconnecting portion 270 is disconnected by the piston interlocking portion 250 which is driven by the movement of the piston 30. Therefore, as described above, even in a state where the trigger 20 is pulled and the first contact 21 is in contact with the trigger 20, the switch 201 which is connected to the first contact 21 in series is disconnected. Accordingly, it is possible to prevent the empty shooting.

[0026] Accordingly, the bullet detection device 300 which detects that the bullet G in the magazine portion 500 runs out will be described. The bullet detection device 300 is disposed in the magazine portion 500. Therefore, first, a configuration of the magazine portion 500 will be described, and thereafter, the bullet detection device 300 will be described.

[0027] The magazine portion 500 has a magazine body portion 501 which constitutes an outer shell as a so-called magazine for supplying the bullet G to the electric gun 10. In addition, a bullet disposition portion 502 is a passage in which a plurality of the bullets G is disposed and through which the bullet G is fed into the electric gun 10. A width of the bullet disposition portion 502 is set to be equal to a width of the bullet G. The bullet disposition portion 502 includes a magazine spring 505 for pushing up the plurality of bullets G in a direction (+y direction) of an opening 503 and a follower portion 510 biased by the magazine spring 505.

[0028] Accordingly, the follower portion 510 includes a first follower 511 which is biased by the magazine spring 505, a second follower 512 which is biased by the first follower 511, and a third follower 513 which is biased by the second follower 512, and the bullet G is always biased in the direction (+y direction) of the opening 503 as described above. That is, the magazine spring 505 presses the first follower 511 in the follower portion 510. In addition, any one of the second follower 512 and the first follower 511 has a shaft portion, the other thereof has a bearing portion, and the shaft portion and the bearing portion are fitted and connected to each other. Therefore, in a case where the bullet disposition portion 502 is curved, the second follower 512 and the first follower 511 are connected to each other in a bendable manner so that the bullet disposition portion 502 can follow the curved shape. Moreover, the third follower 513 is in contact with the second follower 512, and thus, is pressed by the second follower 512.

[0029] In addition, a lower end portion 505a of the magazine spring 505 is disposed at an end portion 502a of the bullet disposition portion 502, and a spring upper end portion 505b of the magazine spring 505 is connected to the first follower 511 of the follower portion 510. Further, a bullet locking portion 515 is disposed to prevent the bullet G from jumping out when the magazine portion 500 is removed from the electric gun 10 (not illustrated) and is biased in the +x direction by a bullet locking spring 516.

[0030] That is, when the plurality of bullets G are packed in the magazine portion 500 having the above-described configuration, the magazine spring 505 is compressed by the plurality of bullets G, and the bullet G disposed at an uppermost position out of the plurality of bullets G is prevented from jumping out by the bullet locking portion 515 biased in the +x direction by the bullet locking spring 516. Accordingly, the plurality of bullets G are disposed in the magazine portion 500. In addition, when the magazine portion 500 is set to the electric gun 10, the bullet locking portion 515 is pressed in the -x direction by a chamber 34 (refer to Fig. 1), and the bullet locking portion 515 is pressed. Accordingly, the engagement between the bullet locking portion 515 and the bullet G is released. As a result, the bullet G is loaded into the electric gun 10. Moreover, in Figs. 3, 4, and 5A, the engagement between the bullet locking portion 515 and the bullet G is released.

[0031] In the present embodiment, the bullet detection

device 300 is disposed in the magazine portion 500 and includes the detection engagement portion 301 which is disposed in the first follower 511 of the follower portion 510 and a detection rotating portion 310 which is rotated in response to rise of the detection engagement portion 301.

[0032] The detection rotating portion 310 includes a detection engaged portion 311, a detection push portion 312 which is disposed at an angle of approximately 90° with respect to the detection engaged portion 311, a detection shaft portion 313, and a first main body portion 330 which is disposed between the detection push portion 312 and the detection shaft portion 313 and is a thin-plate shaped triangular. The detection engaged portion 311, the detection push portion 312, the detection shaft portion 313, and the first main body portion 330 are integrated with each other, and constitute the detection rotating portion 310. In addition, the detection rotating portion 310 rotates so as to oscillate about the detection shaft portion 313 (refer to Fig. 3).

[0033] When all the bullets G disposed in the magazine portion 500 have been shot, there is no bullet G disposed in the magazine portion 500, and a length of the magazine spring 505 is returned to a natural length sufficiently longer than a length of the bullet disposition portion 502. Accordingly, the first follower 511 of the follower portion 510 is pushed up in the direction of the opening 503.

[0034] At the same time, the first follower 511 connected to the spring upper end portion 505b of the magazine spring 505 rises, the detection engagement portion 301 disposed in the first follower 511 rotates the detection engaged portion 311 of the detection rotating portion 310 counterclockwise and rotates the detection push portion 312 integrated with the detection engaged portion 311 counterclockwise. Accordingly, the detection push portion 311 protrudes to jump out from an inside of the magazine portion 500. When all the bullets G disposed in the magazine portion 500 are shot out in this way, the detection push portion 312 protrudes from the inside of the magazine portion 500, and thus, it is detected that there is no bullet G (refer to Fig. 4). In this case, an upper end portion 513a of the third follower 513 protrudes from the opening 503. In the present embodiment, a position at which the detection push portion 312 protrudes so as to jump out from the inside of the magazine portion 500 is a position (in the -x direction) opposite to the housing 16 in the mechanical box with respect to the bullet disposition portion 502 (refer to Fig. 1). That is, the position of the housing 16 in the mechanical box is located in a direction (the +x direction) of the trigger 20 with respect to the bullet disposition portion 502. Meanwhile, the detection push portion 312 of the bullet detection device 300 detects the presence or absence of a bullet in order to disconnect the switch 201 disposed outside the housing 16. Accordingly, the detection push portion 312 is disposed at a position (in the -x direction) opposite to the position of the trigger 20 with respect to the bullet disposition portion 502.

[0035] In addition, there is provided an empty shooting prevention function stopping device 360 in order to stop a function of the bullet detection device 300. Accordingly, a second detection shaft portion 350 which is disposed in the detection engaged portion 311 of the detection rotating portion 310 and a function stop engagement portion 361 of the empty shooting prevention function stopping device 360 engage with each other, and the detection push portion 312 of the detection rotating portion 310 substantially stays in the magazine portion 500 without protruding too much outside the magazine portion 500. As a result, the function of the empty shooting prevention device 200 described later can be stopped, and so-called empty shooting can be performed even in a state where there is no bullet G in the bullet disposition portion 502 and the bullet disposition portion 502 is empty. This is particularly suitable for a user who wants to experience only the recoil shock because an operation check of the electric gun having the recoil shock can be performed in a state where the magazine portion 500 is not filled with the bullets G, which contributes safety.

[0036] That is, the empty shooting prevention function stopping device 360 slides in the -x direction from the state of Fig. 4. Figs. 5A and 5B illustrate a state where the empty shooting prevention function stopping device 360 slides in the -x direction. In this state, the position engagement portion 365 of the empty shooting prevention function stopping device 360 disengages from a first groove portion 551 of the magazine portion 500 and engages with a second groove portion 552. In this case, the function stop engagement portion 361 of the empty shooting prevention function stopping device 360 engages with the second detection shaft portion 350 disposed in the detection engaged portion 311 of the detection rotating portion 310. As described above, the detection rotating portion 310 is pushed down clockwise on an xy plane in Fig. 5A by the empty shooting prevention function stopping device 360, and the detection push portion 312 integrated with the detection engaged portion 311 stays in the magazine body portion 501 without protruding too much outside the magazine body portion 501.

[0037] In this state, in a case where the bullet G is hit and the bullet G in the bullet disposition portion 502 runs out, as described above, the follower portion 510 rises and the detection engagement portion 301 disposed in the first follower 511 of the follower portion 510 engages with the detection engaged portion 311 of the detection rotating portion 310. However, the rotation (counterclockwise rotation in Fig. 5A) of the detection rotating portion 310 is prevented by the empty shooting prevention function stopping device 360, and the detection push portion 312 of the detection rotating portion 310 substantially stays in the magazine body portion 501 of the magazine portion 500 without protruding too much outside the magazine portion 500. In this case, the upper end portion 513a of the third follower 513 does not protrude from the opening 503, and the upper end portion 513a stays in the opening 503.

[0038] In addition, the empty shooting prevention function stopping device 360 slides in the +x direction from the states of Figs. 5A and 5B. When the empty shooting prevention function stopping device 360 slides in the +x direction, the position engagement portion 365 of the empty shooting prevention function stopping device 360 disengages from the second groove portion 552 of the magazine portion 500 and engages with the first groove portion 551. In this case, the function stop engagement portion 361 of the empty shooting prevention function stopping device 360 disengages from the second detection shaft portion 350 disposed on the detection engaged portion 311 of the detection rotating portion 310. As described above, the empty shooting prevention function stopping device 360 moves, and thus, the function stop engagement portion 361 of the empty shooting prevention function stopping device 360 is disposed so as to engage with or disengage from the detection engaged portion 311 of the detection rotating portion 310. In addition, the empty shooting prevention function stopping device 360 has a groove portion 366. Accordingly, since the position engagement portion 365 is elastically deformable so as to be restorable, the position engagement portion 365 is suitable for engaging with the first groove portion 551 and the second groove portion 552, or disengaging therefrom. (refer to Figs. 4, 5A, and 5B).

[0039] Moreover, in Fig. 5B, the second detection shaft portion 350 is configured to protrude toward a front of the drawing, and when the position engagement portion 365 of the empty shooting prevention function stopping device 360 engages with the first groove portion 551 of the magazine portion 500, the second detection shaft portion 350 does not stop the function of the bullet detection device 300, and when the position engagement portion 365 engages with the second groove portion 552, the second detection shaft portion 350 stops the function of the bullet detection device 300 (refer to Figs. 4, 5A, and 5B).

[0040] Next, the empty shooting prevention device 200 in the electric gun 10 will be described. As described above, in the empty shooting prevention device 200, the switch 201 is provided outside the housing 16, and in order to prevent the so-called empty shooting when there is no bullet G in the magazine portion 500, the power supply stop portion 202 described later disconnects the contact with the switch 201. Therefore, the power supply stop portion 202 is operated in response to the protrusion of the detection push portion 312 to disconnect (does not supply power) the contact with the switch 201.

[0041] The power supply stop portion 202 includes a detection receiving portion 210 for receiving the protrusion operation of the detection push portion 312 from the magazine portion 500, the piston interlocking portion 250 which is interlocked with the movement of the piston 30, and the switch disconnecting portion 270 for separating the contact of the switch 201 (refer to Fig. 6). The detection receiving portion 210 has a first detection receiving portion 211 and a second detection receiving portion 212, and receives a movement operation of the detection push portion 312 in the -x direction. The first detection receiving portion 211 receives the movement of the detection push portion 312 in the -x direction and moves in the -x direction (refer to Figs. 6, 7A, and 7B).

[0042] The second detection receiving portion 212 is rotatably supported by a shaft portion 213. The protruding portion 212a of the second detection receiving portion 212 is further pressed by a tip portion 211a of the first detection receiving portion 211 pressed by a tip portion 312a of the detection push portion 312. According to Figs. 8A and 8B which are bottom views, the second detection receiving portion 212 rotates clockwise on an xz plane. Accordingly, the other end portion 212b of the second detection receiving portion 212 also rotates clockwise on the xz plane, and thus, the other end portion 212b protrudes in the trajectory of the recoil plate 61 which reciprocates from the -x direction to the +x direction. That is, the piston 30 reciprocates from the -x direction in the +x direction, and thus, the recoil plate 61 in the piston interlocking portion 250 which is interlocked with the reciprocation of the piston 30 also reciprocates from the -x direction in the +x direction. Moreover, as described above, the other end portion 212b protrudes in the trajectory along which the other end portion 212 reciprocates. That is, in Figs. 8A and 8B, the second detection receiving portion 212 is pressed by the first detection receiving portion 211, and thus, the second detection receiving portion 212 is in a state where the other end portion 212b is located upward in the drawing, that is, the other end portion 212b stands uprightly, and the other end portion 212b protrudes in the trajectory along the recoil plate 61 reciprocates(-x direction and +x direction).

[0043] Fig. 9 is an enlarged side view of a state where a muzzle of the electric gun 10 faces right in the states of Figs. 8A and 8B. This state is a state where a stop plate 280 of the switch disconnecting portion 270 described below does not engage with a switch lever 290.

[0044] In this state, the piston 30 still reciprocates. Accordingly, the other end portion 212b of the second detection receiving portion 212 standing uprightly in Figs. 8A and 8B engages with the recoil plate 61 of the piston interlocking portion 250 in Figs. 10A and 10B thereafter. As described above, the recoil plate 61 reciprocates from the -x direction to the +x direction. Accordingly, the second detection receiving portion 212 engages with the recoil plate 61 and the other end portion 212b of the second detection receiving portion 212 is operated so as to rotate clockwise on the xz plane. That is, the motor 22 rotates and the piston 30 continuously reciprocates since the power supply is not disconnected yet. However, the other end portion 212b of the second detection receiving portion 212 is further rotated clockwise on the xz plane by the piston interlocking portion 250 which follows the reciprocation of the piston 30. Moreover, the spring 214 biases the second detection receiving portion 212 counterclockwise (refer to Figs. 10A and 10B).

[0045] Accordingly, one end portion 212c of the second detection receiving portion 212 also rotates clockwise on

the xz plane. Further, the one end portion 212c of the second detection receiving portion 212 of the detection receiving portion 210 rotated clockwise engages with the switch disconnecting portion 270 to operate the switch disconnecting portion 270. Further, according to the operation of the switch disconnecting portion 270, the switch disconnecting portion 270 disconnects the contact of the switch 201, that is, disconnects the switch 201 (refer to Figs. 8A, 9, 10A, and 10B).

[0046] To further describe this, first, the switch disconnecting portion 270 has a latch 271, the stop plate 280, and a switch lever 290. Moreover, a latch spring 272 biases the latch 271 clockwise. According to the configuration, the one end portion 212c of the second detection receiving portion 212 engages with the latch 271 of the switch disconnecting portion 270, and the one end portion 212c rotates the latch 271 counterclockwise against a clockwise biasing force of the latch spring 272. (refer to Figs. 8A, 9, 10A, 10B, and 11).

[0047] The latch 271 has a latch convex portion 271a, and the stop plate 280 engaging with the latch convex portion 271a is biased in the -x direction by a stop plate spring 281. Therefore, the latch 271 is rotated counterclockwise, and the stop plate 280 disengaged from the latch convex portion 271a of the latch 271 moves in the -x direction. Fig. 11 is a side view illustrating a state where the muzzle of the electric gun 10 faces right in the states of Figs. 10A and 10B. By comparing Fig. 9 with Fig. 11, it can be understood that the stop plate 280 moves in the -x direction.

[0048] The stop plate 280 moves in the -x direction. Accordingly, the switch lever one end portion 291 of the switch lever 290 is pushed down, and the switch lever other end portion 292 is pulled up in the +y direction about the switch lever shaft portion 293. In this case, a convex portion 294 attached to the switch lever shaft portion 293 rotates to lift a first contact portion 201a of the switch 201 and disconnects a contact with a second contact portion 201b of the switch 201. Accordingly, power supply of the motor 22 is prevented, and it is possible to prevent the empty shooting (refer to Fig. 11). That is, the detection receiving portion 210 operates the switch disconnecting portion 270, and the switch disconnecting portion 270 disconnects the switch 201. In addition, the switch lever 290 includes the switch lever one end portion 291 and the switch lever other end portion 292, and has a substantially isosceles triangular shape in which an apex angle therebetween is an obtuse angle. In addition, the switch lever spring 290a biases the switch lever 290 counterclockwise in Fig. 11. Thereby, in a state where the bullet G is disposed in the magazine portion 500 or in a case where the empty shooting prevention function stopping device 360 is operated, the first contact portion 201a of the switch 201 is pushed down, and the contact with the second contact portion 201b of the switch 201 is ensured.

[0049] As described above, in the related art, it is necessary to use a mechanical box having a mechanical power supply stopping device for a dedicated electric gun. However, the empty shooting prevention device can be installed as an independent device from a so-called mechanical box, and thus, this device is installed in a portion where there is a space regardless of an external shape of the electric gun. Accordingly, it is possible to use the existing mechanical box. Therefore, even if the user keeps pulling the trigger 20 in a state where there is no bullet G in the magazine after the shooting of the bullet G ends, an effect of preventing so-called empty shooting can be achieved. Moreover, in the case of an electric gun having no magazine portion, an effect of preventing the empty shooting can be obtained by having the same configuration as that of the bullet detection device in the main body of the electric gun.

[0050] Moreover, in this state, the first contact portion 201a of the switch 201 is lifted by the above-described effects of the stop plate 280 and the switch lever 290, and the contact with the second contact portion 201b of the switch 201 is disconnected (refer to Fig. 11). Therefore, in order to cause the first contact portion 201a and the second contact portion 201b of the switch 201 to come into contact with each other again, a bolt portion 295 is pulled in the +x direction. If a user (not illustrated) pulls the bolt portion 295, the bolt portion 295 engages with the stop plate 280 according to a certain stroke. The stop plate 280 engaging with the bolt portion 295 is biased in the -x direction by the stop plate spring 281. Accordingly, the bolt portion 295 is pulled in the +x direction against this biasing force (refer to Fig. 12).

[0051] Fig. 13 is an enlarged bottom view in a state where the muzzle faces left in the state of Fig. 12. In addition, when the magazine portion 500 filled with the bullets G in advance is set to the electric gun 10 and the bolt portion 295 is pulled in the +x direction as described above, the stop plate 280 also moves in the +x direction and engages with the latch 271 again. The stop plate 280 stays at this position against the stop plate spring 281. The first contact portion 201a of the switch 201 is pushed down to come into contact with the second contact portion 201b of the switch 201 (refer to Figs. 12 and 13). Thereafter, when the trigger 20 is pulled, the bullet G can be fired again. Moreover, in the present embodiment, the recoil shock generating mechanism 50 is provided. However, even in a case where the recoil shock generating mechanism 50 is not provided, the piston interlocking portion 250 which follows the reciprocating motion of the piston 30 may be disposed or the piston 30 itself may be implemented as the piston interlocking portion 250.

Reference Signs List

[0052]

10: electric gun
15: engine portion
16: housing
20: trigger

21: first contact
22: motor
23: motor gear
24: bevel gear
25: gear
26: sector gear
30: piston
31: rack portion
32: spring
50: recoil shock generating mechanism
51: piston engagement portion
52: recoil weight
53: recoil spring
54: tip portion
60: recoil bar
61: recoil plate
200: empty shooting prevention device
201: switch
202: power supply stop portion
250: piston interlocking portion
270: switch disconnecting portion
300: bullet detection device
312: detection push portion
500: magazine portion
G: bullet

Claims

1. An empty shooting prevention device comprising:

a switch which is disposed in series with a contact which comes into contact with the switch to supply power to a motor when a trigger is pulled; and
a power supply stop portion which disconnects the switch to prevent a power supply to the motor in response to an operation of a bullet detection device which detects that there is no bullet.

2. The empty shooting prevention device according to claim 1,
wherein the power supply stop portion includes
a detection receiving portion which receives the operation of the bullet detection device which detects that there is no bullet,
a piston interlocking portion which is interlocked with a movement of a piston driven by the motor, and
a switch disconnecting portion which separates a contact of the switch,
wherein through the detection receiving portion engaging with the piston interlocking portion, the piston interlocking portion operates the switch disconnecting portion, and the switch disconnecting portion disconnects the switch.

3. The empty shooting prevention device according to claim 1 or 2,
wherein the contact which comes into contact with the switch to supply power to the motor when the trigger is pulled is provided inside a housing, and both the switch and the power supply stop portion are provided outside the housing.

4. An electric gun comprising:
the empty shooting prevention device according to any one of claims 1 to 3.

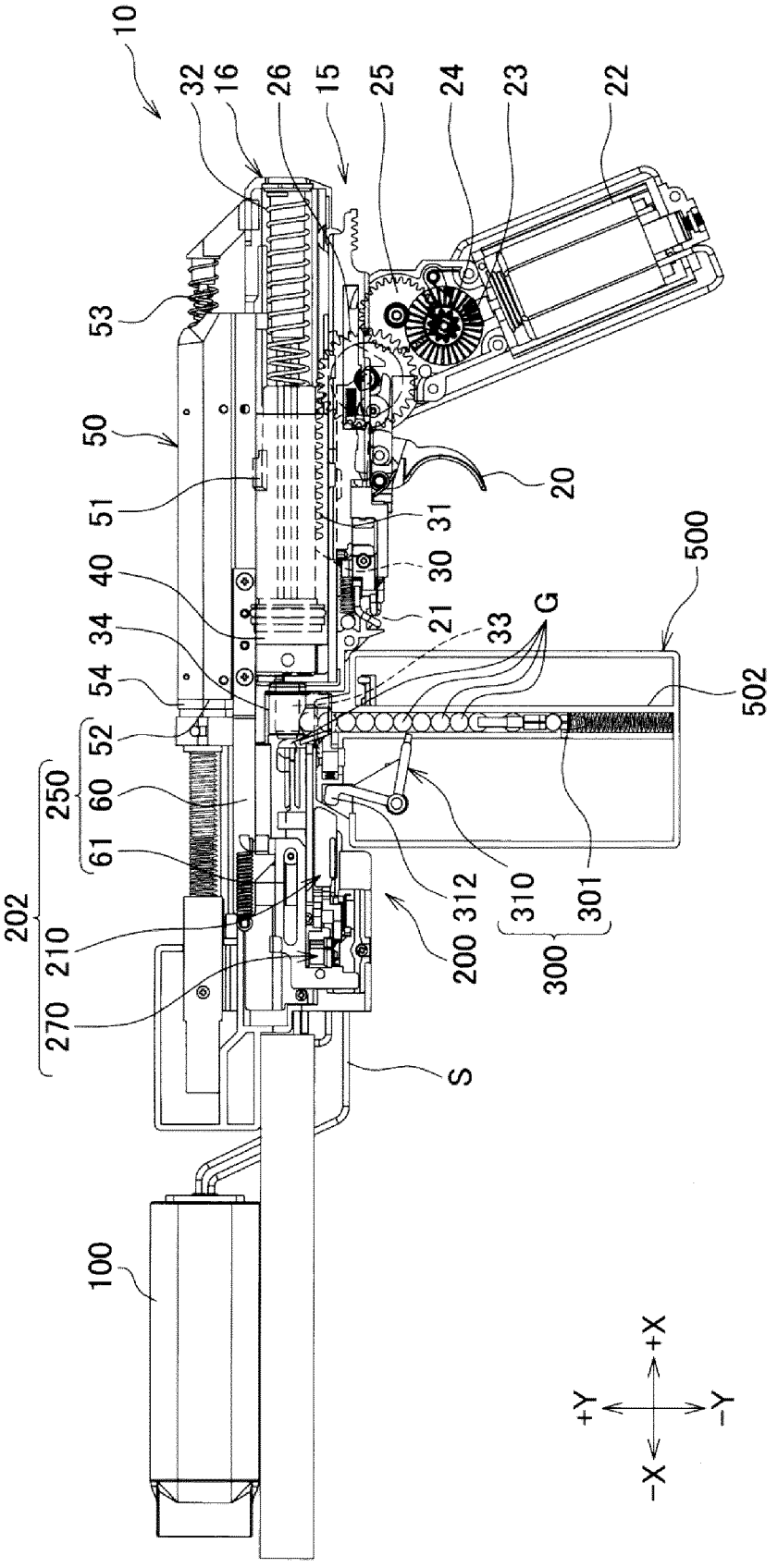

10
32
16
26
15
25
24
23
22
53
50
51
20
31
30
21
33
G
40
34
54
52
60
61
250
202
210
270
312
310
301
300
200
S
500
502
100
+X
+Y
-Y
-X

FIG. 1

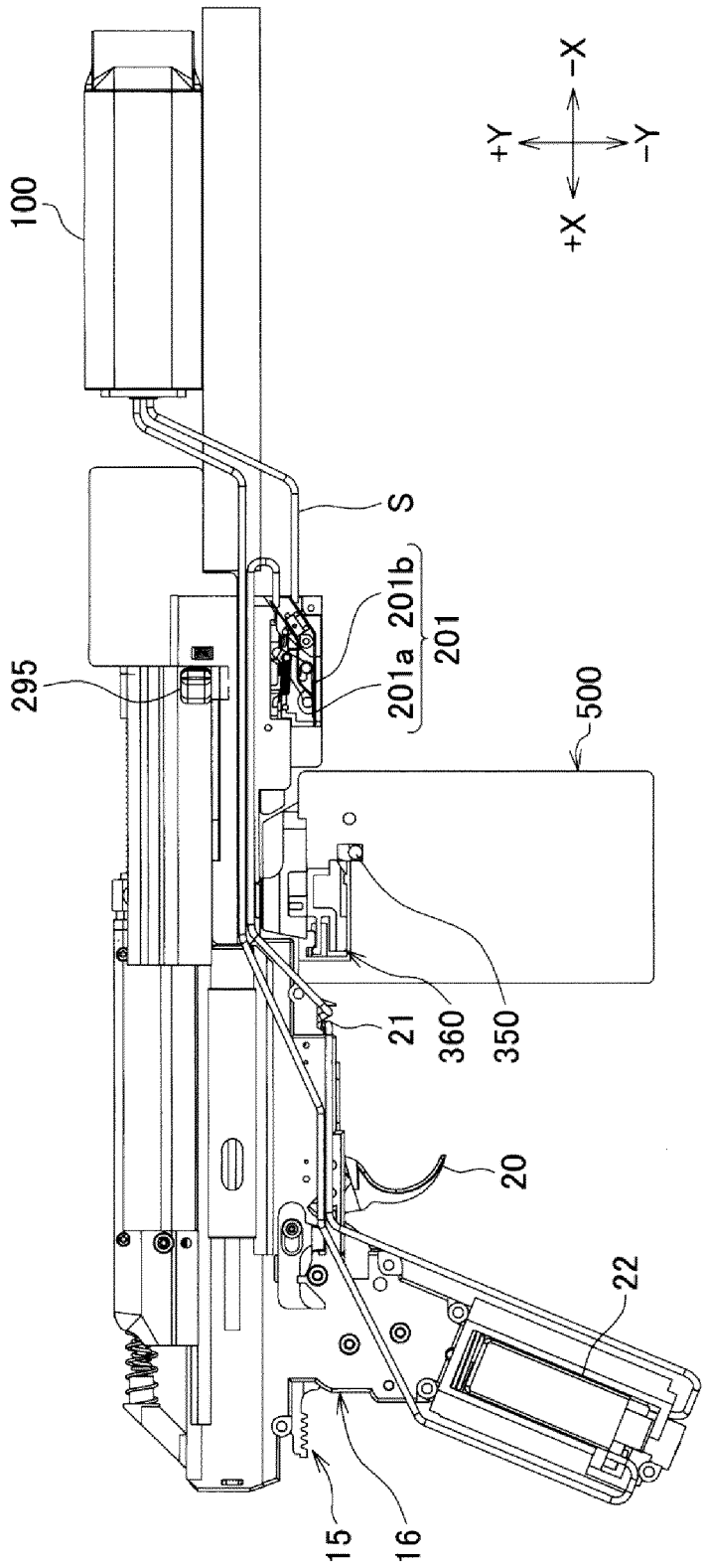


FIG. 2

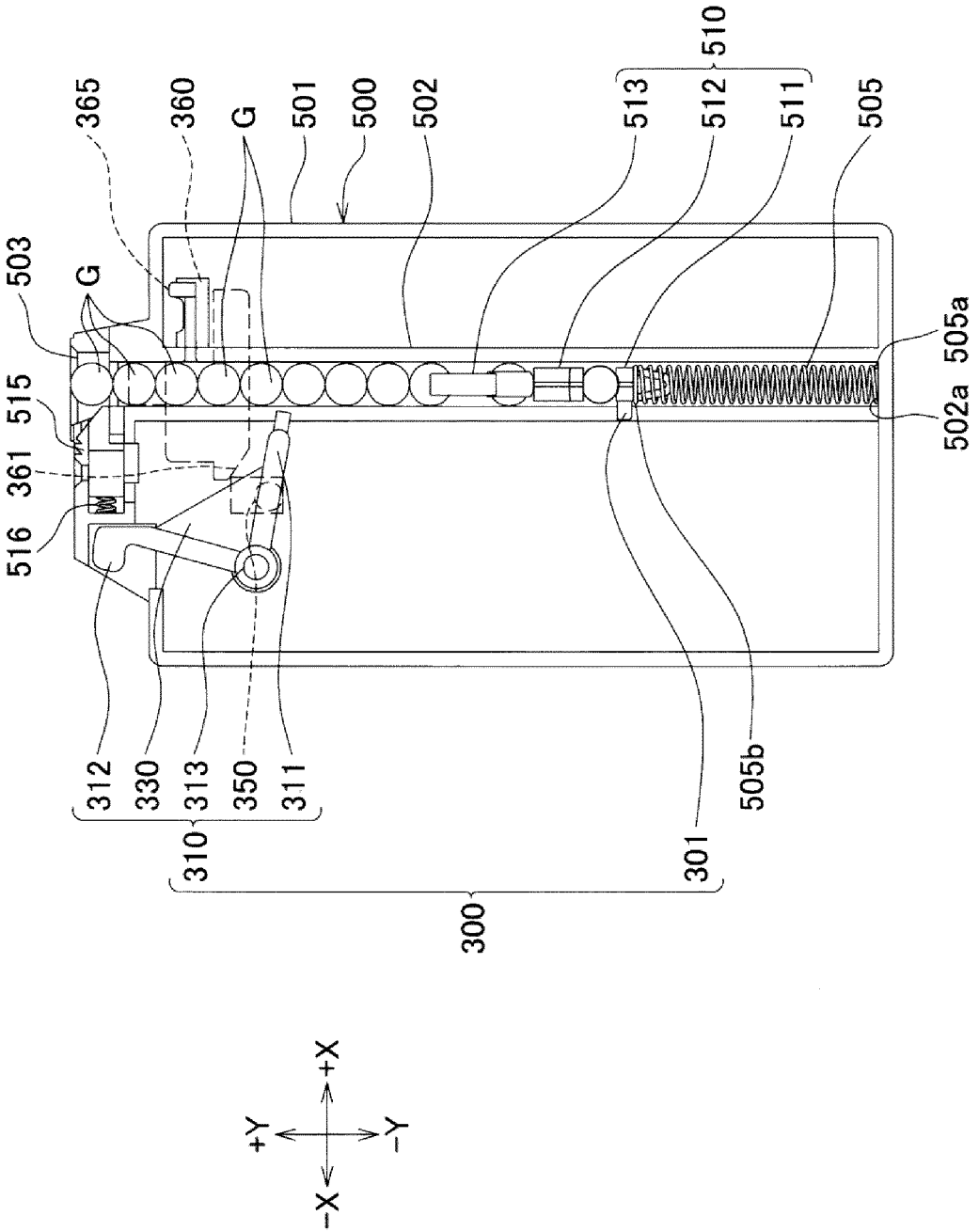

365
360
G
501
500
502
513
512
510
511
505
503
G
505a
515
502a
361
516
312
330
313
350
311
505b
310
301
300
+X
+Y
-Y
-X

FIG. 3

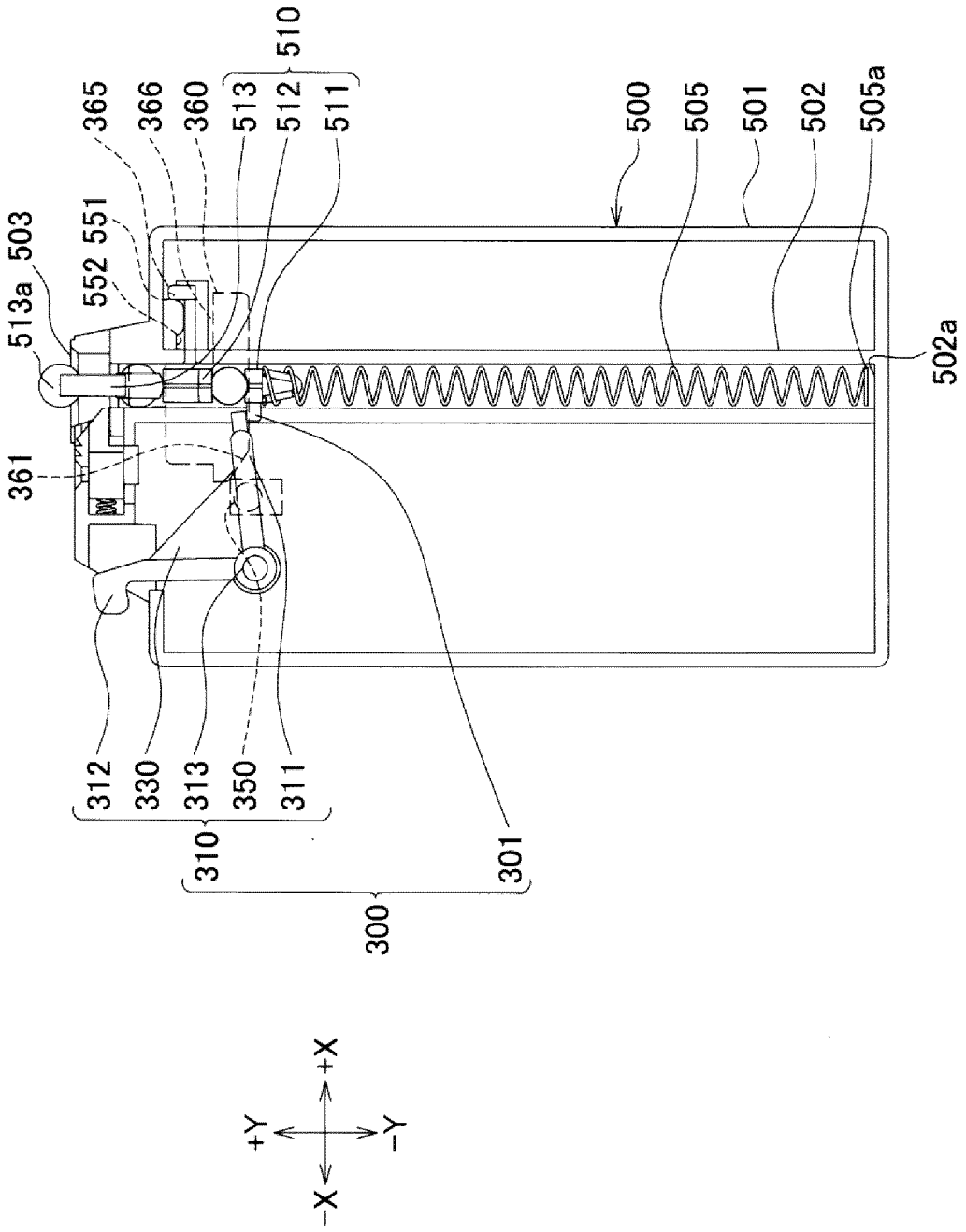

365
366
360
513
512
511
510
500
505
501
502
505a
503
513a
552
551
502a
361
312
330
313
350
311
310
301
300
+X
-X
+Y
-Y

FIG. 4

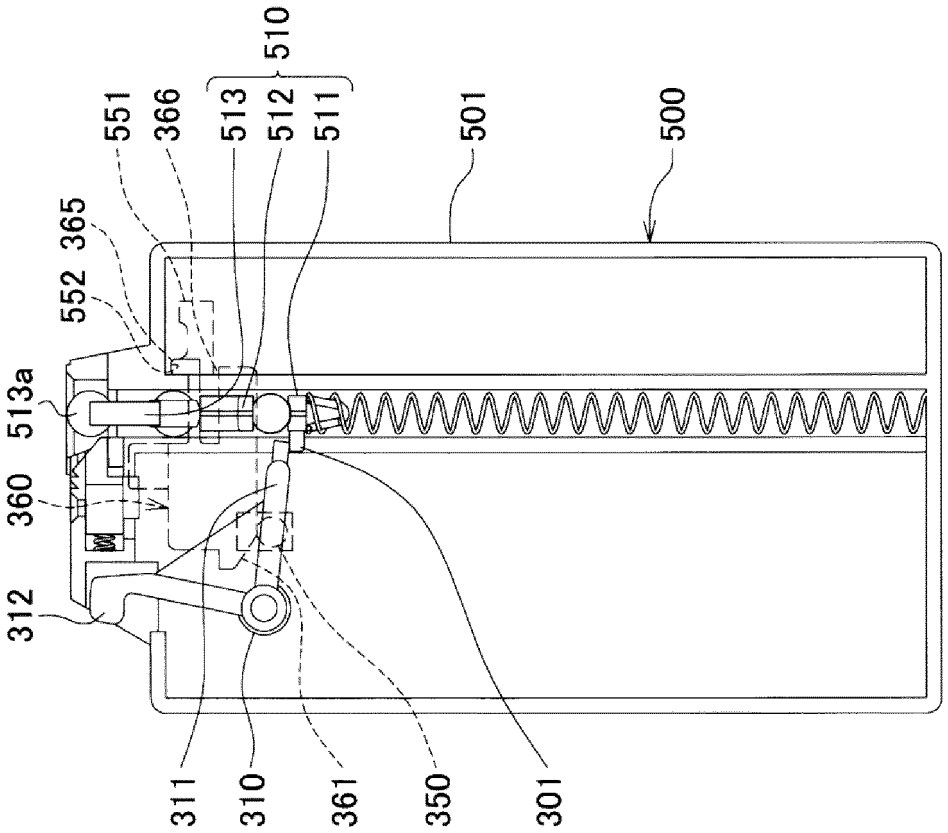
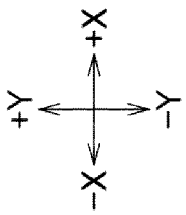
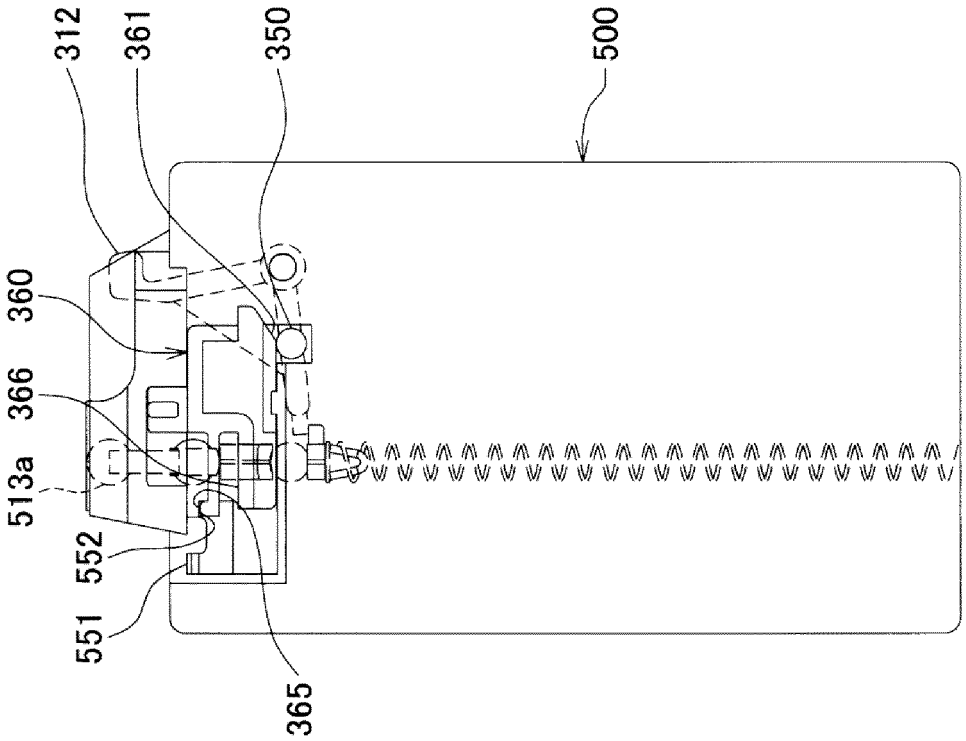

510
551
366
513
512
511
501
500
365
552
513a
360
312
311
310
361
350
301

FIG. 5A


+X
+Y
-Y
-X



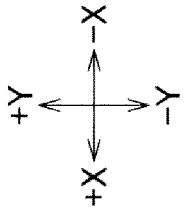


FIG. 5B

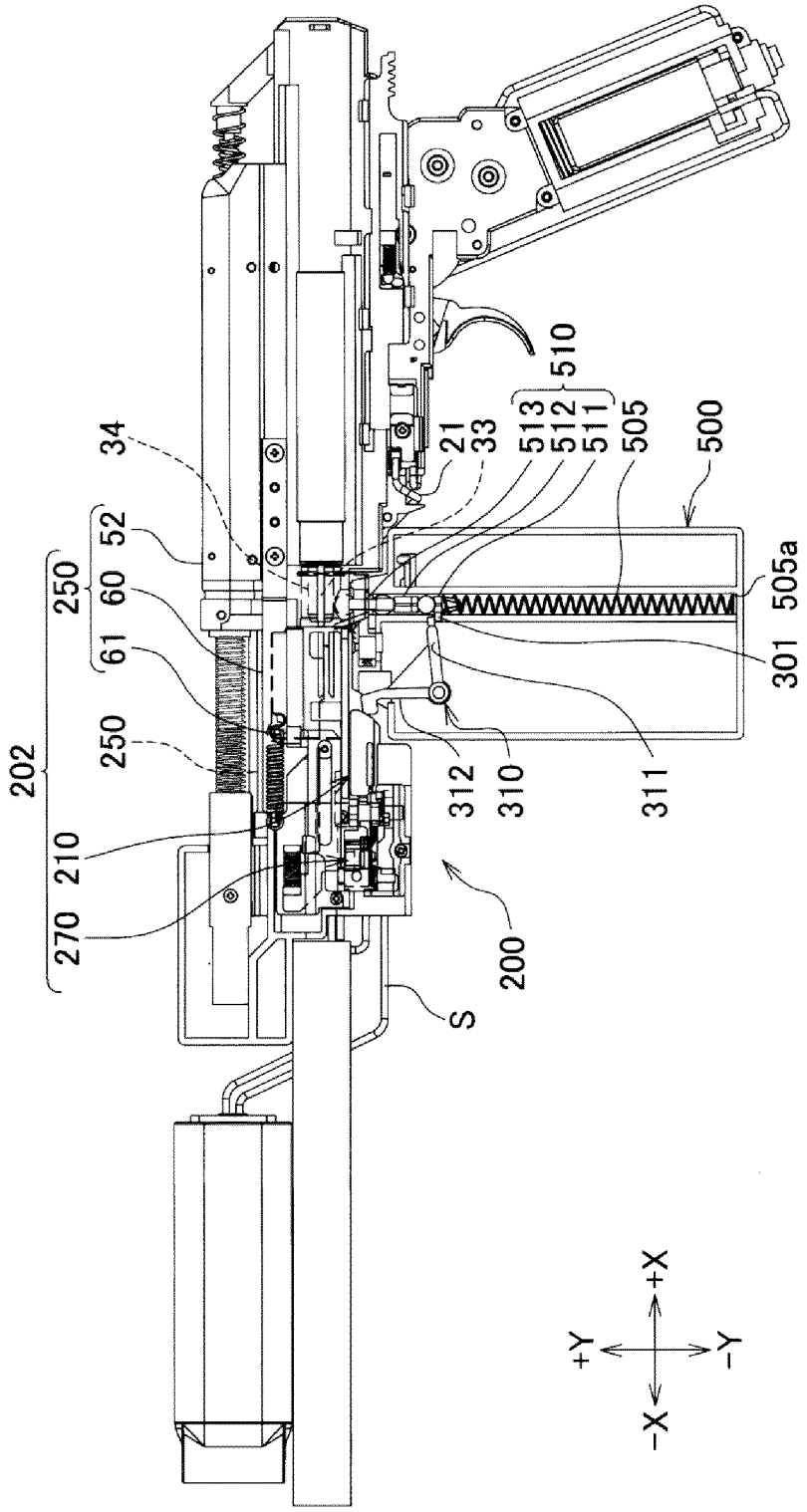

34
52
250
60
61
250
202
210
270
21
33
510
513
512
511
505
500
505a
301
312
310
311
200
S
+X
+Y
-Y
-X

FIG. 6

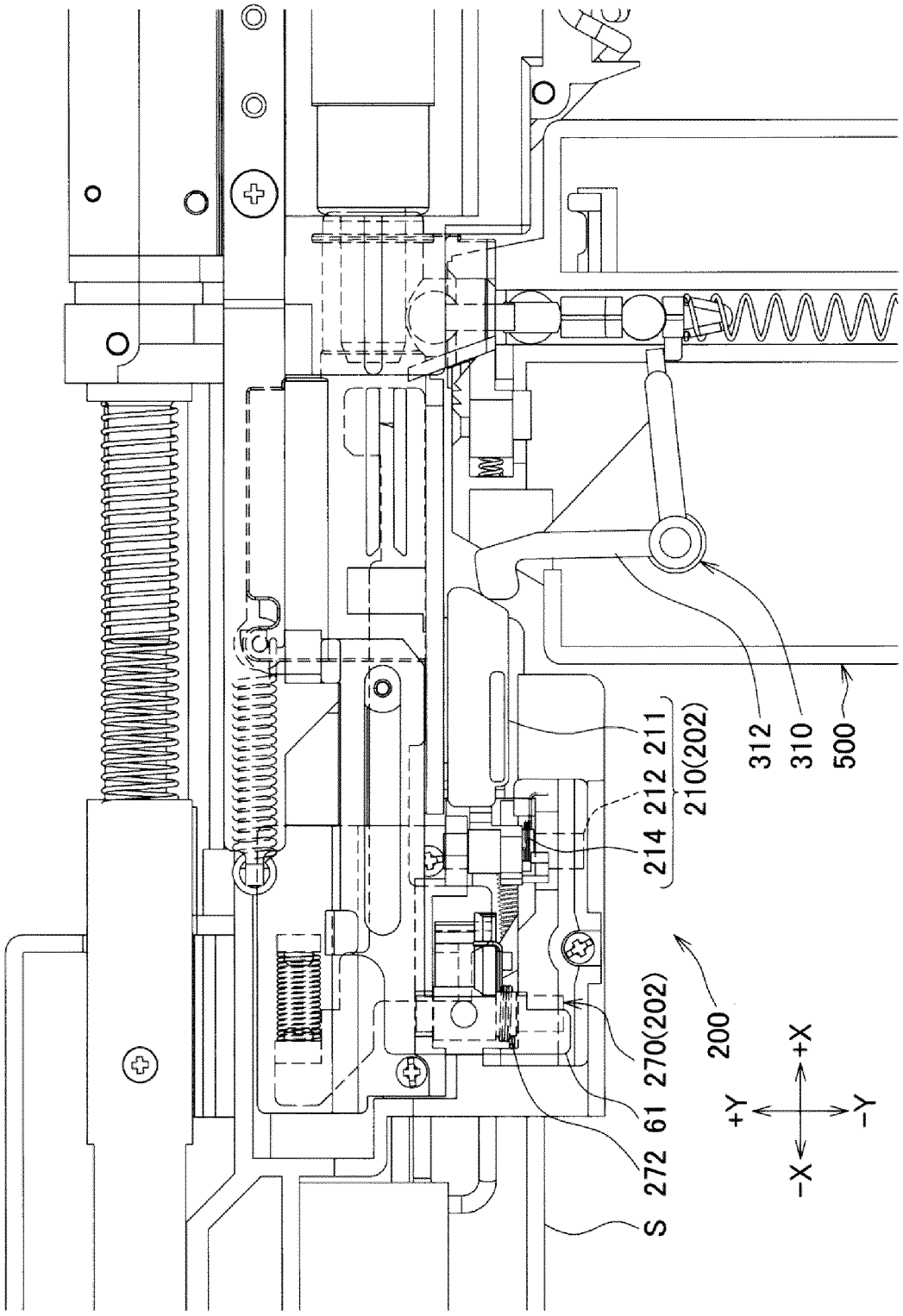


FIG. 7A

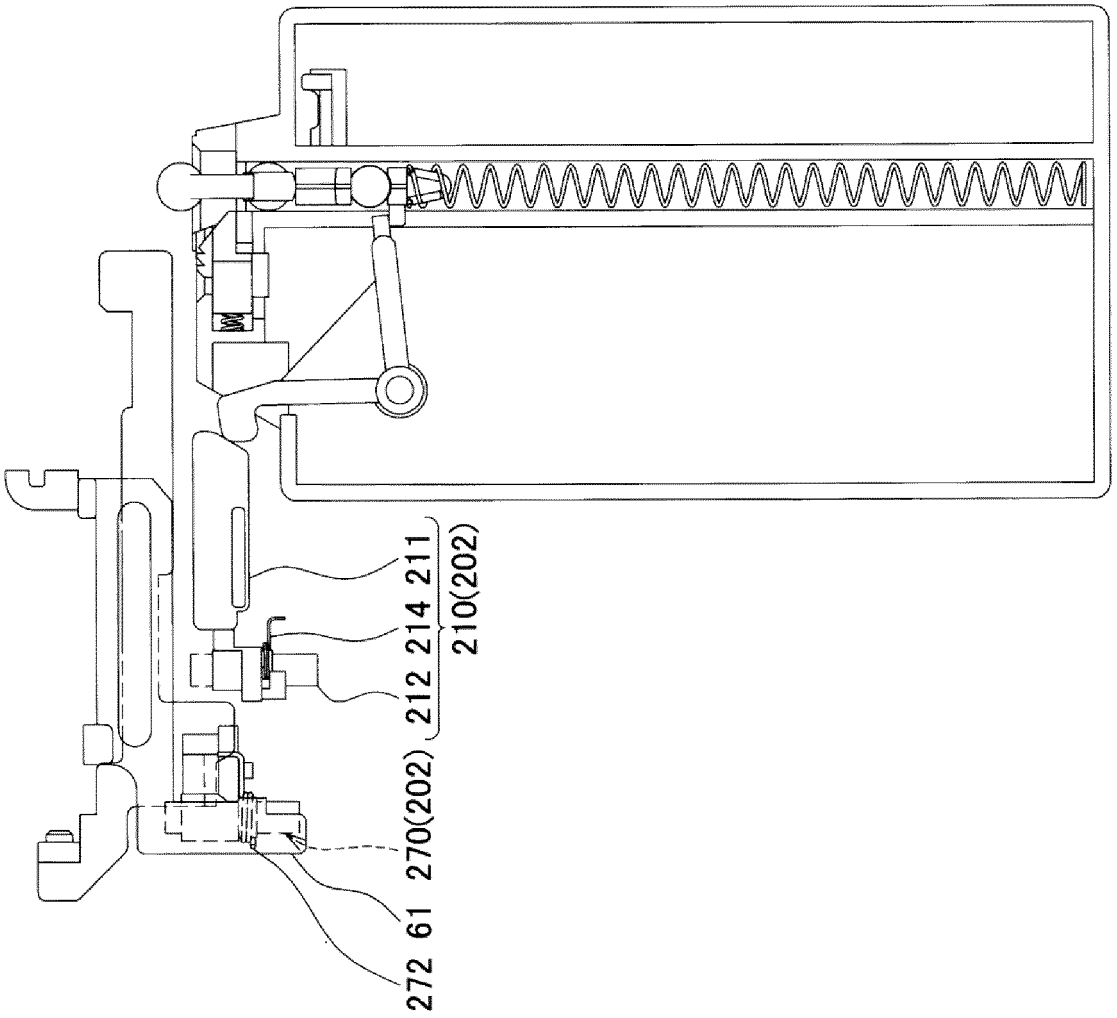
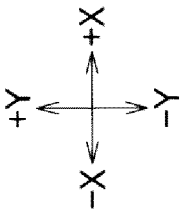


FIG. 7B



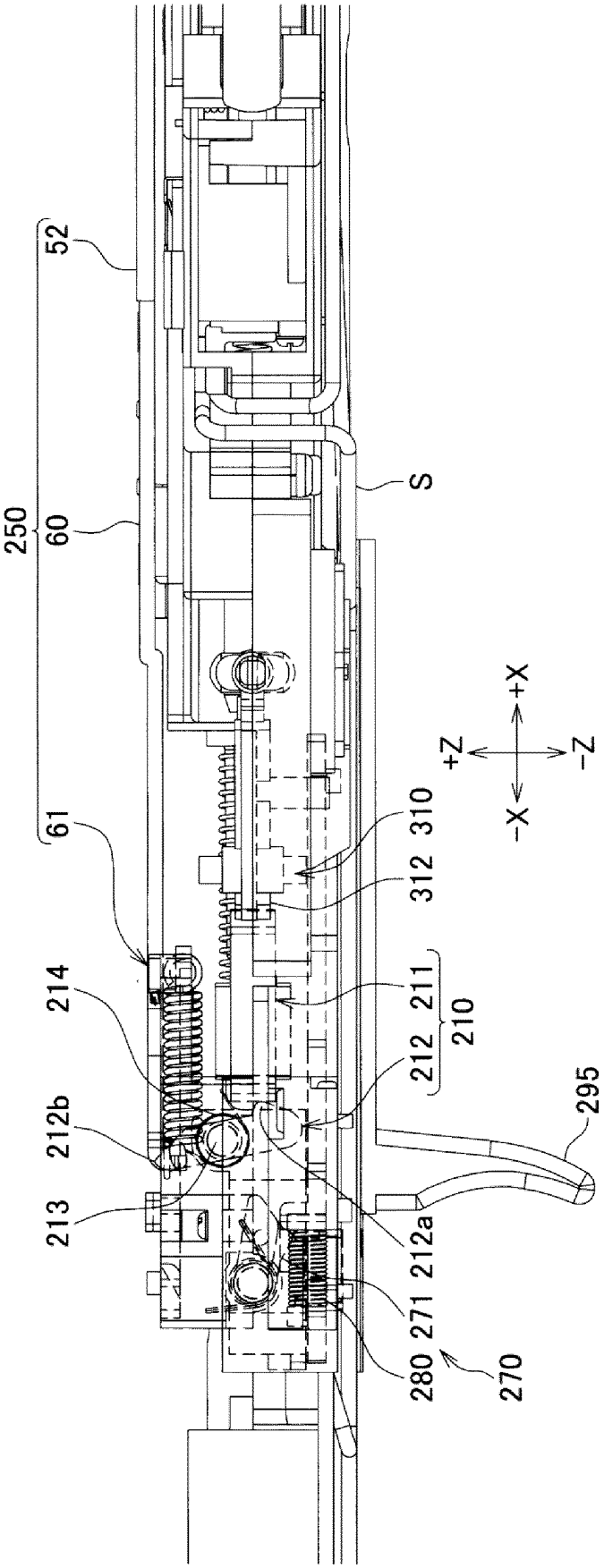

52
250
60
S
61
310
312
214
211
210
212b
212
295
213
212a
271
280
270
+X
-X
+Z
-Z

FIG. 8A

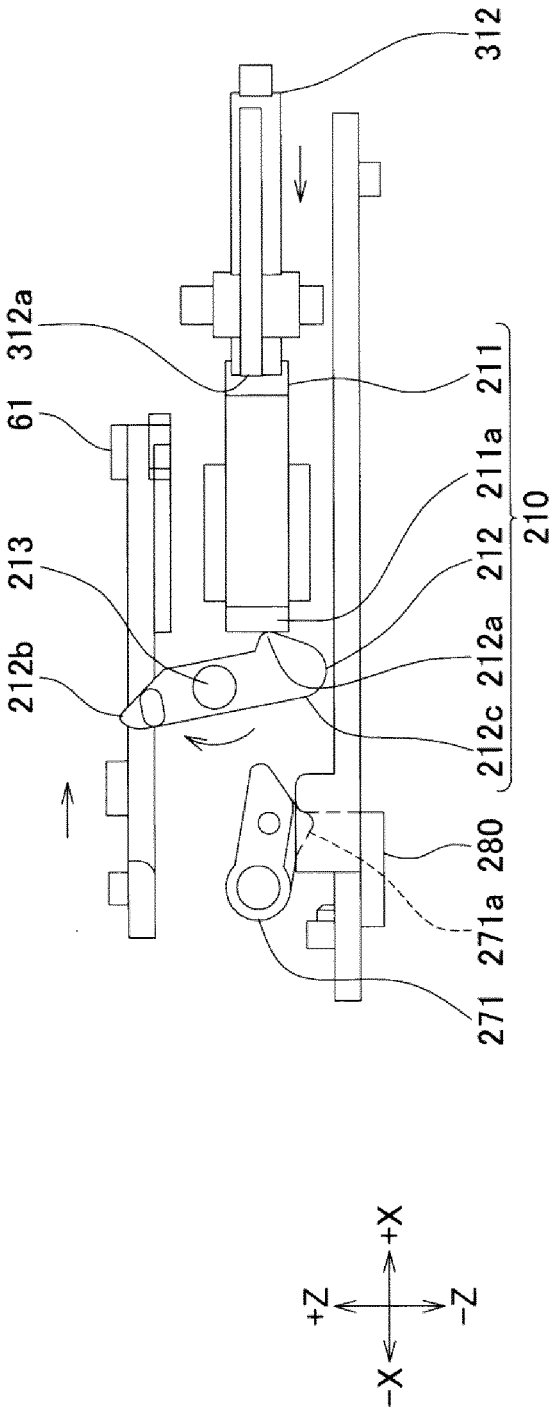

312
312a
61
213
212b
211
211a
210
212
212a
212c
280
271a
271
+X
-X
+Z
-Z

FIG. 8B

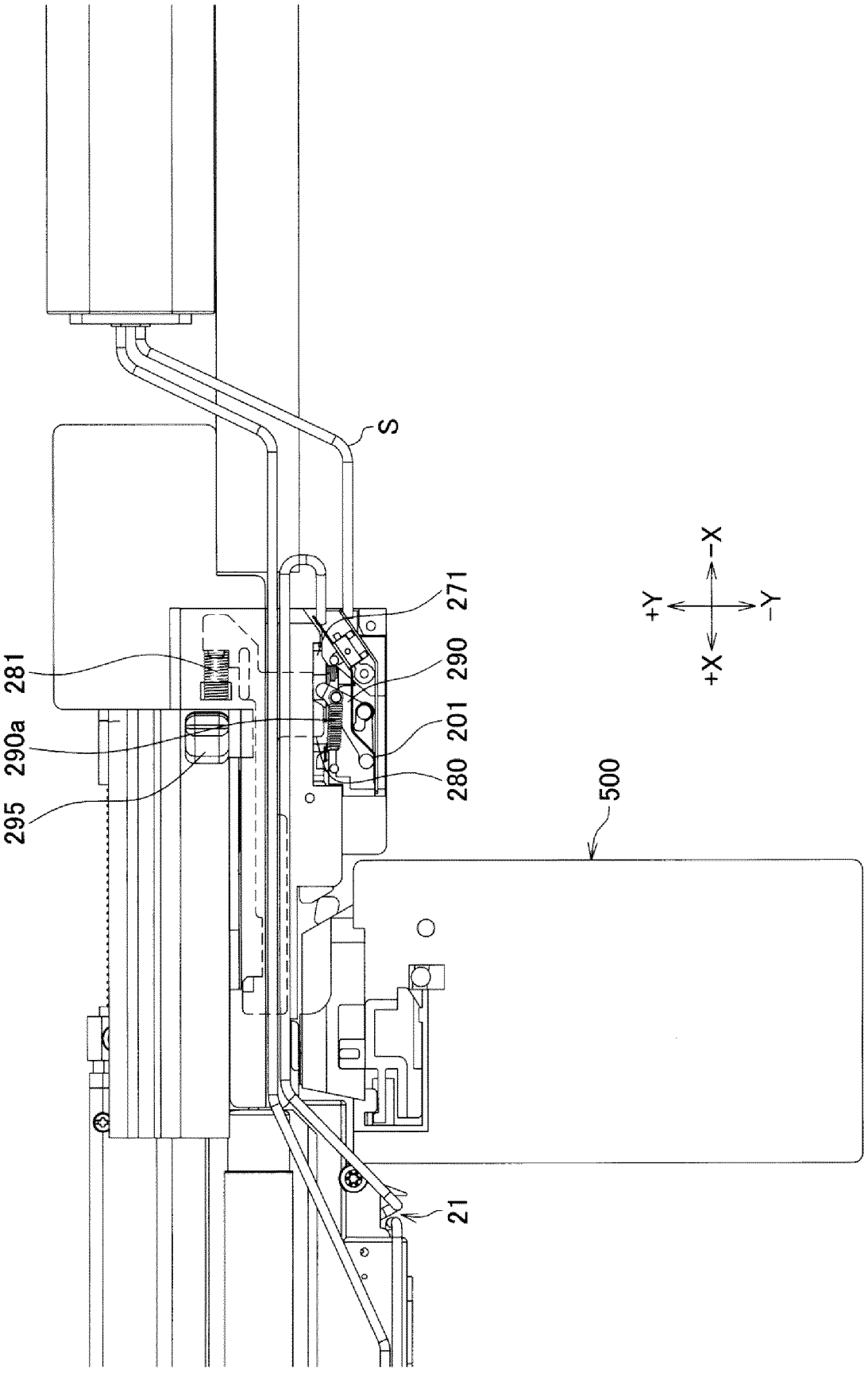


FIG. 9

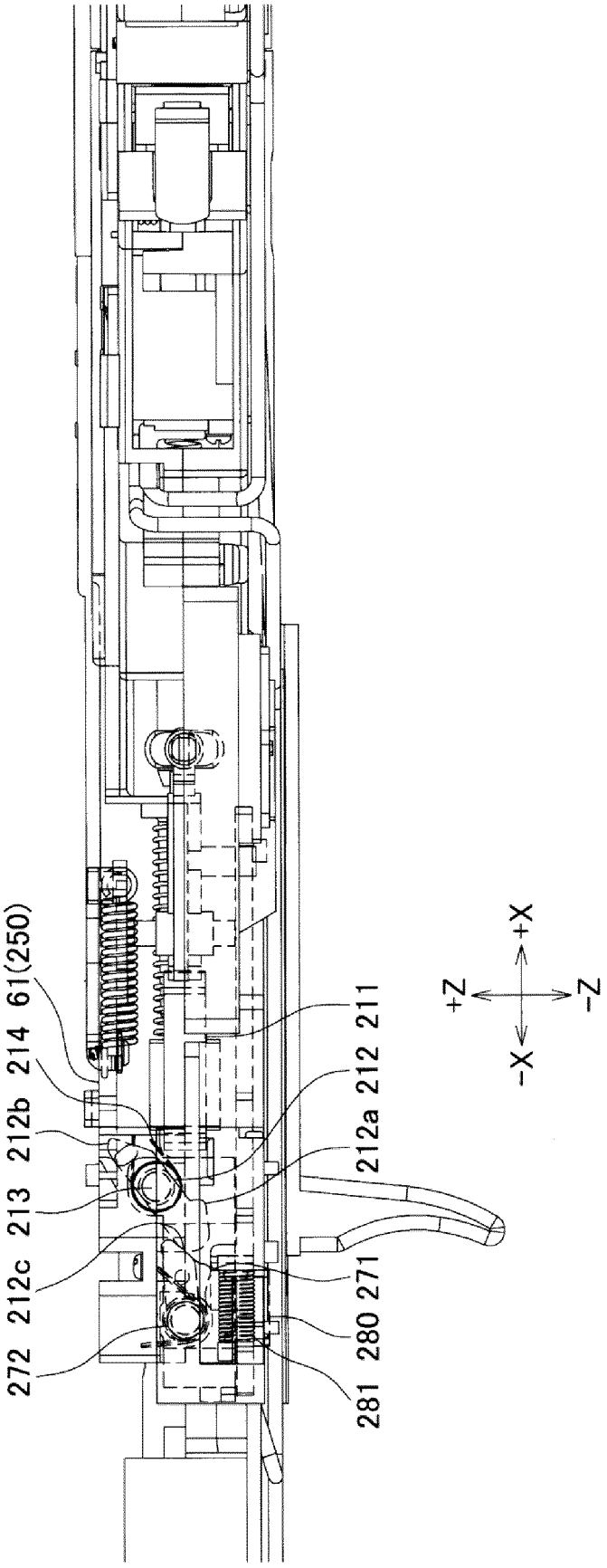


FIG. 10A

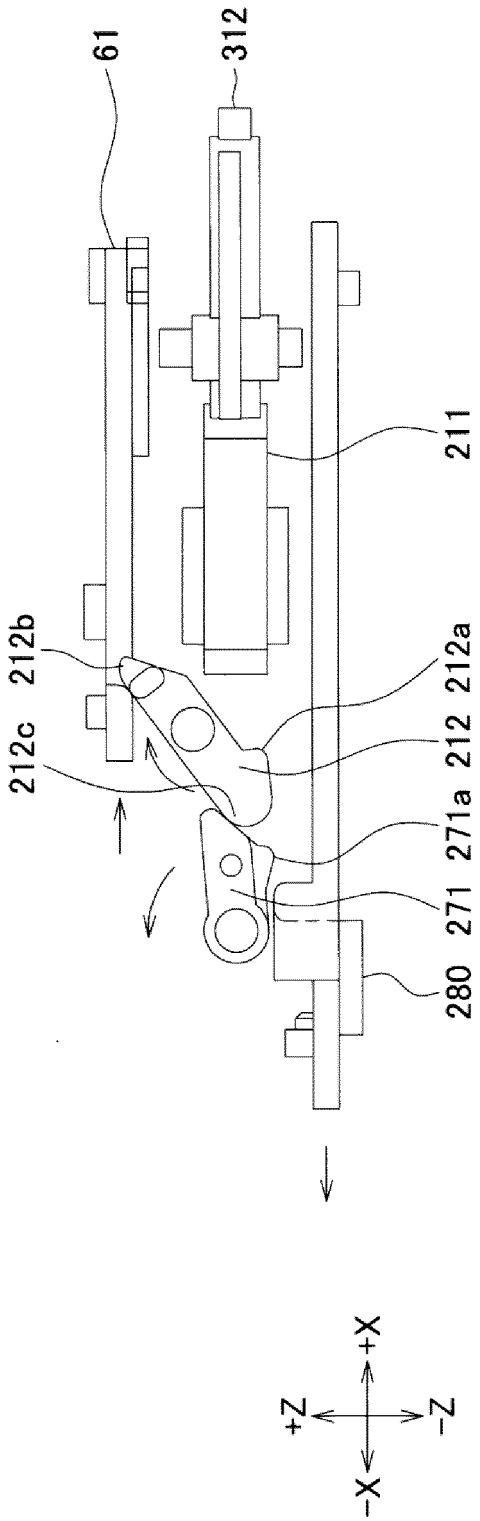


FIG. 10B

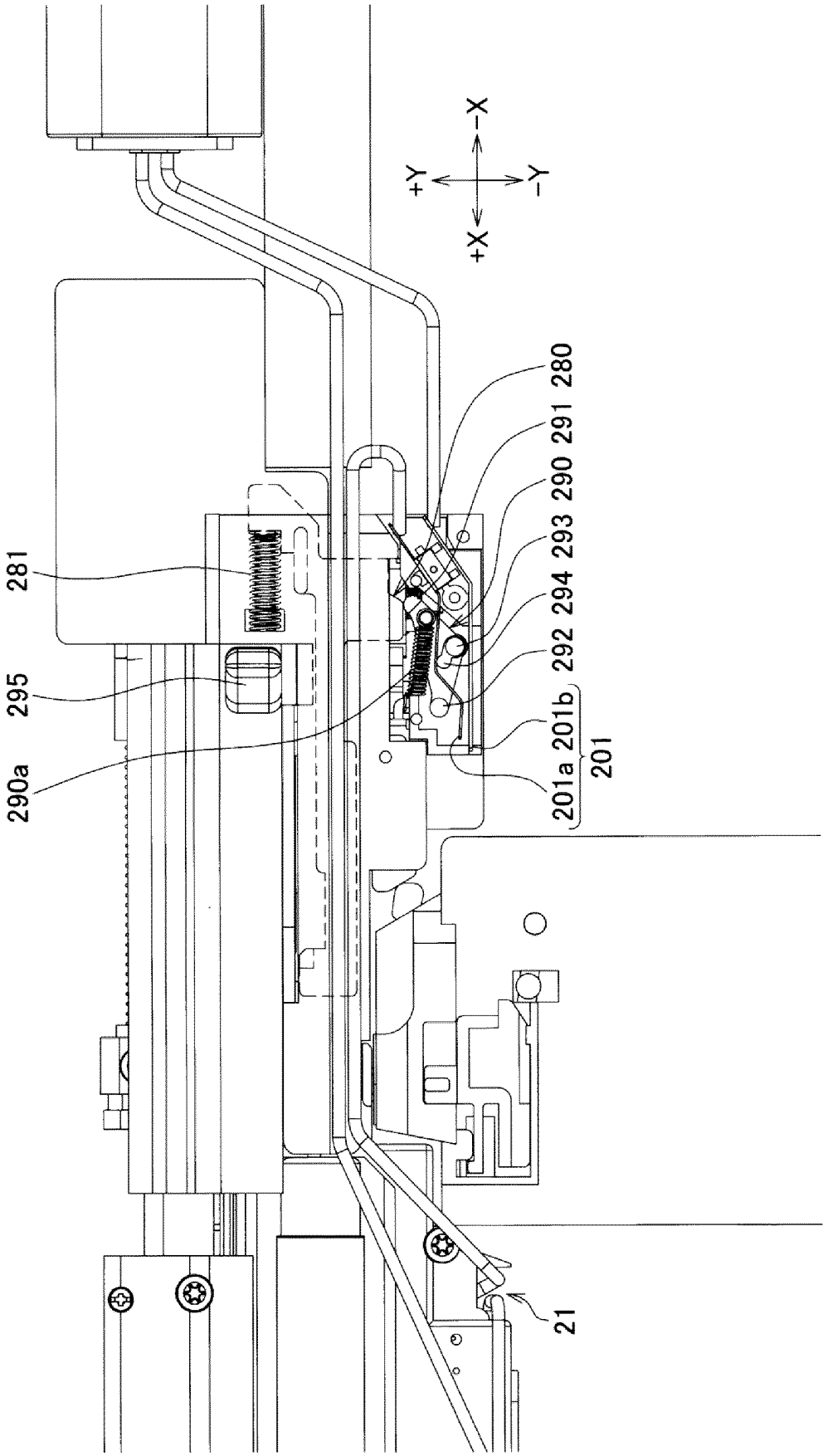


FIG. 11

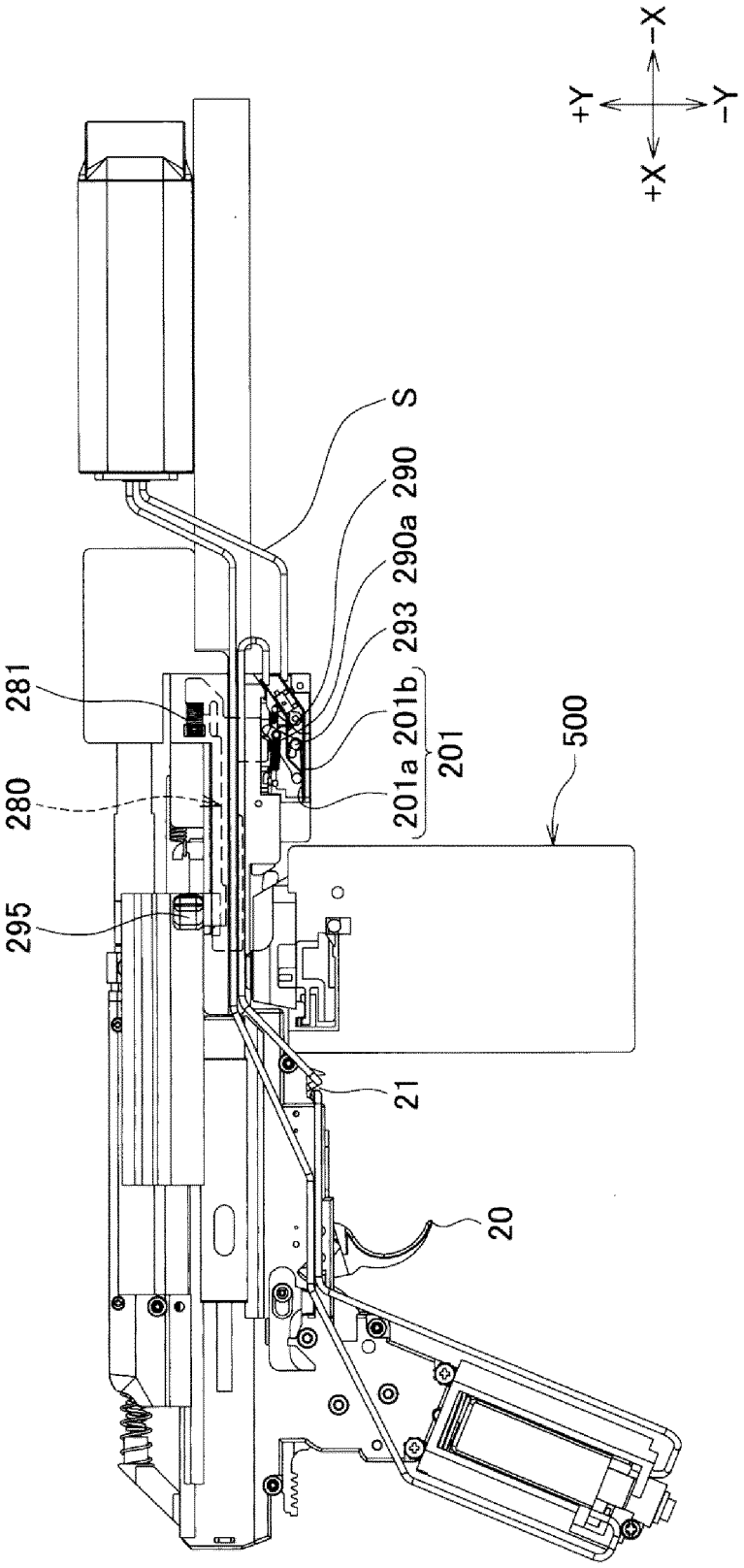


FIG. 12

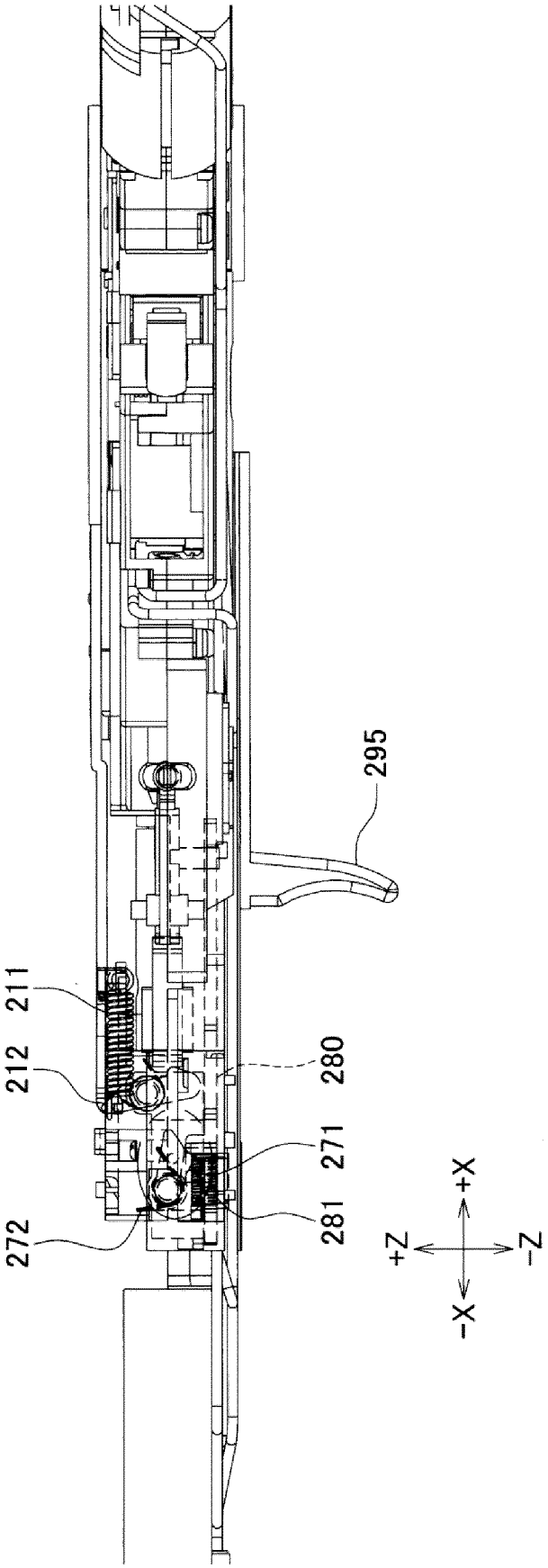


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/034362

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. F41B11/71(2013.01)i, F41B11/643(2013.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. F41B11/71, F41B11/643

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2017
Registered utility model specifications of Japan 1996-2017
Published registered utility model applications of Japan 1994-2017

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-25501 A (TOKYO MARUI KK) 04 February 2010 (Family: none)	1-4
A	WO 2005/066574 A1 (TSURUMOTO, Koichi) 21 July 2005 & US 2007/0000483 A1 & EP 1701127 A1 & AU 2003292713 A1	1-4
A	WO 2016/181507 A1 (TOKYO MARUI KK) 17 November 2016 (Family: none)	1-4
A	EP 3015812 A1 (GUAY GUAY TRADING CO., LTD.) 04 May 2016 (Family: none)	1-4
A	EP 2388548 A2 (YIH KAI ENTERPRISE CO., LTD.) 23 November 2011 & US 2011/0283984 A1 & HK 1148432 A2	1-4

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28.11.2017	12.12.2017
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

- JP 2010025501 A **[0004] [0007]**