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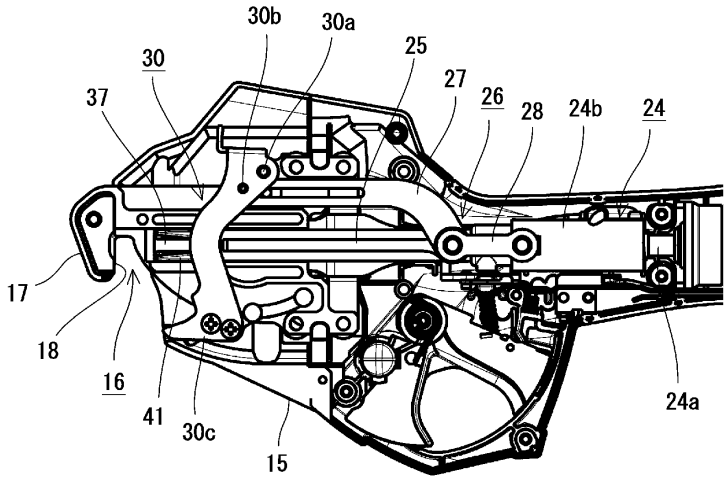
(54) **BINDER**

(57) The present invention is provided with: a driver (25) that is caused to move linearly by a drive mechanism (22); and a clincher (18) that is disposed at a position to receive a tip of the driver (25). An insertion port (16) for insertion of an object to be bound (50) is disposed between the driver (25) and the clincher (18). A standby section (37) that stands by in a state in which a binding tool (41) is available to be pushed out is disposed between the driver (25) and the insertion port (16). When the driver mechanism (22) is activated, the driver ("5) pushes out the binding tool (41) which has been supplied to the standby section (37), and a leg section (41a) of the binding tool (41) that has been pushed out is pushed against the clincher (18) and deforms.

FIG.9A



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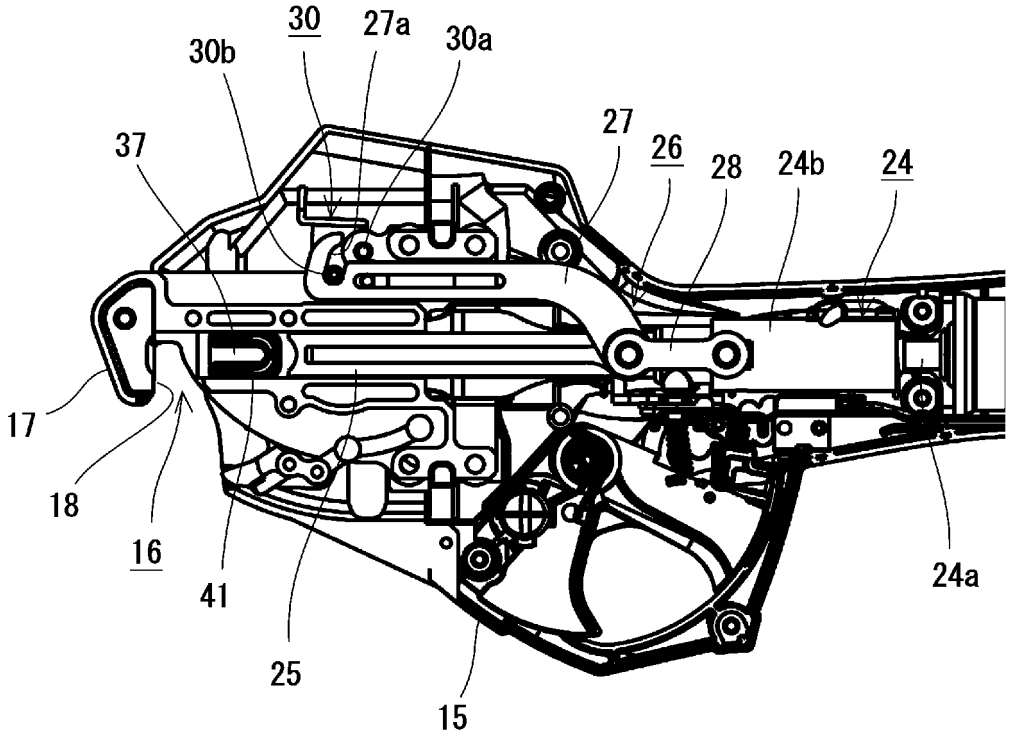
(Cont. next page)

FIG.9B



Description

Technical Field

[0001] The present invention relates to a binding machine (binder machine) that can be used for binding a harness, binding a bag mouth, binding a field wire or an attraction string.

Background Art

[0002] For example, in a factory that manufactures home appliances, a plurality of harnesses used for power supply and signal communication are bound and assembled. Such harness binding is mainly performed by manually wrapping an adhesive tape and the workability is poor.

[0003] In this respect, for example, if a device as described in Patent Literature 1 is used, the binding can be performed mechanically, so that the time and effort to wrap the tape can be saved.

[0004] In addition, Patent Literature 2 discloses a handy type binding machine capable of performing a fastening work by using C-rings. The binding machine described in Patent Literature 2 has a structure in which, when a trigger is operated, a pair of jaws is closed to push and deform the C-ring from both sides, and when the operated trigger is released, a next C-ring is sent to a tip end portion thereof.

Citation List

Patent Literature

[0005]

Patent Literature 1: JP-A-H6-329118
Patent Literature 2: JP-A-2000-33526

Summary of Invention

Technical Problem

[0006] In the device described in Patent Literature 1, a plurality of gears are disposed in vicinity of an insertion opening for a harness, resulting in complication of the mechanical structure and a large number of components.

[0007] In addition, the binding machine described in Patent Literature 2 above requires both a mechanism for rotating the jaws and a mechanism for performing rectilinear motion to send the C-rings, resulting in complication of the mechanical structure and a large number of components.

[0008] Therefore, an object of the present invention is to provide a binding machine having a simple mechanical structure and a small number of components compared to the related art.

Solution to Problem

[0009] The present invention has been made to solve the above-described problems. A binding machine is configured to bind a bound member by a binder that is plastically deformable. The binding machine includes a driver configured to strike out the binder; a drive mechanism configured to drive the driver linearly; and a clincher disposed at a position where a tip end portion of the driver is received. An insertion opening into which the bound member is inserted is provided between the driver and the clincher, and a standby portion configured to make the binder stand by is provided between the driver and the insertion opening. When the drive mechanism is actuated, the driver strikes out the binder supplied to the standby portion, and leg portions of the struck binder are pressed against the clincher and deformed.

Advantageous Effects of Invention

[0010] The present invention is as described above, and includes the driver that performs rectilinear motion by the drive mechanism, and the clincher disposed at a position where the tip end portion of the driver is received, and the insertion opening for inserting the bound member is provided between the driver and the clincher. Therefore, for example, when a harness is bound, the driver may be driven by inserting the harness into the insertion opening of the binding machine.

[0011] The standby portion is provided between the driver and the insertion opening for making the binder stand by in a state for being struck out. When the drive mechanism is actuated, the driver strikes out the binder supplied to the standby portion, and the leg portions of the binder are pressed toward the clincher and are deformed. According to such a configuration, the harness inserted into the insertion opening of the binding machine can be bound by the binder.

[0012] In the present invention, since striking of the binder and clinching of the binder are continuously performed only by the rectilinear motion of the driver, a complicated mechanism as in related art is not required. Therefore, the mechanical structure can be simplified and the number of components can be reduced.

[0013] Since the mechanical structure of the tip end portion can be simplified, insertion into a gap or the like of a harness is easy, thereby providing a user-friendly machine.

Brief Description of Drawings

[0014]

Fig. 1 is an external view of a binding machine in which a binder is set.
Fig. 2 is an external view immediately after binding a bound member by the binding machine.
Fig. 3A is a front view of the binder, and Fig. 3B is a

side view of a coupled binder.

Fig. 4A is an external view of the binder that binds the bound member, and Fig. 4B is a front view of the binder that binds the bound member.

Fig. 5 is a perspective view showing an internal structure of the binding machine.

Figs. 6A and 6B are partially enlarged views of vicinity of an output portion of the binding machine, in which Fig. 6A is a view showing a standby state, and Fig. 6B is a view showing a binding completion state.

Fig. 7A is a top view of the binding machine before the binder is set, and Fig. 7B is a partially enlarged cross-sectional view of vicinity of a tip end portion of the binding machine in Fig. 7A.

Fig. 8A is a top view of the binding machine after the binder is set, and Fig. 8B is a partially enlarged cross-sectional view of the vicinity of the tip end portion of the binding machine in Fig. 8A.

Figs. 9A and 9B are views showing inside of the binding machine in a standby state, in which Fig. 9A is a view in which a guide member is not omitted, and Fig. 9B is a view in which a part of the guide member is omitted.

Figs. 10A and 10B are views showing the inside of the binding machine during binding, in which Fig. 10A is a view in which the guide member is not omitted, and Fig. 10B is a view in which the part of the guide member is omitted.

Figs. 11A and 11B are views showing the inside of the binding machine in the binding completion state, in which Fig. 11A is a view in which the guide member is not omitted, and Fig. 11B is a view in which the part of the guide member is omitted.

Figs. 12A and 12B are views of a binding machine according to a first modification, in which Fig. 12A is a perspective view, and Fig. 12B is a side view.

Figs. 13A and 13B are views showing an internal structure of the binding machine according to the first modification, in which Fig. 13A is a perspective view, and Fig 13B a side view.

Figs. 14A and 14B are views showing an internal structure when binding by the binding machine according to the first modification is completed, in which Fig. 14A is a perspective view, and Fig. 14B is a side view.

Fig. 15 is a view showing inside of a binding machine according to a second modification.

Figs. 16A and 16B are views showing inside of a binding machine according to a third modification, in which Fig. 16A is a top view, and Fig. 16B is a side view.

Fig. 17A and 17B are partially enlarged views of vicinity of an output portion of the binding machine according to the third modification, and Fig. 17A is a view before clinching, and Fig. 17B is a view after clinching.

Figs. 18A and 18B are views showing inside of a binding machine according to a fourth modification, in which Fig. 18A is a view showing a standby state, and Fig. 18B is a view showing a binding completion state.

Figs. 19A and 19B are views showing inside of a binding machine according to a fifth modification, in which Fig. 19A is a top view, and Fig. 19B is a side view.

Figs. 20A, 20B, 20C and 20D are views explaining actuation of the binding machine according to the fifth modification.

Description of Embodiments

[0015] Embodiments of the present invention are described with reference to the drawings. In the following description, "front" refers to a direction in which a binder 41 is struck out, and "rear" refers to a direction opposite to the direction in which the binder 41 is struck out.

[0016] A binding machine 10 according to the present embodiment is a handheld type binding machine 10 that binds a bound member 50 with the binder 41 that is plastically deformable. Specifically, the binding machine 10 can use the binder 41 having an opening 41c as shown in Fig. 3A, and binds the bound member 50 by closing an opening 41c of the binder 41. The binding machine 10 is used, for example, to bind a harness, to bind a bag mouth, to bind a field wire or an attraction string.

[0017] As shown in Fig. 1, the binding machine 10 is covered with a housing 11, and includes a motor accommodation portion 12, a grip portion 13 and an output portion 15. In the binding machine 10 according to the present embodiment, these portions are arranged alongside in a front-rear direction along a striking direction D2 (see Fig. 6A) of the binder 41. That is, the motor accommodation portion 12, the grip portion 13 and the output portion 15 are disposed in this order from a rear side to a front side as viewed in the striking direction D2 of the binder 41.

[0018] The motor accommodation portion 12 is provided at a rear portion of the binding machine 10, and a power source connection portion 12a which connects an external power source is provided at a rear end portion thereof. By receiving a voltage supply from the power source connection portion 12a, the binding machine 10 can perform various operations such as striking out the binder 41. A cord which connects to an AC [0] power source may be connected to the power source connection portion 12a, or a harness which connects to a rechargeable battery may be attached thereto. Although the binding machine 10 according to the present embodiment is of an electric type, the present invention is not limited thereto, and the binding machine 10 may be of a compressed air type. When the binding machine 10 is of the compressed air type, a connection portion which receives supply of compressed air may be provided instead of the power source connection portion 12a.

[0019] As shown in Fig. 5, a motor 20 and a control portion 21 are housed in the motor accommodation por-

tion 12. The motor 20 is a power source which drives a drive mechanism 22 described below. The control portion 21 is a control device that controls rotation of the motor 20 and the like, and is a control board on which a CPU and a memory are mounted in the present embodiment.

[0020] The grip portion 13 is a portion to be gripped by a user when the binding machine 10 is used. The grip portion 13 is provided in an intermediate portion of the housing 11, and is formed in a constricted shape so as to be easily gripped by the user. A trigger 14 is provided on an oblique front side of the grip portion 13 at a position that can be operated with an index finger when the grip portion 13 is gripped. The trigger 14 is manually operable to perform binding operation, and is a trigger-shaped swing member in the present embodiment. When the user pulls the trigger 14, a switch 14a (see Fig. 5) disposed adjacent to the trigger 14 is turned on, and an operation signal is output from the switch 14a to the control portion 21. Upon receiving the operation signal, the control portion 21 rotates the motor 20 and strikes out the binder 41. Specifically, when the trigger 14 is operated, a series of cycles including forward moving of the driver 25 to a binding position, holding of the driver 25 at the binding position, and retracting of the driver 25 to a standby position are continuously performed. The binding operation from start to completion is continuously performed in this way, and thus does not stop in the middle, so that binding force is not insufficient.

[0021] As shown in Fig. 5, the drive mechanism 22 is housed in the grip portion 13. The drive mechanism 22 is a mechanism that is actuated by the motor 20 when the trigger 14 is operated, and performs the binding operation by reciprocating the driver 25 described below back and forth.

[0022] The drive mechanism 22 includes a speed reduction mechanism 23 and a ball screw 24. The speed reduction mechanism 23 is connected to a rotation shaft of the motor 20, and is a mechanism to reduce the rotation speed of the motor 20 to obtain a large torque. The ball screw 24 is connected to an output shaft of the speed reduction mechanism 23, and rotates a screw shaft 24a by a rotational force of the motor 20, and enables a nut 24b to perform rectilinear motion back and forth by rotating the screw shaft 24a. Specifically, when the motor 20 is rotated forward, the nut 24b is moved forward and the binding operation is performed. When the motor 20 is rotated reversely after the binding operation is completed, the nut 24b is moved rearward and returned to a standby state.

[0023] In the present embodiment, by housing the drive mechanism 22 in the grip portion 13, the machine is miniaturized and is easy to handle. Since the rotation shaft of the motor 20 and the screw shaft 24a of the ball screw 24 are linearly disposed, the machine is slimmed and is easy to use even in a narrow working place.

[0024] The output portion 15 is provided in vicinity of a tip end portion of the binding machine 10. At a tip end portion of the output portion 15, a protrusion forming portion 17 protrudes in a substantially L-shape, and an insertion opening 16 into which the bound member 50 is inserted is opened inside the protrusion forming portion 17. As shown in Fig. 5, the driver 25, a guide member 30 and an interlock mechanism 26 are housed in the output portion 15. As shown in Figs. 7A, 7B, 8A and 8B, a magazine portion 35 is provided on a side portion of the output portion 15.

[0025] The protrusion forming portion 17 is formed as a part of the housing 11 or is integrally fixed to the housing 11. A clincher 18 is provided on an inner surface of the protrusion forming portion 17 at a position where a tip end portion of the driver 25 described below is received. The clincher 18 and the driver 25 stand by at positions apart from each other before the binder 41 is struck out, and the insertion opening 16 is provided between the clincher 18 and the driver 25. The binding machine 10 according to the present embodiment performs binding by striking out the binder 41 toward the insertion opening 16.

[0026] The insertion opening 16 is formed in the striking direction of the binder 41, and is opened in a direction different from a tip end direction of the output portion 15 (the front-rear direction of the binding machine 10). In the present embodiment, as shown in Fig. 6 and the like, when the striking direction of the binder 41 is the front-rear direction, the binder 41 is opened laterally so as to be substantially orthogonal to the front-rear direction.

[0027] The clincher 18 is configured to clinch leg portions 41 a of the binder 41 struck out by the driver 25 to complete the binding. Specifically, the clincher 18 is a plate against which the binder 41 struck out by the driver 25 is pressed. A groove for guiding the leg portions 41a of the binder 41 is formed on a surface of the clincher 18, and the leg portions 41a of the binder 41 pressed against the clincher 18 are deformed (clinched) by being bent inward along the groove.

[0028] The protrusion forming portion 17 provided with the clincher 18 is formed without any movable portion including the clincher 18, and has a simple and slim shape. Therefore, the protrusion forming portion 17 is easily inserted into a gap of the bound member 50 such as a harness.

[0029] The protrusion forming portion 17 has a tapered shape as shown in Fig. 6 and the like. Specifically, an outer surface 17a of the protrusion forming portion 17 is inclined with respect to an opening direction D1 of the insertion opening 16, and forms an acute angle with respect to an inner surface 17b on which the clincher 18 is formed. The protrusion forming portion 17 is formed in the tapered shape in the opening direction D1 of the insertion opening 16, and thus has a shape that can be easily inserted into a narrow gap.

[0030] A pick-up surface 11a is formed on the housing 11 facing the clincher 18. The pick-up surface 11a is inclined with respect to the inner surface 17b of the protrusion forming portion 17 on which the clincher 18 is formed so that the insertion opening 16 is greatly opened. By

forming the pick-up surface 11a, the bound member 50 such as a harness is easily guided to inside of the insertion opening 16. The pick-up surface 11a covers the guide member 30 (described below) that stands by before actuation, and prevents the bound member 50 from being caught by the guide member 30 when the bound member 50 is guided to the inside of the insertion opening 16.

[0031] The driver 25 is an elongated plate that performs rectilinear motion by the drive mechanism 22 in order to strike out the binder 41 toward the insertion opening 16. The driver 25 is slidably guided inside the housing 11, and is capable of reciprocating in the striking direction D2 of the binder 41. The driver 25 according to the present embodiment is fixed to the nut 24b of the ball screw 24, and protrudes forward of the nut 24 b. Therefore, when the nut 24b is moved forward, the binder 41 is struck out. The driver 25 presses the struck binder 41 against the clincher 18 to bend the leg portions 41a of the binder 41, thereby closing the opening 41c to complete the binding.

[0032] The guide member 30 is configured to stabilize a position of the bound member 50 inserted into the insertion opening 16, and to close an opening of the insertion opening 16 immediately before the binder 41 is struck out by the driver 25 and the opening 41c of the binder 41 is closed. As shown in Fig. 5, the guide member 30 is attached to the housing 11 so as to be swingable about a swing shaft 30a in the front-rear direction. In a natural state, the guide member 30 is biased in a direction in which the insertion opening 16 is opened by a biasing unit (not shown).

[0033] The guide member 30 includes an actuation pin 30b that is engaged with a slide member 27 described below. The actuation pin 30b is slidably engaged with the slide member 27, and is configured to swing in a direction in which the guide member 30 closes the insertion opening 16 against a biasing force of the biasing unit when the actuation pin 30b is pushed by the slide member 27.

[0034] The guide member 30 includes a tip end portion 30c formed in a claw shape in order to close the insertion opening 16. In the present embodiment, the tip end portion 30c is provided with a first guide portion 30d and a second guide portion 30e.

[0035] The first guide portion 30d is configured to guide the binder 41 when the opening of the insertion opening 16 is closed, and is formed so as to be parallel to the striking direction D2 of the binder 41 when the insertion opening 16 is closed as shown in Fig. 2. A groove which guides a side portion of the binder 41 is formed inside the first guide portion 30d.

[0036] The second guide portion 30e is configured to press the bound member 50, and is formed so as to enter toward the insertion opening 16 inward than the first guide portion 30d when the opening of the insertion opening 16 is closed. By pressing the bound member 50 by the second guide portion 30e in this manner, the position of the bound member 50 is stabilized, and the bound member 50 can be reliably held by the binder 41 when the binder 41 is struck out.

[0037] The interlock mechanism 26 is a mechanism which actuates the guide member 30 in conjunction with striking of the binder 41. By actuating the guide member 30 via the interlock mechanism 26, the guide member 30 is configured to be actuated in synchronization with the striking of the binder 41. As shown in Fig. 5, the interlock mechanism 26 includes the slide member 27 and a connection member 28. The slide member 27 is fixed to the nut 24b of the ball screw 24 by the connection member 28, and is configured to move back and forth integrally with the nut 24b.

[0038] As shown in Figs. 9B, 10B and 11B, the slide member 27 is configured to be engaged with the actuation pin 30b of the guide member 30. Specifically, a continuous engagement surface is formed by a hook 27a, an inclined portion 27b and a horizontal portion 27c, and the slide member 27 is engaged with the actuation pin 30b on the engagement surface.

[0039] The hook 27a forms a substantially U-shaped groove and is engaged with the actuation pin 30b in the standby state (a state before the binder 41 is struck out).

[0040] The inclined portion 27b is a surface inclined with respect to the striking direction D2 of the binder 41. When the actuation pin 30b slides on the inclined portion 27b, the guide member 30 swings.

[0041] The horizontal portion 27c is a surface parallel to the striking direction D2 of the binder 41, and when the actuation pin 30b slides on the horizontal portion 27c, the guide member 30 maintains a state where the opening of the insertion opening 16 is closed.

[0042] The magazine portion 35 is configured to load a plurality of binders 41. The binding machine 10 according to the present embodiment uses a coupled binder 40 as shown in Fig. 3, and the coupled binder 40 can be loaded to the magazine portion 35.

[0043] The coupled binder 40 is configured by coupling a plurality of binders 41 to each other. Each binder 41 is a resin member made of plastic or the like, including the pair of leg portions 41 a and a connection portion 41b connecting the pair of leg portions 41a, and is formed in a substantially U-shape. The opening 41c which holds the bound member 50 is formed between the pair of leg portions 41a. When the binder 41 is struck out by the driver 25 and clinched, the leg portions 41a are plastically deformed as shown in Fig. 4 so that the bound member can be held and bound.

[0044] As shown in Fig. 7B, the magazine portion 35 includes a rib 35a that enters between the leg portions 41a of the binder 41 (that is, the opening 41c). A groove 35b that guides the connection portion 41b of the binder 41 is formed so as to face a tip end portion of the rib 35a.

[0045] The magazine portion 35 is provided with a pusher 36 slidable along a longitudinal direction of the magazine portion 35. The pusher 36 is configured to bias the coupled binder 40 loaded in the magazine portion 35 forward, and is always biased forward (in a direction in

which the binder 41 is sent to a standby portion 37 described below) by a spring (not shown).

[0046] The magazine portion 35 is connected to the side portion of the output portion 15, and is configured to guide the coupled binder 40 inside the output portion 15. Inside the output portion 15 continuous with the magazine portion 35, the standby portion 37 is provided which makes the binder 41 stand by in a state for being struck out. The standby portion 37 is provided between the driver 25 and the insertion opening 16, and the binder 41 standing by in the standby portion 37 is struck out by the driver 25 in a direction of the insertion opening 16.

[0047] The opening 41c of the binder 41 standing by in the standby portion 37 is opened toward the striking direction D2 of the binder 41, that is, the tip end direction of the output portion 15. On the other hand, the insertion opening 16 is opened in a direction substantially orthogonal to the tip end direction of the output portion 15. Therefore, in the present embodiment, an opening direction of the insertion opening 16 and an opening direction of the binder 41 closed by the driver 25 are different.

[0048] When the coupled binder 40 is loaded in the magazine portion 35, as shown in Fig. 8B, the coupled binder 40 is loaded so as to straddle the rib 35a, so that the connection portion 41b of the binder 41 passes through the groove 35b of the magazine portion 35. When the coupled binder 40 is loaded in this manner, the coupled binder 40 is biased by the pusher 36 toward the standby portion 37. In this way, only by setting the coupled binder 40, the binder 41 is brought into a state in which the binder 41 can be struck out. According to such a configuration, sending the binder 41 to the binding position before being struck out is not required. Since the binder 41 supplied to the standby portion 37 stands by in a state of being connected to the coupled binder 40, the binder 41 separated from the coupled binder 40 is not detached from the binding machine 10.

[0049] Although the coupled binder 40 is biased by the pusher 36 toward the standby portion 37 in the present embodiment, the present invention is not limited thereto, and a mechanism for sending the binder 41 to the standby portion 37 in conjunction with driving of the driver 25 may be provided.

[0050] Next, the binding operation of the binding machine 10 will be described.

[0051] When binding is performed using the binding machine 10 according to the present embodiment, the bound member 50 is first inserted into the insertion opening 16. At this time, as shown in Fig. 6, since the opening direction D1 of the insertion opening 16 is set different from the striking direction D2 of the binder 41 (that is, an advancing and retracting direction of the driver 25), the bound member 50 can be engaged with the inside of the insertion opening 16 such that the binder 41 is hooked on the bound member 50.

[0052] When the trigger 14 is operated in this state, the motor 20 is rotated to actuate the drive mechanism 22. At this time, the guide member 30 is first actuated by the drive mechanism 22. That is, in the standby state before the trigger 14 is operated, as shown in Figs. 9A and 9B, the actuation pin 30b is engaged with the hook 27a of the slide member 27, and the guide member 30 is in the state where the opening of the insertion opening 16 is opened. When the drive mechanism 22 starts to actuate from this state, as shown in Fig. 10, the slide member 27 moves forward, whereby the actuation pin 30b moves along the inclined portion 27b of the slide member 27, thereby swinging the guide member 30 to close the opening of the insertion opening 16. When the actuation pin 30b reaches the horizontal portion 27c of the slide member 27, the guide member 30 completely closes the opening of the insertion opening 16.

[0053] Thereafter, when the motor 20 is further rotated to actuate the drive mechanism 22, as shown in Figs. 11A and 11B, the driver 25 strikes out the binder 41 supplied to the standby portion 37, and the leg portions 41a of the struck binder 41 are clinched by the clincher 18 to complete the binding (see Figs. 11A and 11B).

[0054] When the binding is completed as shown in Figs. 11A and 11B, the motor 20 is reversely rotated to return to the standby state as shown in Figs. 9A and 9B. At this time, since the driver 25 is retracted from the standby portion 37 and the standby portion 37 is vacant, the coupled binder 40 in the magazine portion 35 is pushed by the pusher 36, and a next bundling tool 41 is automatically sent to the standby portion 37. As the slide member 27 retracts, the guide member 30 also swings in the opening direction. The guide member 30 swings to a position where the actuation pin 30b is engaged with the hook 27a of the slide member 27, and returns to the state where the opening of the insertion opening 16 is opened.

[0055] As described above, according to the present embodiment, there are provided the driver 25 that performs the rectilinear motion by the drive mechanism 22 and the clincher 18 disposed at the position where the tip end portion of the driver 25 is received, and the insertion opening 16 into which inserts the bound member 50 is provided between the driver 25 and the clincher 18. Therefore, for example, when a harness is bound, the driver 25 may be driven by inserting the harness into the insertion opening 16 of the binding machine 10.

[0056] The standby portion 37 is provided between the driver 25 and the insertion opening 16 which makes the binder 41 stand by in a state for being struck out. When the trigger 14 is operated, the driver 25 strikes out the binder 41 supplied to the standby portion 37, and the leg portions 41a of the struck binder 41 are clinched by the clincher 18 to complete the binding. According to such a configuration, the harness inserted into the insertion opening 16 of the binding machine 10 can be bound by the binder 41.

[0057] The binding machine in related art has the structure in which, when the trigger is operated, the pair of jaws is closed to push and deform the C-ring from both sides, and when the operated trigger is released, a next C-ring is sent to the tip end portion thereof. In the struc-

ture, immediately after the C-ring is loaded into the machine, the trigger must be operated to make an empty shot in order to send the next C-ring to the tip end portion. In this respect, according to the present embodiment, since one action is performed from cutting to clinching of the binder 41, the empty shot after the binder 41 is loaded is not required.

[0058] Since the binding machine 10 is configured as a handheld type handy tool, binding work can be easily performed even on a long harness and the like, and workability is good.

[0059] Since striking of the binder 41 and clinching of the binder 41 are continuously performed only by the rectilinear motion of the driver 25, a structure that pushes the C-ring from both sides is not required as in the structure in related art. Therefore, the mechanical structure can be simplified and the number of components can be reduced. Since no movable portion is provided on a tip end side of the insertion opening 16, handling is good. In addition, a structure having strong anti-dropping property can be obtained.

[0060] Since the clincher 18 is formed so as to protrude from the tip end portion of the binding machine 10, the binding machine 10 that is no provided in related art is realized. That is, in order to realize a structure in which the binder 41 is struck out as in the present embodiment, the clincher 18 is required to be disposed in order to receive the struck binder 41. In this respect, in a case of a stationary structure, the structure for receiving the binder 41 can be freely set, but in a case of the handy tool as in the present embodiment, there is no idea that the binder 41 is struck out or the binder 41 is received. In such a situation, in the present embodiment, by adopting a novel structure in which the clincher 18 is formed to protrude from the tip end portion of the binding machine 10, a configuration in which the binder 41 is struck out to perform binding without inhibiting ease of handling can be realized.

[0061] According to the structure in related art, since the bound member 50 is inserted inside the C-ring standing by at the binding portion, many restrictions are required on the design such as an insertion direction of the bound member 50 and a sending direction of the C-ring. In this respect, according to the present embodiment, since the binder 41 is struck out so as to straddle the bound member 50 inserted into the insertion opening 16, the opening direction of the insertion opening 16 can be set regardless of a drive shaft of the machine (a moving direction of the driver 25).

[0062] The binding machine 10 uses the coupled binder 40 in which the plurality of binders 41 are coupled, and the binder 41 supplied to the standby portion 37 can stand by in a state of being connected to the coupled binder 40. Therefore, the mechanism that sends the binder 41 to the binding position before striking is not required, and the binder 41 separated from the coupled binder 40 is not detached from the binding machine 10.

[0063] The magazine portion 35 to which the coupled binder 40 can be loaded is provided, and the magazine unit 35 can bias the coupled binder 40 toward the standby portion 37. According to such a configuration, since the binder 41 is automatically supplied to the standby portion 37 by biasing of the magazine portion 35, a simple structure can be obtained.

[0064] The drive mechanism 22 enables the driver 25 to reciprocate using the ball screw 24. According to such a configuration, rotation motion of the motor 20 can be converted into a rectilinear movement by the ball screw 24, and the driver 25 can be driven.

[0065] Although the ball screw 24 is used for the drive mechanism 22 in the present embodiment, the present invention is not limited thereto, and other mechanisms may be used. For example, a rack and pinion may be used for the drive mechanism 22. That is, as shown in Fig. 15, a pinion 43 may be fixed to the rotation shaft 20a of the motor 20, and a rack 44 meshing with the pinion 43 may be provided (second modification). The rotation motion of the motor 20 may be converted into the rectilinear motion by the rack and pinion, and the driver 25 connected to the rack 44 may be driven back and forth. At this time, the motor 20 may be disposed inside the grip portion 13. The grip portion 13 may be disposed so as to be orthogonal to the output portion 15. If the grip portion 13 is disposed so as to be orthogonal to the output portion 15, the entire length of the machine can be shortened and the machine can be miniaturized.

[0066] Although the above embodiment has been described on an assumption that a user holds the binding machine 10, the binding machine 10 may be attached to a machine such as a robot arm. In this case, a portion to be attached to the machine such as the robot arm may be used as the grip portion 13.

[0067] Although the binding machine 10 according to the above embodiment is configured to receive voltage supply from the power supply connection portion 12a, the present invention is not limited thereto, and the binding machine 10 may have a built-in power source, or a battery pack may be detachably attached to the binding machine 10. Although the binding machine 10 according to the above embodiment includes the control portion 21, the present invention is not limited thereto, and the control unit 21 may be disposed outside the machine. For example, the binding machine 10 may be actuated by centralized control or the like.

[0068] Although the handheld type binding machine 10 has been described in the above embodiment, the present invention is not limited thereto, and the present invention may be applied to a stationary type binding machine 10' as shown in Figs. 12A to 14B (first modification).

[0069] The stationary type binding machine 10' shown in Figs. 12A to 14B has a basic structure the same as the handheld type binding machine 10, and includes a clincher 18', a motor, a driving mechanism, a driver, a guide member 30' and the like having structures the same as those already described. However, the shape of the housing 11' is changed to a shape suitable for a stationary

type.

[0070] The stationary type binding machine 10' includes a plate-shaped base 42, and the machine is fixed on the base 42. When the binding machine 10' is used, the binding machine 10' can be placed in a working place by fixing the base 42 to a working table or the like. When the base 42 is placed on a horizontal surface, as shown in Fig. 12B, an insertion opening 16' is opened upward.

[0071] A trigger 14' of the binding machine 10' according to this modification is disposed at a deep portion of the insertion opening 16'. Therefore, when the bound member 50 is inserted into the deep portion of the insertion opening 16', the trigger 14' is pressed and actuated by the bound member 50. As shown in Fig. 13B and Fig. 14B, when the trigger 14' is pressed and actuated, the switch 14a is turned on similarly to the handheld type binding machine 10, and binding operation is performed.

[0072] Even in such a stationary type binding machine 10', similarly to the handheld type binding machine 10, the mechanical structure can be simplified and the number of components can be reduced.

[0073] Although the binding operation is performed by driving the driver 25 linearly in the above embodiment, the present invention is not limited thereto, and the binding operation may be performed by linearly driving the clincher 18.

[0074] For example, Figs. 16A, 16B, 17A and 17B show the binding machine 10 according to a third modification. The binding machine 10 according to the third modification includes an electric cylinder 45, a rectilinear member 47 driven by the electric cylinder 45 to reciprocate, and a clinch member 46 rotatably attached to the rectilinear member 47. The clinch member 46 is formed in a substantially L-shape, and one end portion (a base end side) is connected to the rectilinear member 47 via a rotation shaft 18a, and the clincher 18 is provided on an inner side of the other end portion (a tip end side).

[0075] In the third modification, the insertion opening 16 into which the bound member 50 is inserted is opened in a direction of tips of the binder 41, and is opened in a direction the same as a driving direction of the clinch member 46. When the trigger 14 is operated after the bound member 50 is inserted into the insertion opening 16, first, as shown in Fig. 17A, the clinch member 46 is rotated about the rotation shaft 18a by a rotation mechanism (not shown) to close the insertion opening 16. At this time, the clincher 18 is disposed so as to face the tips of the binder 41. Thereafter, as shown in Fig. 17B, the rectilinear member 47 and the clinch member 46 are attracted toward the binder 41 by the electric cylinder 45. By the rectilinear motion, the binder 41 is pressed against the driver 25 by the clincher 18, and the binding operation is performed.

[0076] As a rotation mechanism which rotates the clinch member 46, a cam or a link mechanism that rotates the clinch member 46 along with the movement of the rectilinear member 47 may be provided, or a driving source which rotates the clinch member 46 may be separately provided.

[0077] Figs. 18A and 18B show the binding machine 10 according to a fourth modification. The binding machine 10 according to the fourth modification includes the electric cylinder 45 and the rectilinear member 47 driven by the electric cylinder 45 to reciprocate. The rectilinear member 47 has a tip end portion bent at a substantially right angle, and includes the clincher 18 on an inner side of the tip end portion. The clincher 18 is disposed so as to face tips of the binder 41.

[0078] In the fourth modification, the insertion opening 16 into which the bound member 50 is inserted is opened in a direction different from (a direction substantially orthogonal to) a direction of the tips of the binder 41, and is opened in a direction different from (a direction substantially orthogonal to) a driving direction of the clinch member 46. When the trigger 14 is operated after the bound member 50 is inserted into the insertion opening 16, as shown in Fig. 18B, the rectilinear member 47 is attracted toward the binder 41 by the electric cylinder 45. By the rectilinear motion, the binder 41 is pressed against the driver 25 by the clincher 18, and the binding operation is performed.

[0079] The specific configuration of the electric cylinder 45 according to the third and fourth modifications is not particularly limited. For example, the drive mechanism 22 using the ball screw 24 or a mechanism driven by the pinion 43 or the rack 44 may be used as in the other embodiments already described.

[0080] Although the binding operation is performed by driving the driver 25 linearly in the above embodiment, the present invention is not limited thereto, and the binding operation may be performed by rotationally driving the driver 25.

[0081] For example, Figs. 19A to 20D show the binding machine 10 according to a fifth modification. The binding machine 10 according to the fifth modification includes the driver 25 that is rotated by the motor 20, and the clincher 18 disposed on a rotation orbit of the driver 25. The driver 25 according to the fifth modification swings about the rotation shaft 25a within a predetermined range. That is, the driver 25 swings from a standby position shown in Fig. 19B to a binding position shown in Fig. 20D.

[0082] In the fifth modification, the insertion opening 16 into which the bound member 50 is inserted is opened in a direction different from a driving direction of the driver 25. When the trigger 14 is operated after the bound member 50 is inserted into the insertion opening 16, as shown in Fig. 20A, the driver 25 is rotationally driven by the motor 20, and tips of the first binder 41 is moved in a direction of the clincher 18 by the driver 25. As shown in Figs. 20B and 20C, the binder 41 is pressed against the clincher 18, and the binding operation is performed.

[0083] In the fifth modification, since the driver 25 approaches the clincher 18 while rotating, the orbit of pressing the binder 41 against the clincher 18 is an arc. That is, a timing when the driver 25 is inclined with respect to

the clincher 18 may occur, and the clinching posture may not be stable. In order to solve such a problem, the clincher 18 may be tiltable. That is, as shown in Fig. 20D, if the clincher 18 is configured to be tiltably supported by a tilt shaft 18b, the clincher 18 is tilted following the movement of the driver 25, so that clinching can be performed while keeping the clincher 18 and the driver 25 parallel to each other.

[0084] If the driver 25 is of a rotation type as in the fifth modification, the overall length of the machine can be shortened as compared with a case where the driver 25 performs the rectilinear motion.

[0085] In the fifth modification, the driver 25 is configured to be rotated, but the present invention is not limited thereto. That is, instead of rotating the driver 25, the clincher 18 may be rotated, whereby binding may be performed by pressing the clincher 18 against the fixed driver 25.

[0086] The present application is based on Japanese Patent Application No. 2017-088483 filed on April 27, 2017, Japanese Patent Application No. 2018-022386 filed on February 9, 2018, and Japanese Patent Application No. 2018-075141 filed on April 10, 2018, the contents of which are incorporated herein by reference.

Reference Signs List

[0087]

10 binding machine
10' binding machine
11 housing
11' housing
11a pick-up surface
12 motor accommodation portion
12a power source connection portion
13 grip portion
14 trigger
14' trigger
14a switch
15 output portion
16 insertion opening
17 protrusion forming portion
17a outer surface
17b inner surface
18 clincher
18a rotation shaft
18b tilt shaft
18' clincher
20 motor
20a rotation shaft
21 control portion
22 drive mechanism
23 speed reduction mechanism
24 ball screw
24a screw shaft
24b nut
25 driver
25a rotation shaft
26 interlock mechanism
27 slide member
27a hook
27b inclined portion
27c horizontal portion
28 connection member
30 guide member
30' guide member
30a swing shaft
30b actuation pin
30c tip end portion
30c' tip end portion
30d first guide portion
30d' first guide portion
30e second guide portion
30e' second guide portion
35 magazine portion
35' magazine portion
35a rib
35b groove
36 pusher
36' pusher
37 standby portion
40 coupled binder
41 binder
41a leg portion
41b connection portion
41c opening
42 base
43 pinion
44 rack
45 electric cylinder
46 clinch member
47 rectilinear member
50 bound member
D1 opening direction of insertion opening
D2 striking direction of binder (advancing and retracting direction of driver)

Claims

1. A binding machine configured to bind a bound member by a binder that is plastically deformable, the binding machine comprising:

   a driver configured to strike out the binder;
   a drive mechanism configured to drive the driver linearly; and
   a clincher disposed at a position where a tip end portion of the driver is received,
   wherein an insertion opening into which the bound member is inserted is provided between the driver and the clincher, and a standby portion configured to make the binder stand by is provided between the driver and the insertion opening, and

wherein, when the drive mechanism is actuated, the driver strikes out the binder supplied to the standby portion, and leg portions of the struck binder are pressed against the clincher and deformed.

2. The binding machine according to claim 1, wherein the clincher is provided in a protrusion forming portion that is formed so as to protrude from a tip end portion of the binding machine.

3. The binding machine according to claim 2, wherein the protrusion forming portion has a tapered shape.

4. The binding machine according to any one of claims 1 to 3, wherein the insertion opening is opened in a direction different from a driving direction of the driver.

5. The binding machine according to any one of claims 1 to 4, wherein the binding machine is configured to load a coupled binder in which a plurality of binders are coupled, and wherein the binder supplied to the standby portion is configured to stand by in a state of being connected to the coupled binder.

6. The binding machine according to claim 5, wherein a magazine portion is provided to load the coupled binder, and wherein the magazine portion is configured to bias the coupled binder toward the standby portion.

7. The binding machine according to any one of claims 1 to 6, wherein the drive mechanism is a mechanism actuated by a motor.

8. The binding machine according to any one of claims 1 to 7, further comprising: a guide member configured to close an opening of the insertion opening during binding operation.

9. The binding machine according to any one of claims 1 to 8, wherein the binder is supplied to the standby portion such that an opening of the binder faces a striking direction.

10. The binding machine according to any one of claims 1 to 9, wherein striking of the binder and clinching of the binder are continuously performed by rectilinear motion of the driver.

11. The binding machine according to any one of claims 1 to 10, wherein the insertion opening is formed on a striking direction of the binder, and wherein the binder is struck out toward the insertion opening so as to straddle the bound member inserted into the insertion opening.

12. The binding machine according to any one of claims 1 to 11, wherein a switch configured to drive the drive mechanism is disposed at a deep portion of the insertion opening.

FIG.1

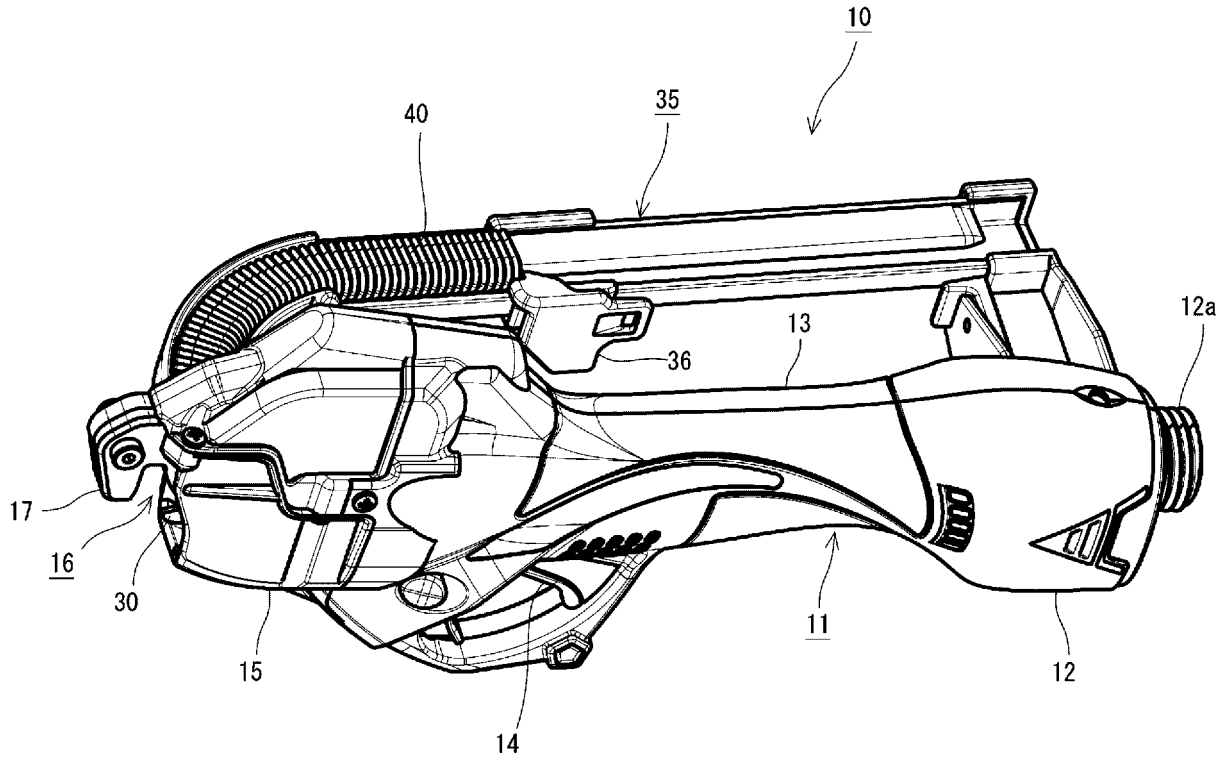


FIG.2

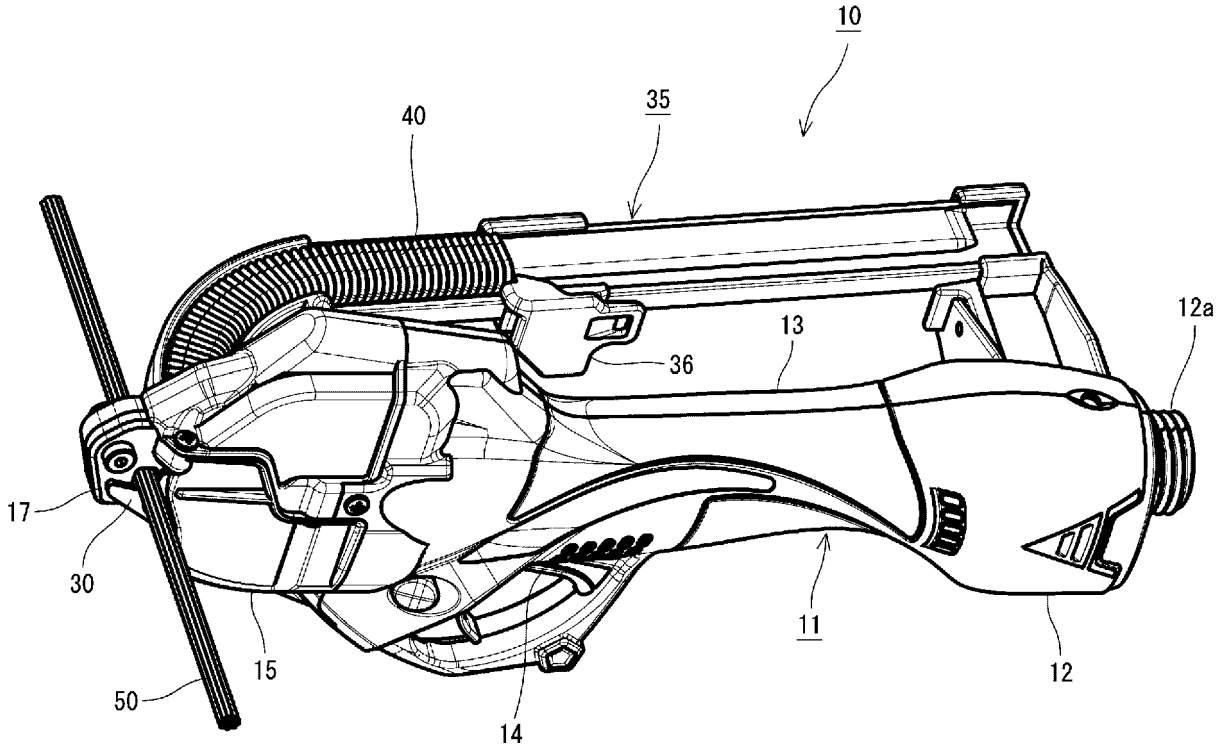


FIG.3A

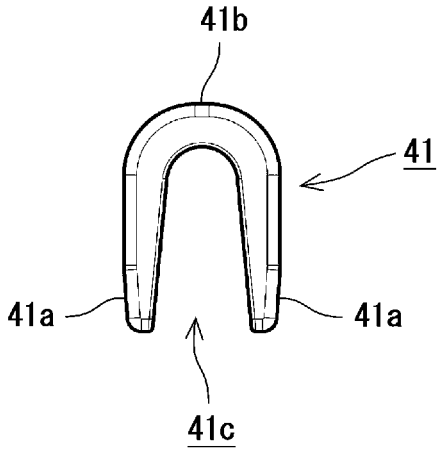


FIG.3B

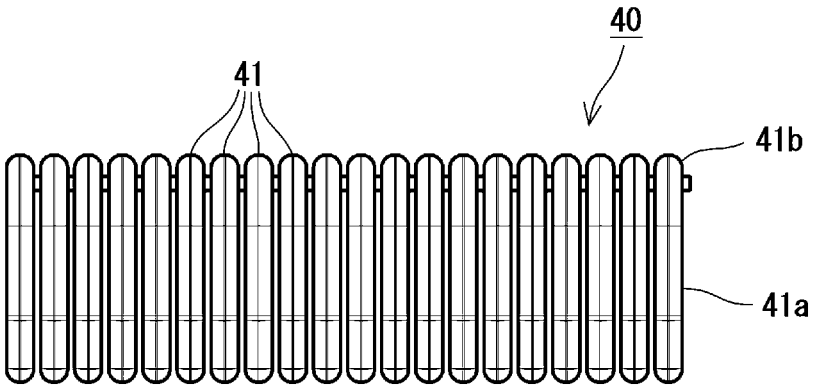


FIG.4A

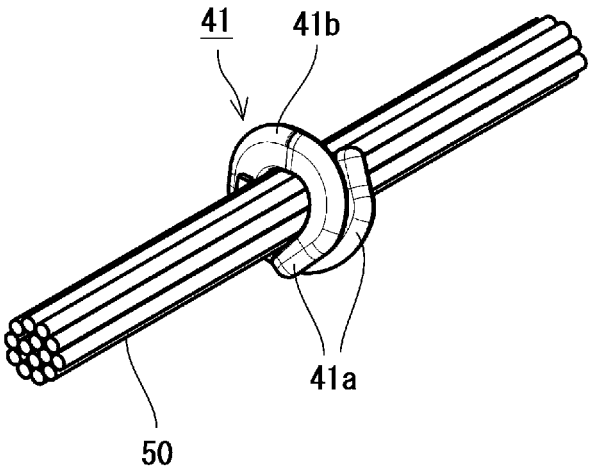


FIG.4B

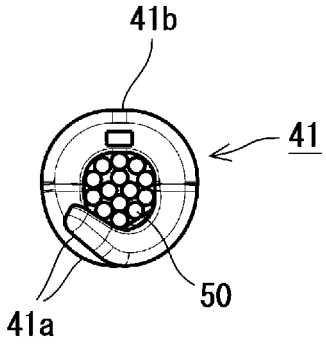
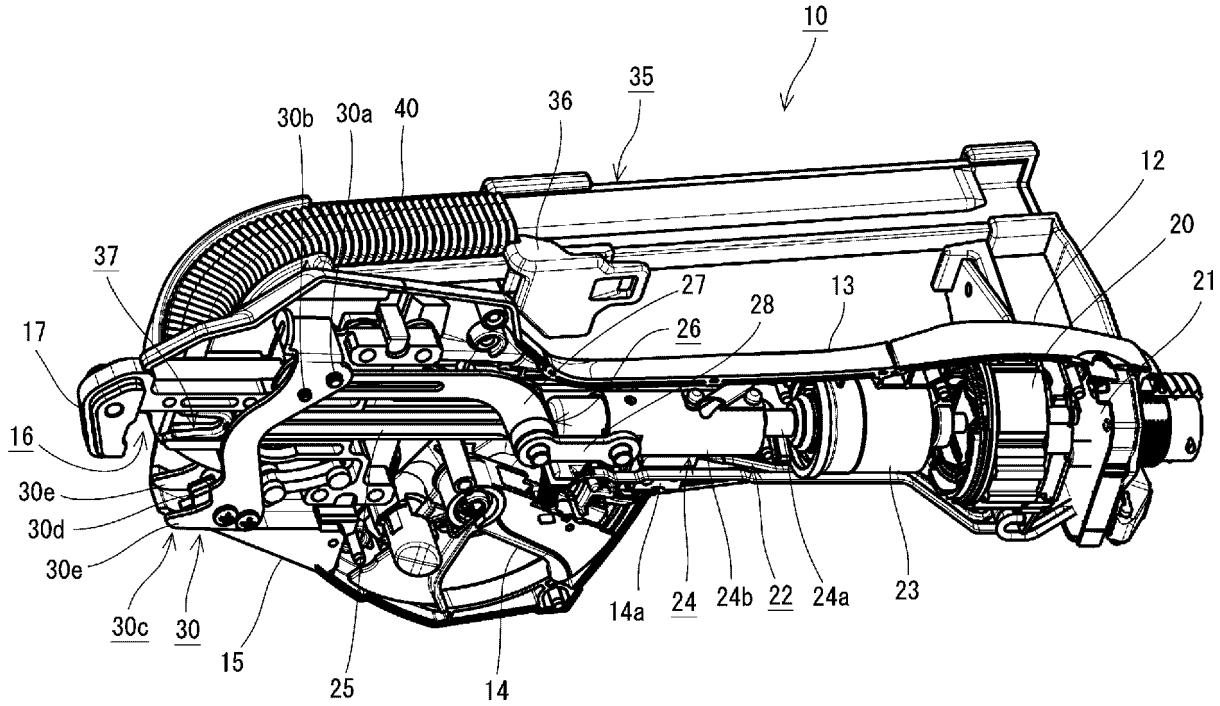


FIG.5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35
36
30b
30a
40
12
20
21
37
27
28
13
26
17
16
30e
30d
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30
15
25
14
14a
24
24b
22
24a
23

FIG.6A

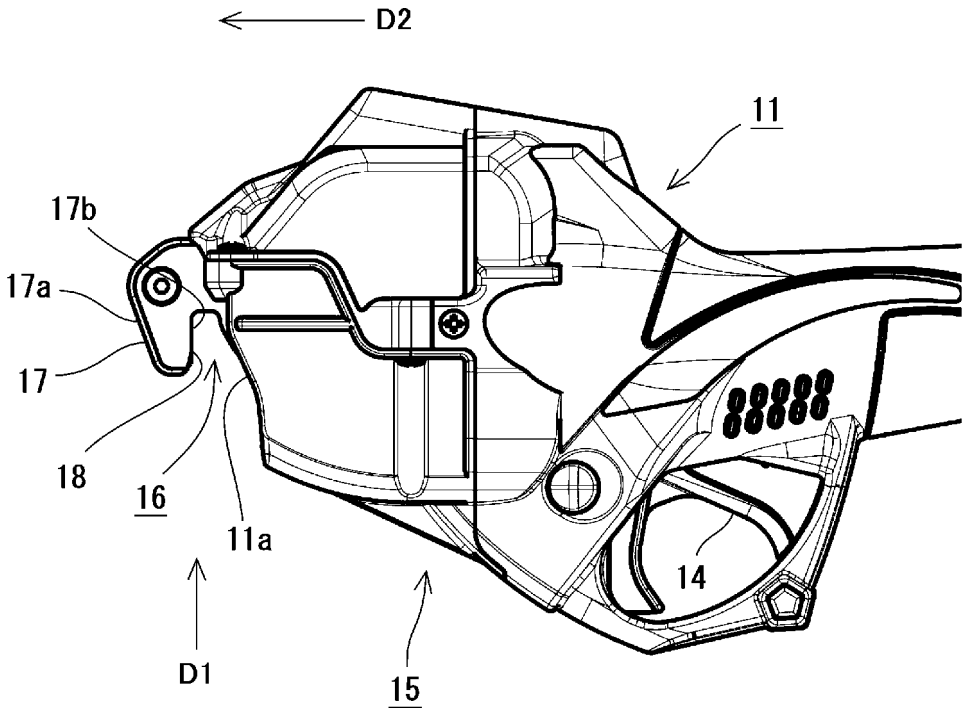


FIG.6B

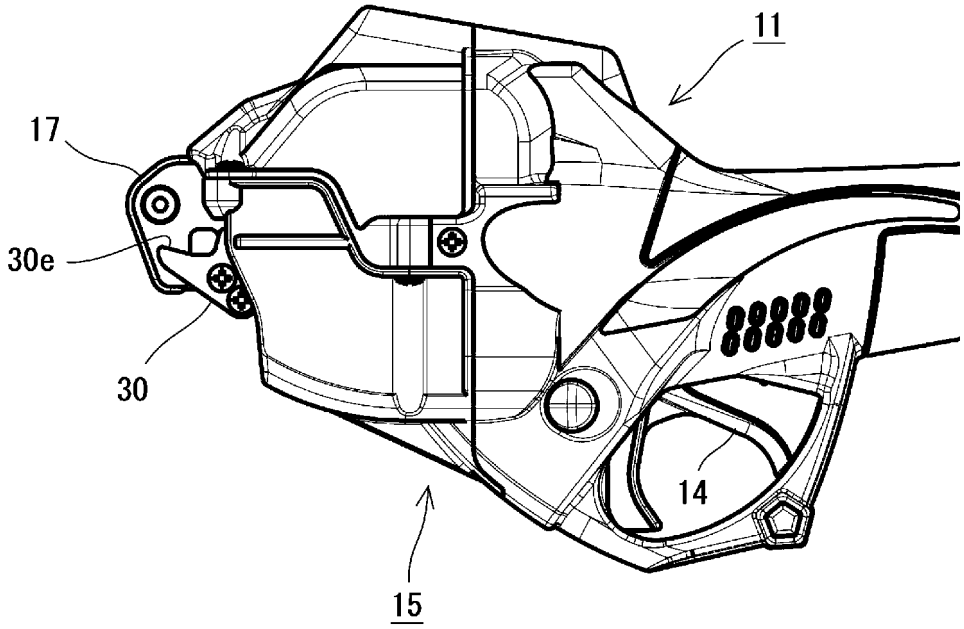


FIG.7A

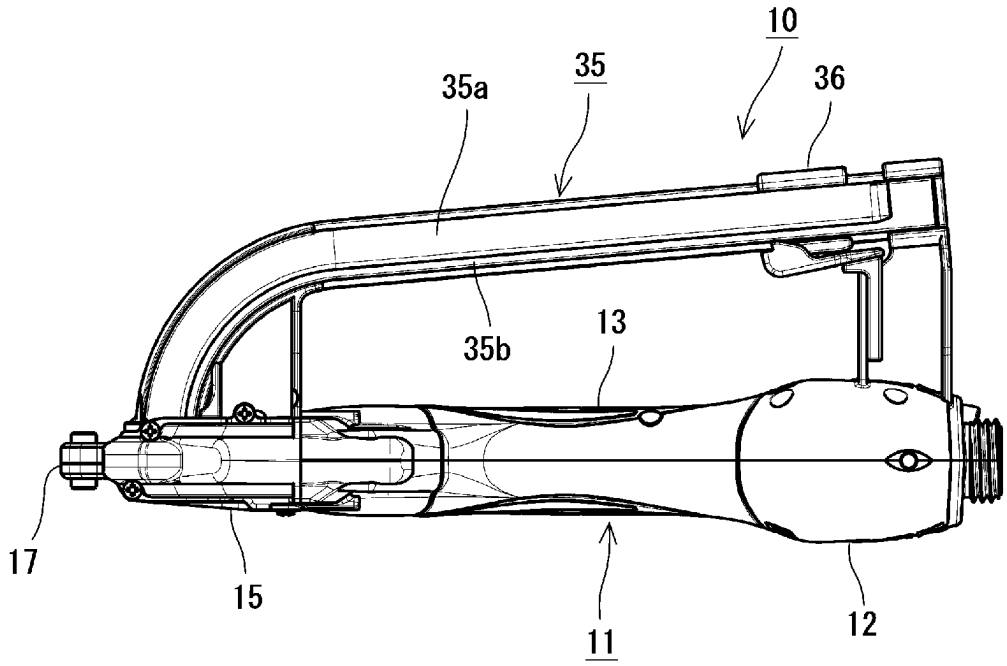


FIG.7B

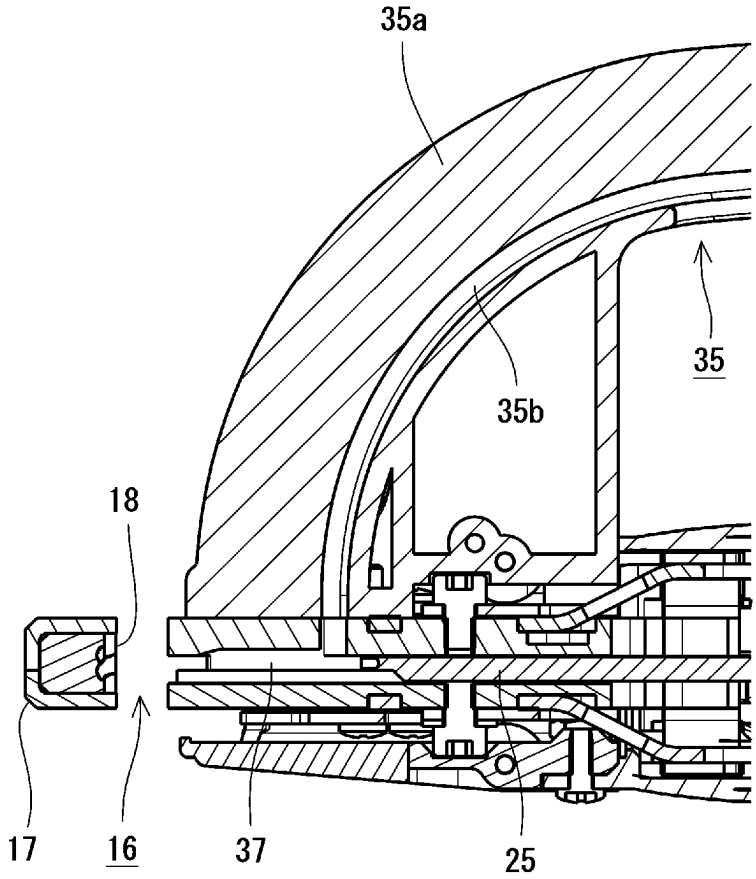
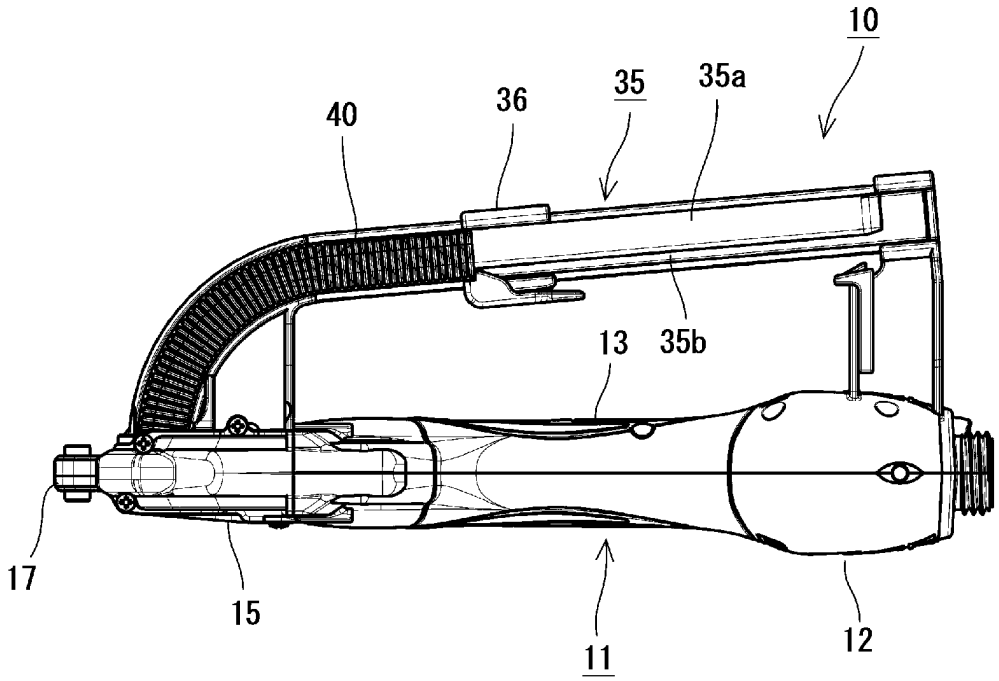


FIG.8A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35
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36
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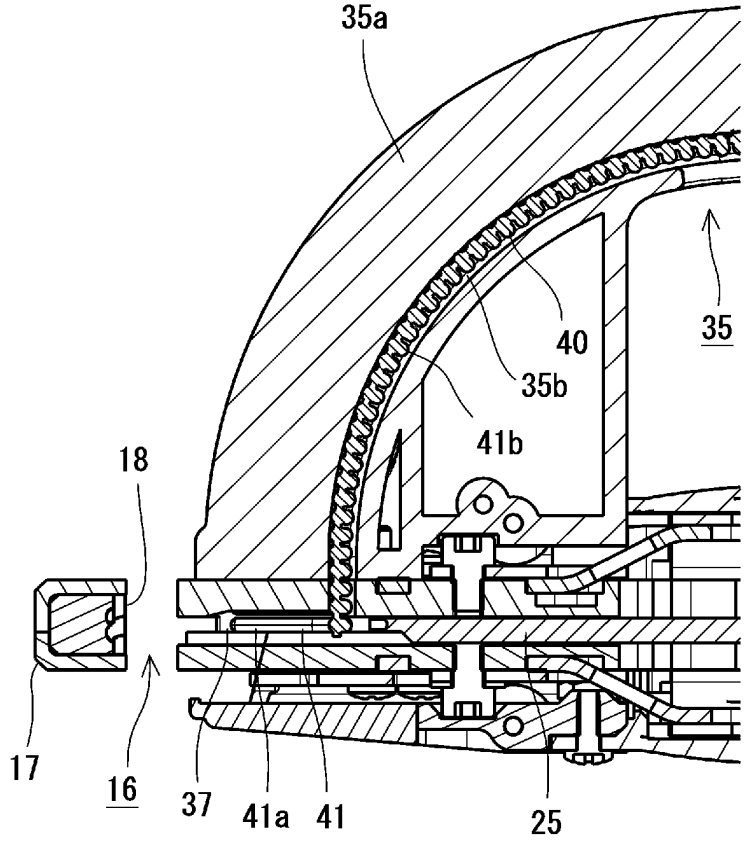
13
35b
17
15
11
12

FIG.8B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35b
41b
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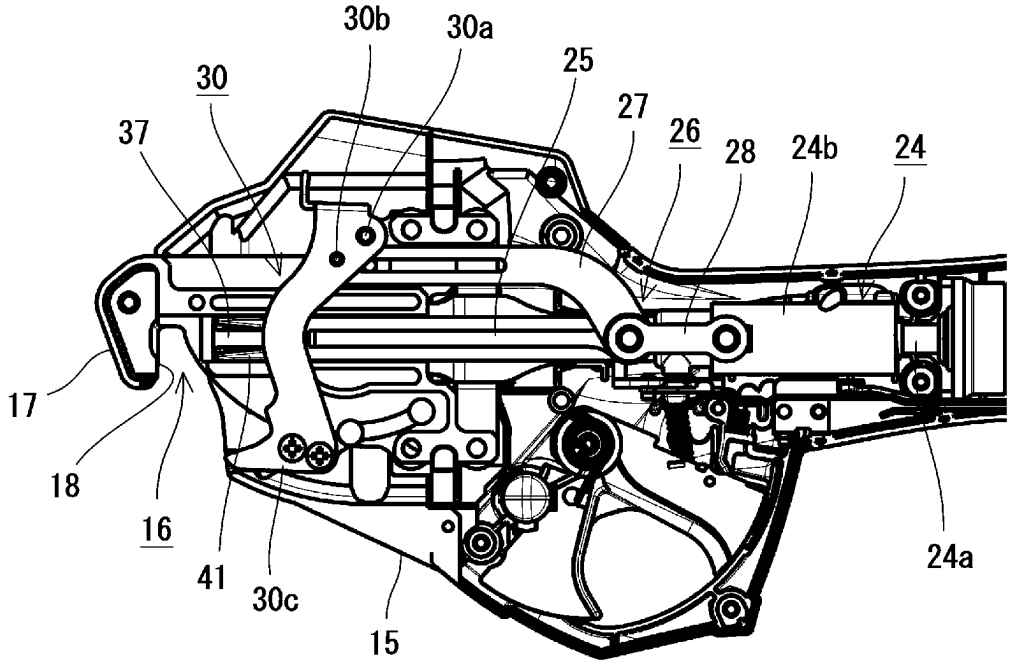
16
37
41a
41
25

FIG.9A


30b
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30
27
37
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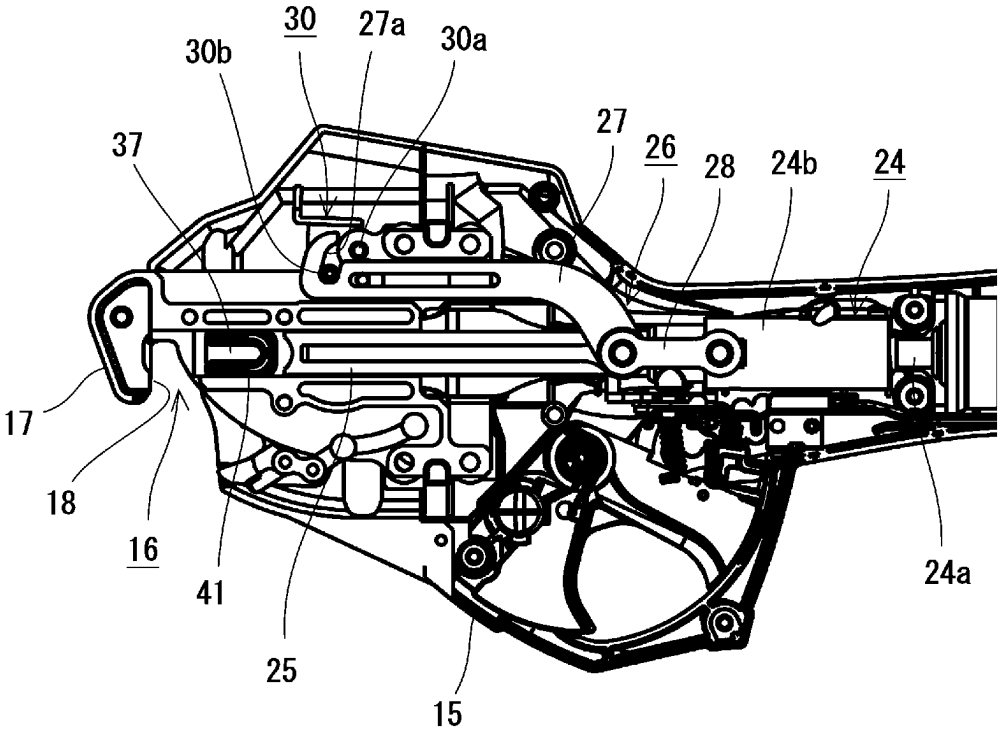
28
24b
24
17
18
16
41
30c
15
24a

FIG.9B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27a
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30a
27
37
26
28
24b
24
17
18
16
41
25
15
24a

FIG.10A

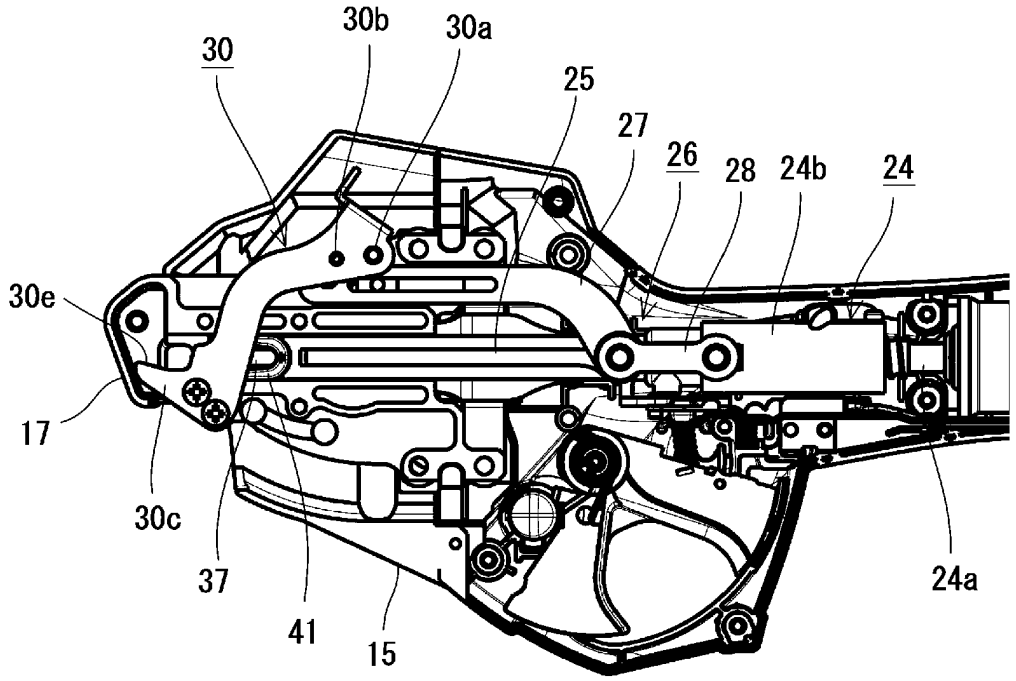


FIG.10B

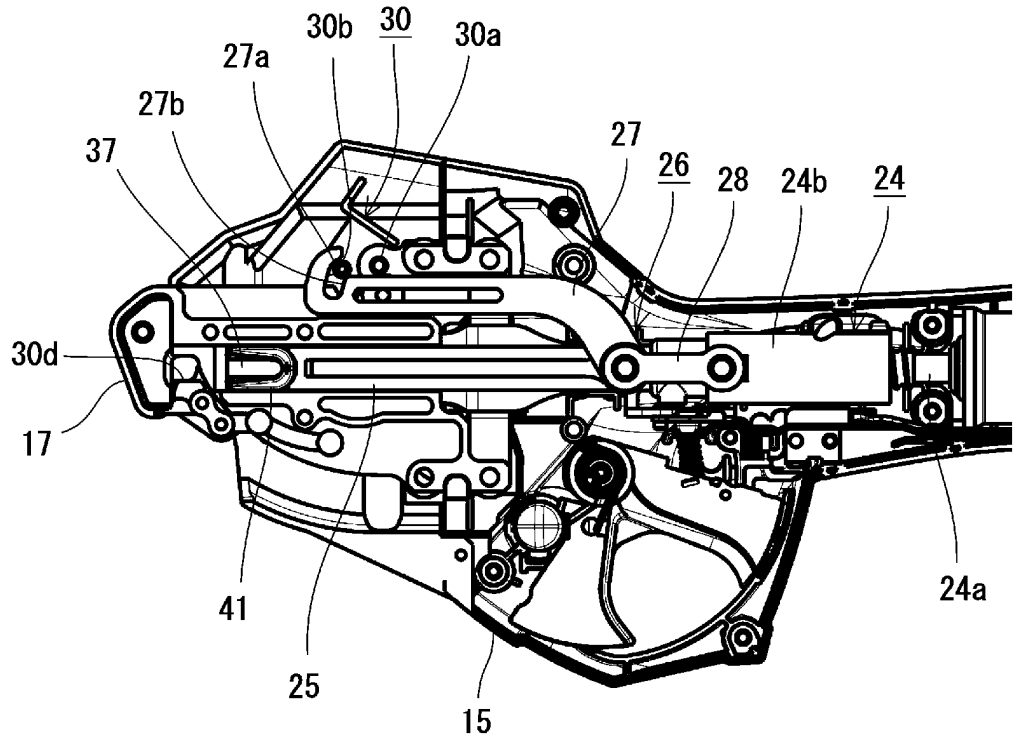


FIG.11A

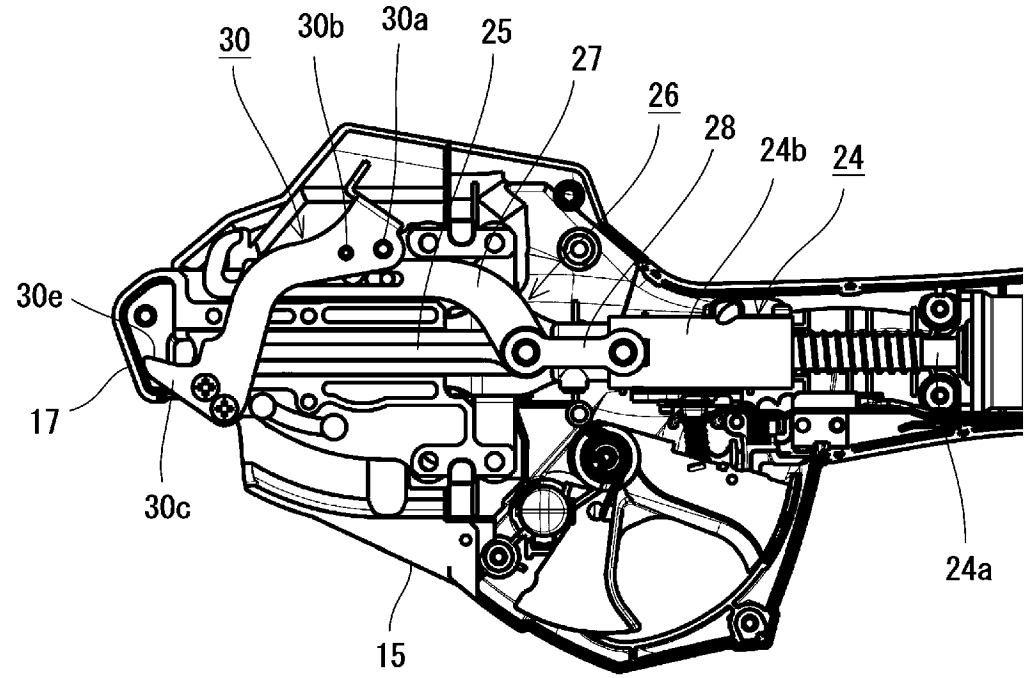


FIG.11B

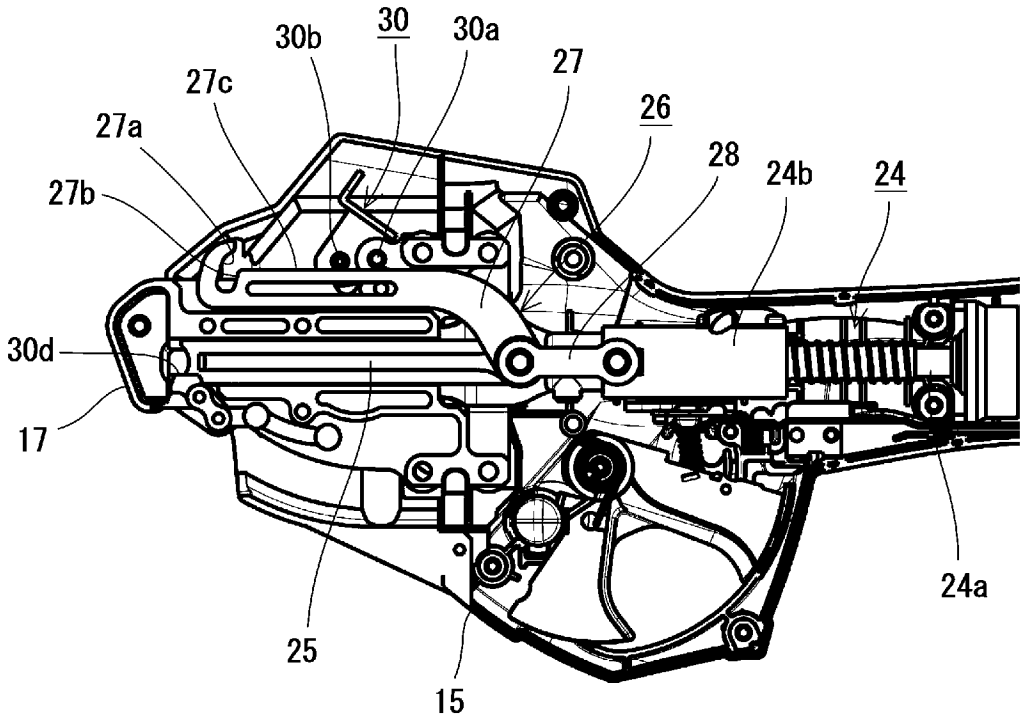


FIG.12A

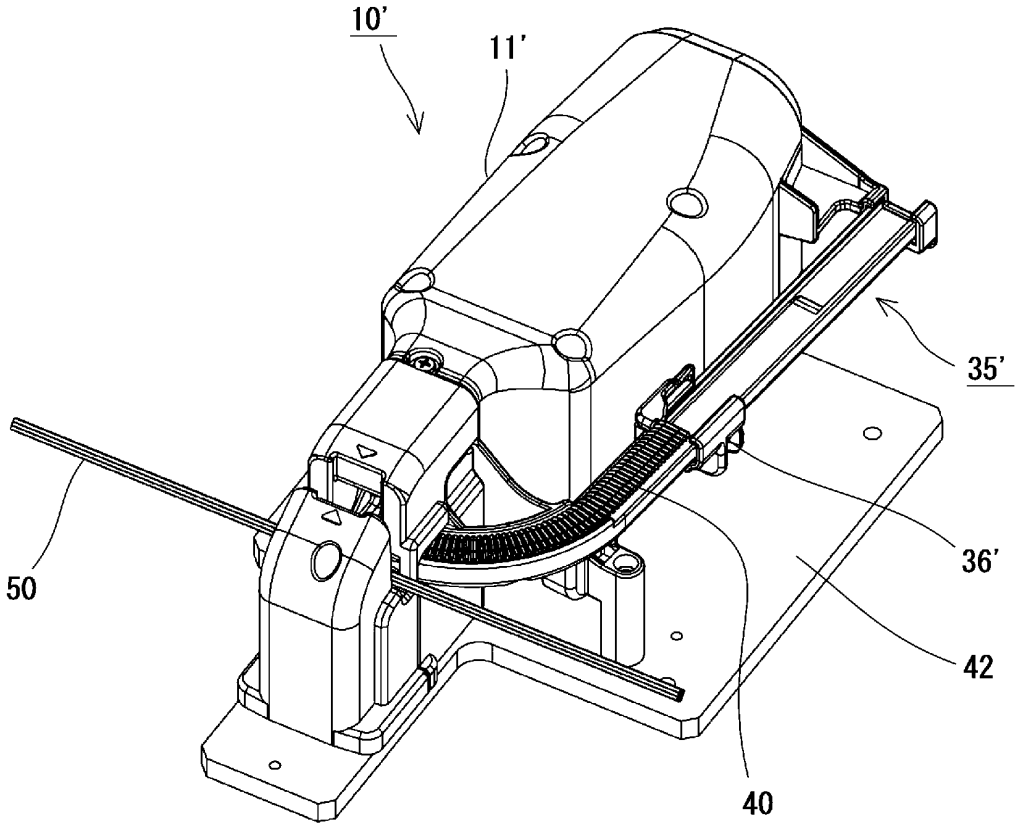


FIG.12B

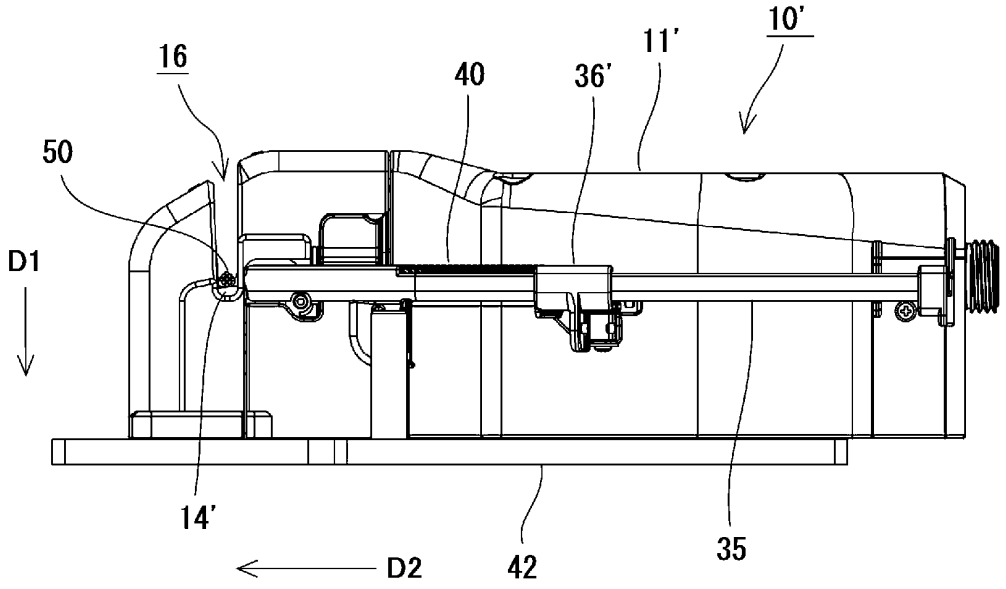


FIG.13A

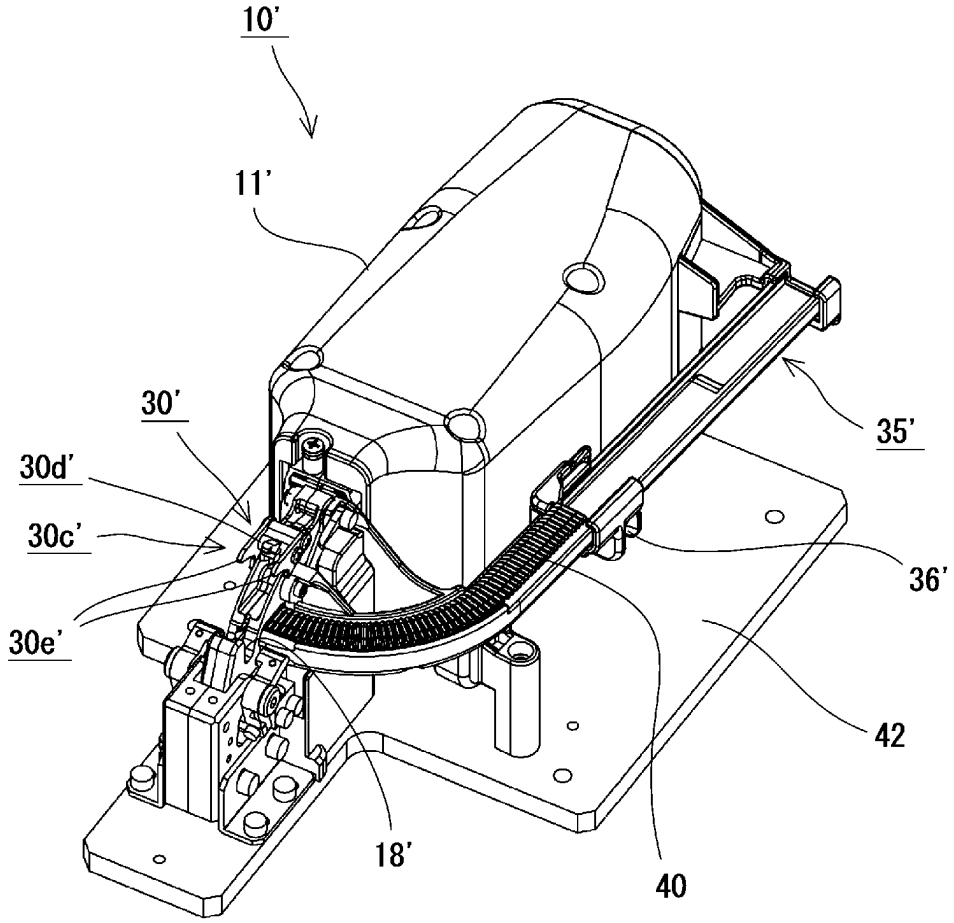


FIG.13B

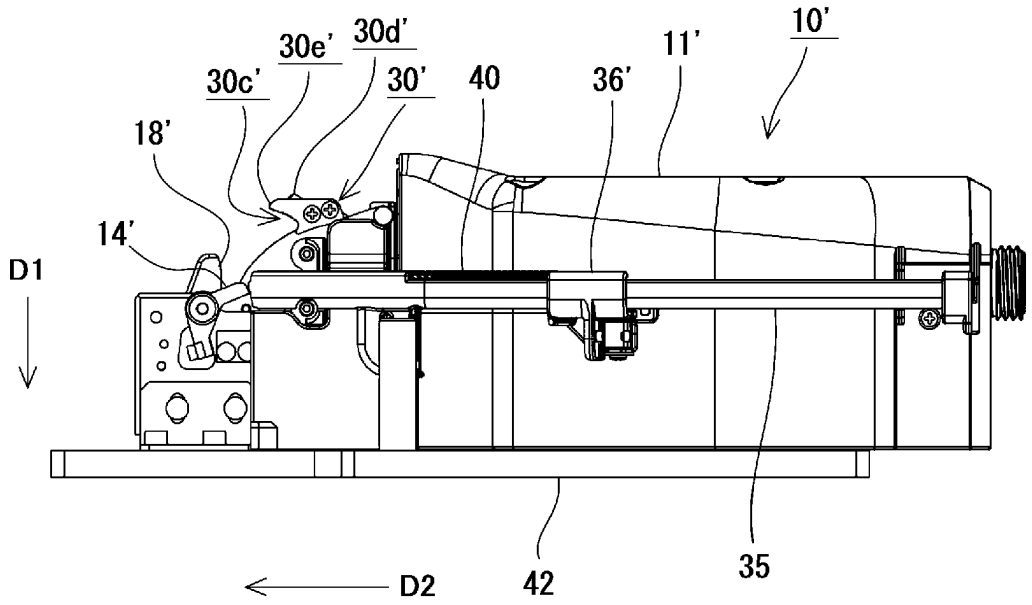


FIG.14A

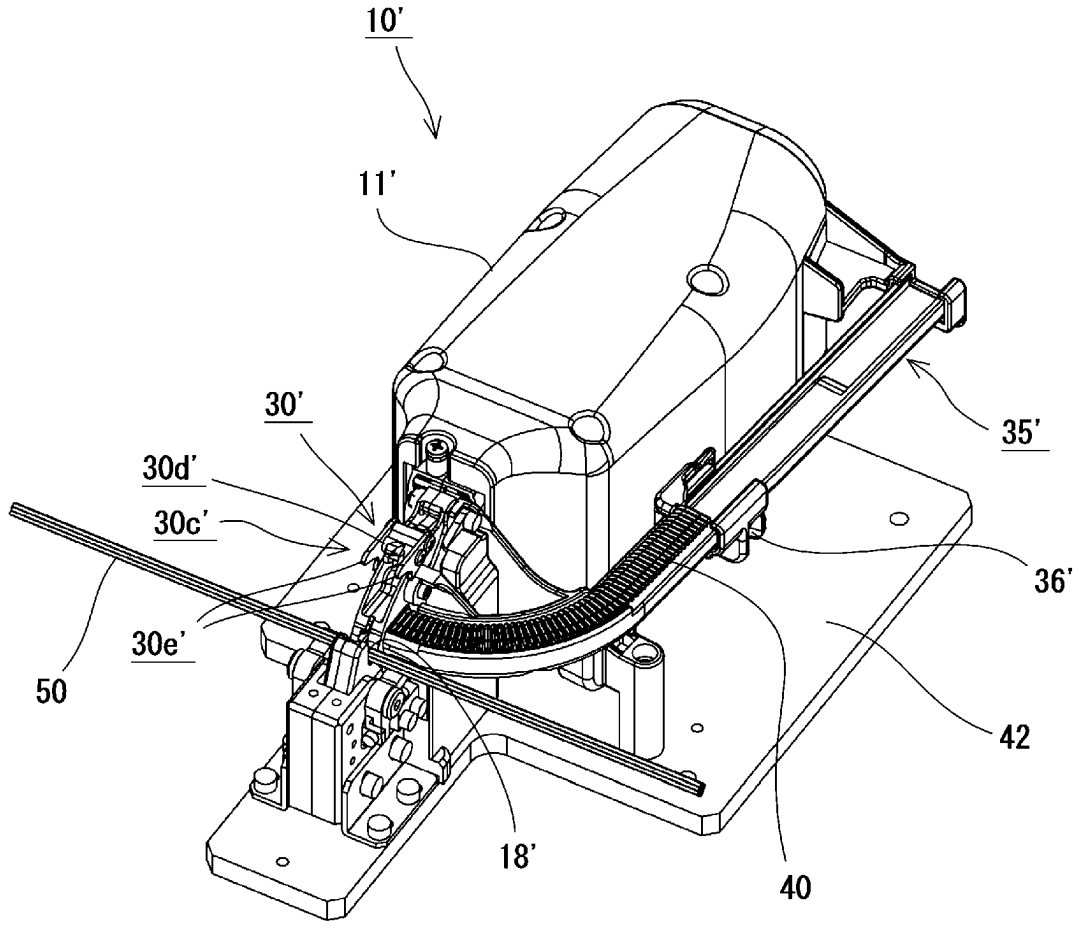


FIG.14B

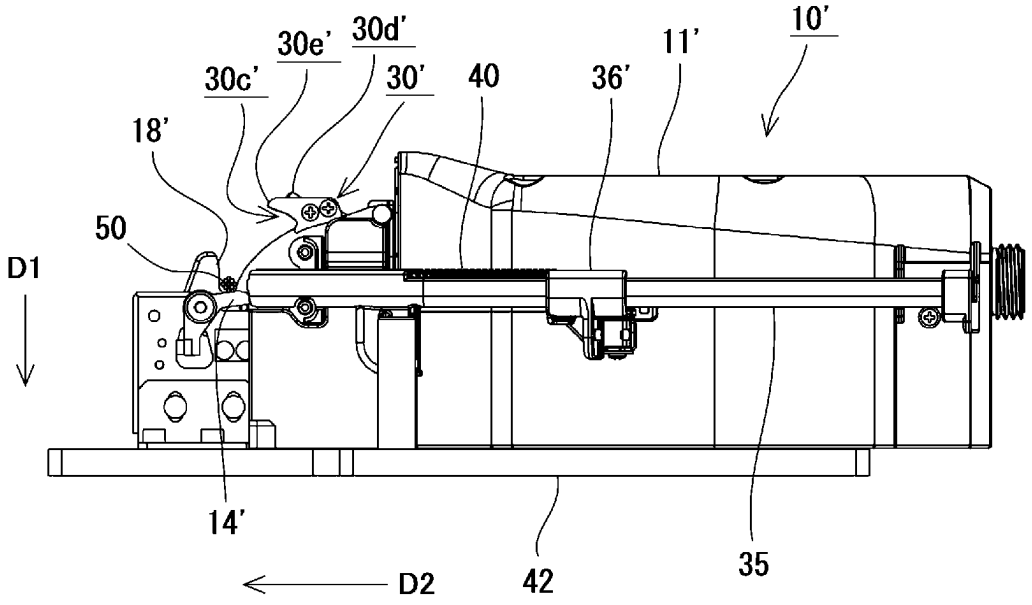


FIG.15

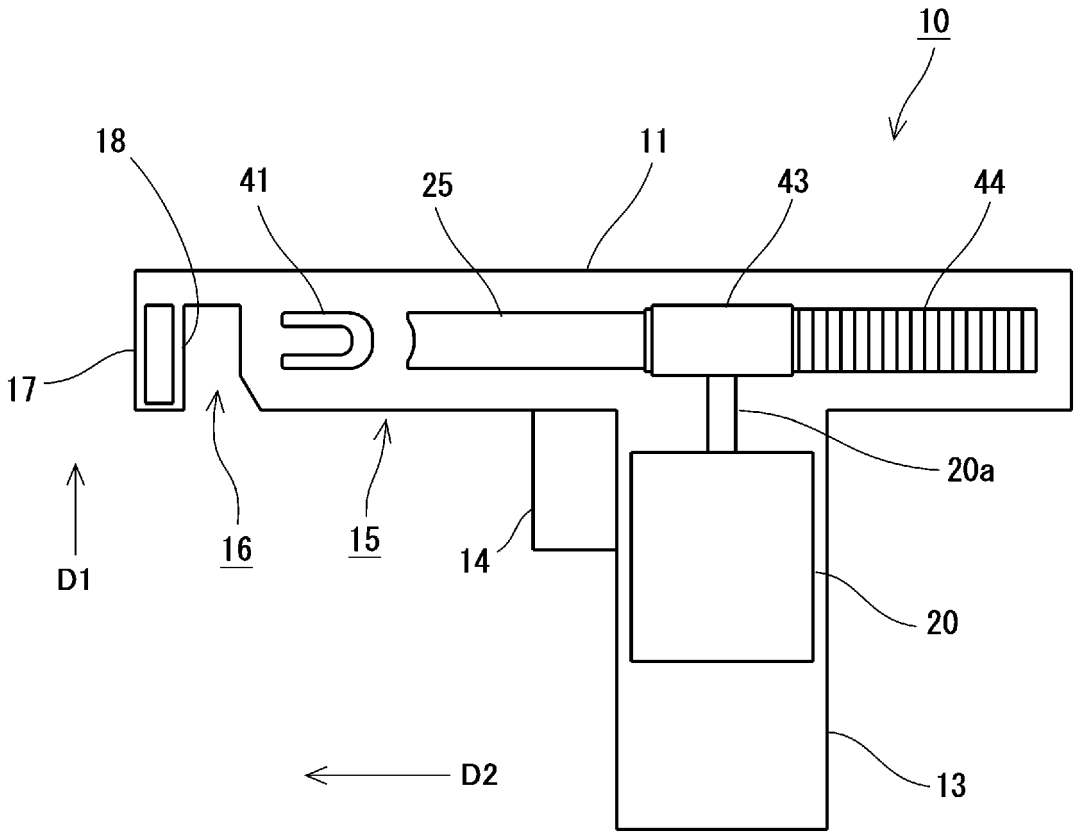


FIG.16A

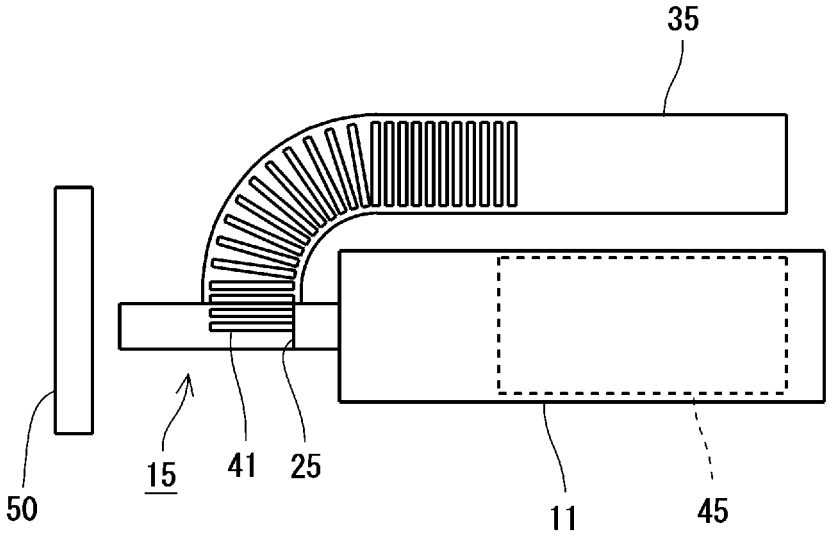


FIG.16B

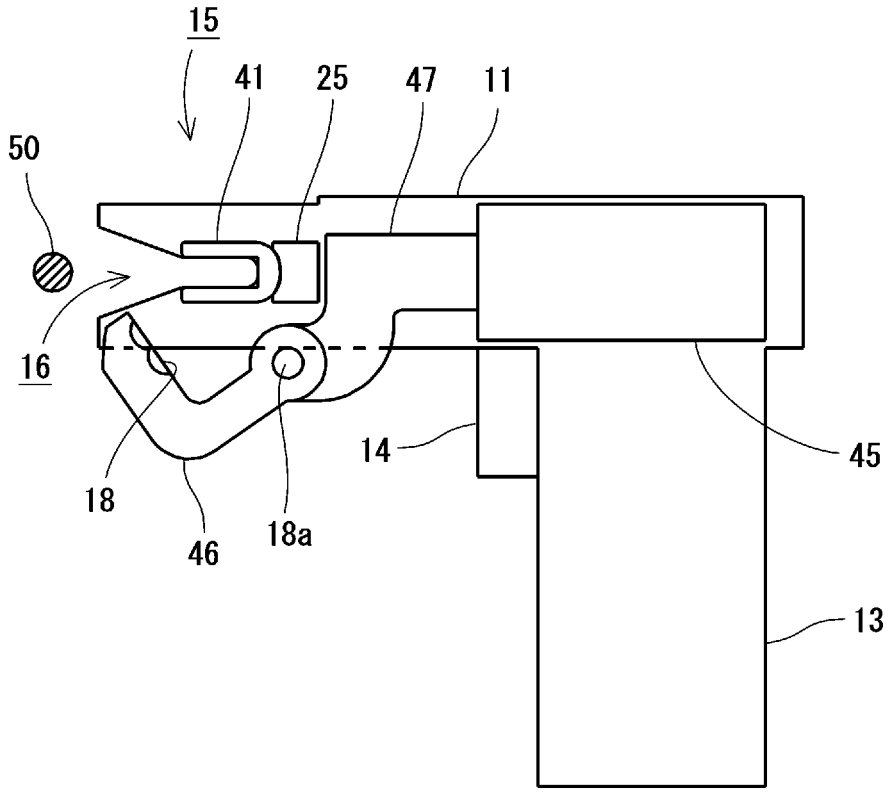


FIG.17A

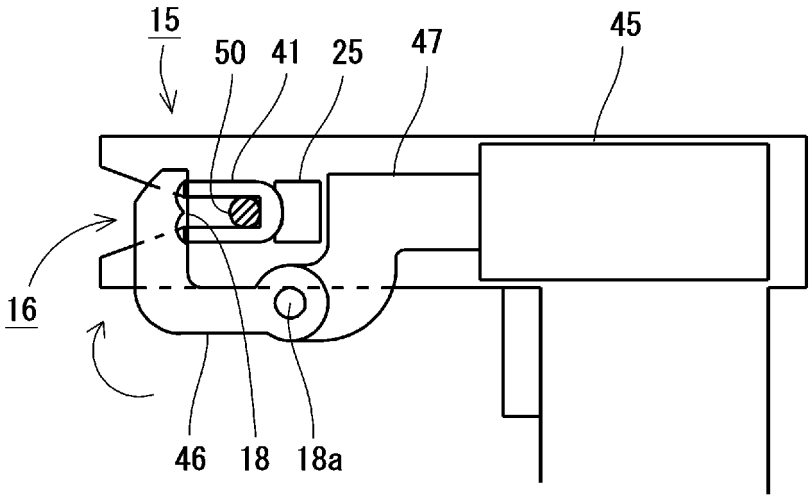


FIG.17B

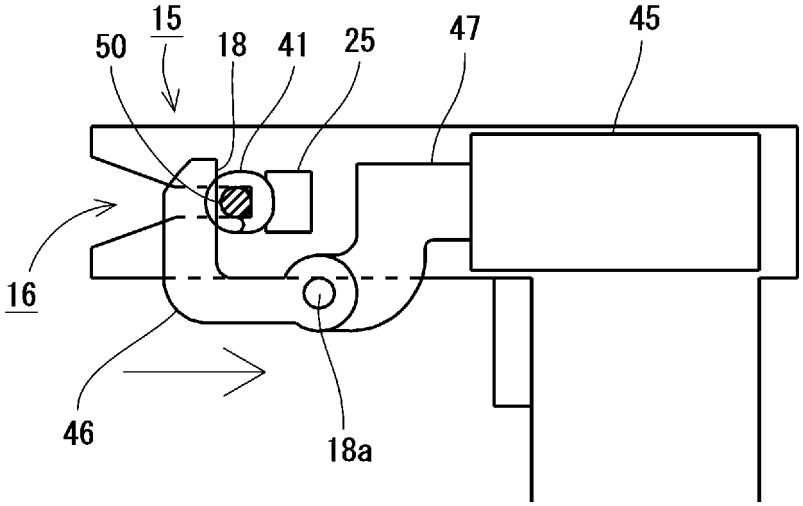


FIG.18A

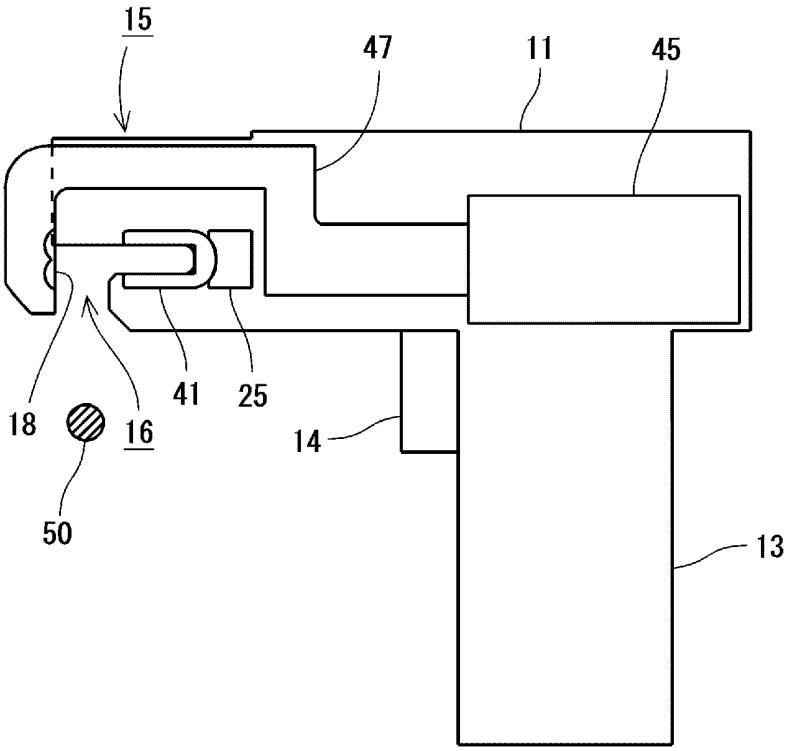


FIG.18B

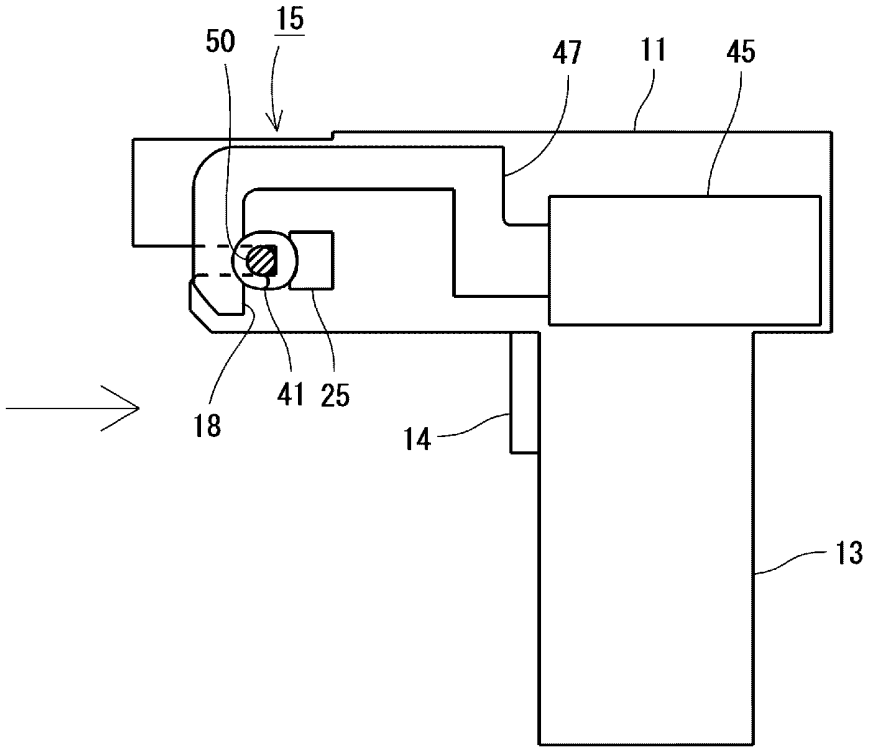


FIG.19A

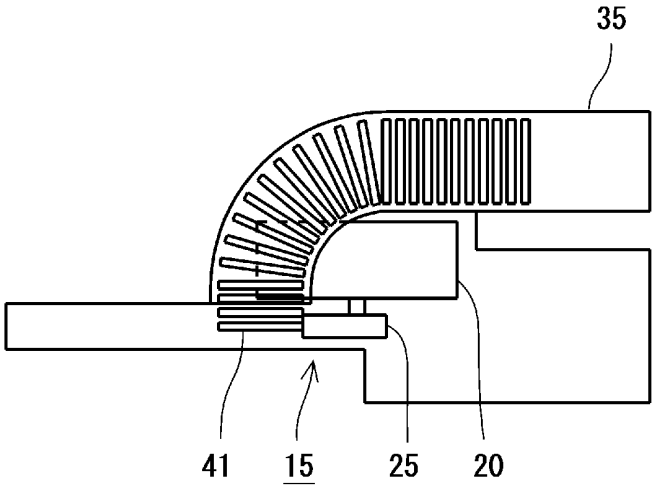


FIG.19B

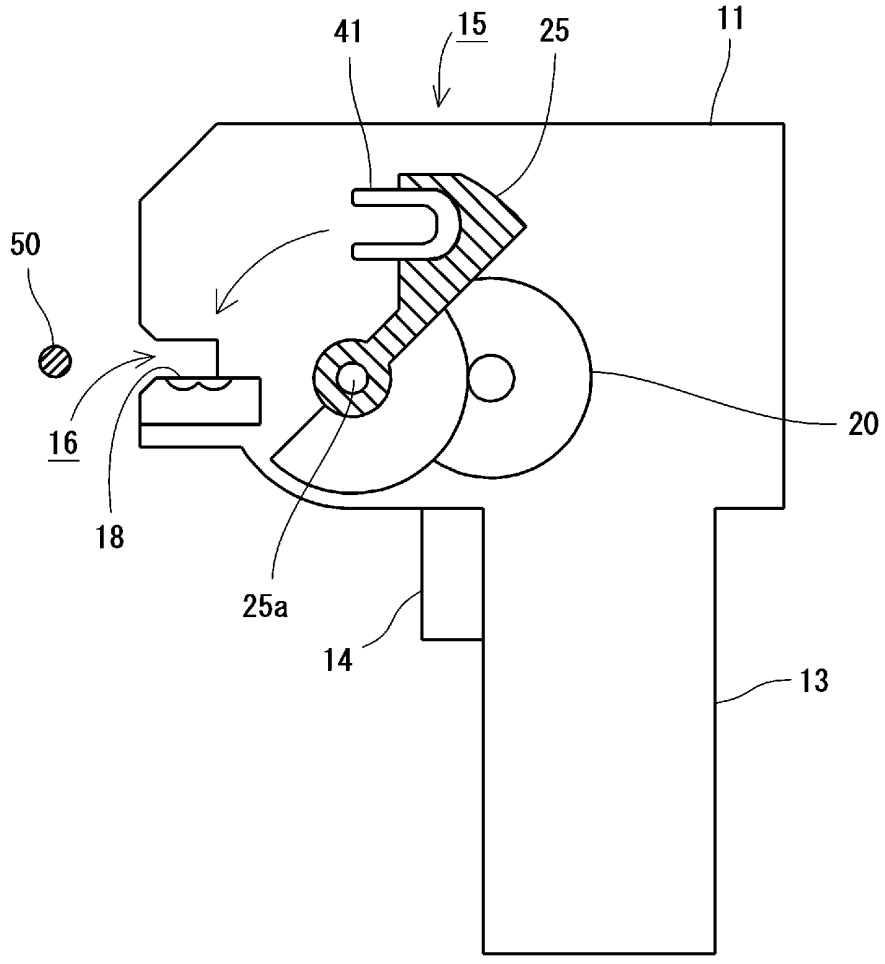


FIG.20A

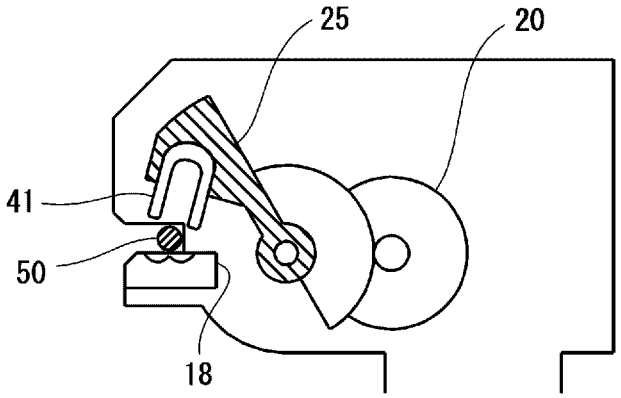


FIG.20B

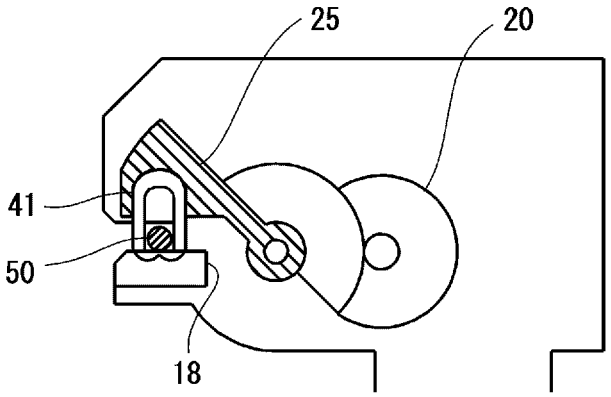


FIG.20C

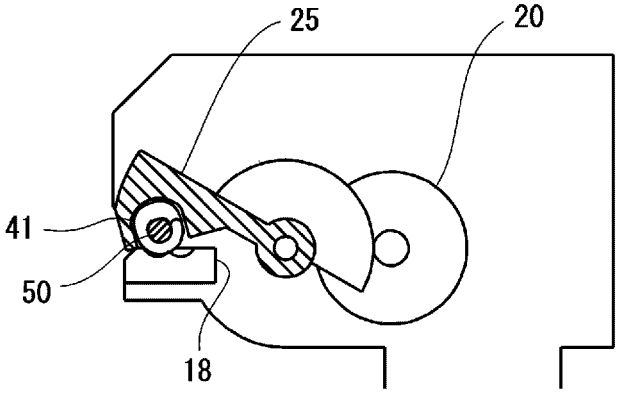
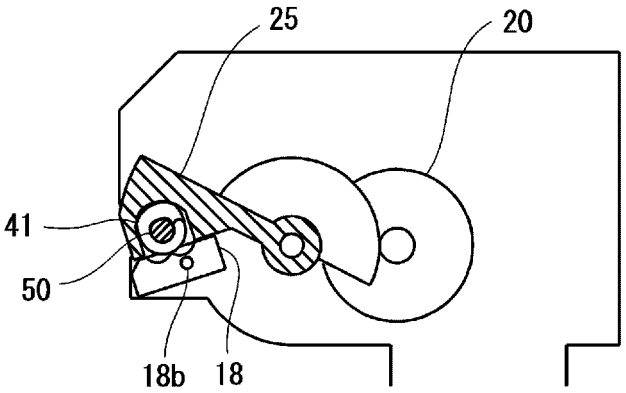


FIG.20D



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/016887

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. B65B13/34(2006.01)i, B25B25/00(2006.01)i, B65B27/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. B65B13/34, B25B25/00, B65B27/00

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	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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.
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 033364/1990 (Laid-open No. 123808/1991) (MAX CO., LTD.) 16 December 1991, specification, page 11, line 1 to page 16, line 18, fig. 1-5 (Family: none)	1-2 3-12
Y	JP 61-164919 A (JAPAN BANO'K CO., LTD.) 25 July 1986, page 3, lower left column, lines 3-9, page 4, lower right column, lines 7-20, fig. 1, 11 & US 4683920 A, column 3, lines 63-68, column 6, lines 33-47, fig. 2, 17 & EP 191183 A2 & EP 288968 A2 & DE 3585629 A & CA 1286216 A & DK 568985 A & AT 50955 T & AT 73406 T & AT 50955 E & AT 73406 E & DK 568985 A0	3-12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search 11 July 2018 (11.07.2018)	Date of mailing of the international search report 24 July 2018 (24.07.2018)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/016887

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-222520 A (MAX CO., LTD.) 12 August 2004, paragraph [0020], fig. 12 (Family: none)	6-12
Y	JP 08-156923 A (MAX CO., LTD.) 18 June 1996, paragraph [0012], fig. 1 (Family: none)	7-12
Y	JP 06-329118 A (WATANABE DENKI KK) 29 November 1994, paragraphs [0007]-[0008], fig. 5 (Family: none)	12

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H6329118 A **[0005]**
- JP 2000033526 A **[0005]**
- JP 2017088483 A **[0086]**
- JP 2018022386 A **[0086]**
- JP 2018075141 A **[0086]**