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(71) Applicant: OMRON TATEISI ELECTRONICS CO.
10, Tsuchido-cho Hanazono Ukyo-ku
Kyoto 616(JP)

(72) Inventor: Noguchi, Masayoshi Patent Center
OMRON TATEISI ELECTRONICS CO. 20, Igadera
Shimo-kaiinji Nagaokakyo-shi Kyoto 617(JP)

(72) Inventor: Yamane, Norihito Patent Center
OMRON TATEISI ELECTRONICS CO. 20, Igadera
Shimo-kaiinji Nagaokakyo-shi Kyoto 617(JP)

(72) Inventor: Nishimura, Yasuhide Patent Center
OMRON TATEISI ELECTRONICS CO. 20, Igadera
Shimo-kaiinji Nagaokakyo-shi Kyoto 617(JP)

(72) Inventor: Kitamura, Takao Patent Center
OMRON TATEISI ELECTRONICS CO. 20, Igadera
Shimo-kaiinji Nagaokakyo-shi Kyoto 617(JP)

(74) Representative: WILHELMS, KILIAN & PARTNER
Patentanwälte
Eduard-Schmid-Strasse 2
D-8000 München 90(DE)

(54) **Switch assembly.**

(57) A switch assembly coprises a switch mechanism, a latch mechanism having a latch lever and mounted operatively engageably with the switch mechanism, a first contact operated in response to movement of the lever of the latch mechanism relative to the switch mechanism into a latched state, a second contact operated in response to the release of the latch lever from the latched state, whereby the timing at which the first contact is operated is deviated from that of the second contact.

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WILHELMS · KILIAN & PARTNER
PATENTANWÄLTE
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EUROPEAN PATENT ATTORNEYS EUROPAISCHE PATENTVERTRETER MANDATAIRES EN BREVETS EUROPÉENS

OMRON TATEISI ELECTRONICS CO.

Kyoto / Japan

DR.RER.NAT. ROLF E. WILHELMS
DR. RER. NAT. HELMUT KILIAN
DR.-ING. JÜRGEN SCHMIDT-BOGATZKY*

EDUARD-SCHMID-STRASSE 2
8000 MÜNCHEN 90

TELEFON (089) 65 20 91
TELEX 523 467 (wilp-d)
TELEGRAMME PATRANS MÜNCHEN
TELEFAX G3/G2 (089) 651 62 06

SWITCH ASSEMBLY

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FIELD OF THE INVENTION

The present invention relates to a swith assembly which can be used, for example, as a door-sctuated switch for an electronic cocking range.

DESCRIPTION OF THE PRIOR ART

In the electronic cocking range, it is required that two or more switches be changed over through a sequence of corresponding operations.

Figs. 1 and 2 of the accompanying drawings show a hitherto known swith assembly of the type mentioned above and application thereof to an electronic cocking range or the like. referring to the figures, a switch assembly denoted by a reference numeral 10 is constituted by slider guides 12 and 13 mounted on a base panel 11, a slider member 14 inserted in the guides 12 and 13 slidably selectively in the directions indicated by arrows A and B, switch elements 17 and 18 having respective levers 15 and 16 of which inclinations are changed by the movement of the slider member, and a printed circuit board 19 on which the switch elements 17 and 18 are mounted. In operation, when the slider member 14 is moved in the direction indicated by the arrow A, the switch elements 17 and 18 respond therto to be thereby turned on (i.e. closed), resulting in that an electric motor 21 and a coil 22 incorporated in the electronic range 20,

as shown in Fig. 2, are electrically energized.

In the case of the hitherto known switch arrangement 10 described above, both the switch elements 17 and 18 are simultaneously turned on or off. As a consequence, the motor 21 and the coil 22 are electrically energized simultaneously, giving rise to a large amount of starting current flow as a whole. In the hitherto known electronic range 20, the above problem is dealt with by using a fuse having a large current capacity. However, such measures are ineffective to reduce the maximum starting current. Under the circumstance, an attempt to reduce the maximum starting current by actuating the switch elements 17 and 18 at different time points deviated slitely from each other to thereby make the supply of the starting current to the motor 21 be deviated correspondingly from that of the coil 22 has been proposed and actually adopted in some of the electronic cocking ranges. In that case, however, difficulty has been encountered in deviating the operating time points of the switch elements slightly relative to each other. Accordingly, in the electronic cocking range 20 in which a number of switch elements (e.g. micro-switches) are employed, a multiplicity of switches manufactured in accordance with the same standards are manually operated to detect individually the oprating points of the switches, wherein the switches are selectively classified on the basis of the operating points as detected. This procedure however requires an extra step for the selective classification of the switches, eventually increasing the manufacturing cost.

Besides, there likely happen such situations where the switches as classified are eroneously mounted or switches exhibiting the same operating points are incorporated in the electronic range upon manufacturing thereof, as the rsult of which the desired performance of the range cannot be attained. For these reasons, the actual use of the switches classified as mentioned above are objected by the manufacturers of the electronic ranges because workers are required to pay attention to the operating points of the switches at the time of incorporating them in the range.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a switch assembly of such a structure in which the coincidence or overlap of the starting currents accompanying switch operation can be prevented.

Another object of the present invention is to provide a switch assembly which is capable of suppressing the maximum current supplied to an electric circuit upon switch operation to a possible minimum value.

A further object of the present invention is to provide a switch assembly which can be mounted on an electronic device as an electronic cocking range in a much facilitated and simplified manner.

In view of the above objects, there is provided according to an aspect of the invention a switch assembly which includes a latch mechanism mounted detacheably relative to a main body of the switch assembly, a first

contact adapted to be operated when a latch lever of the latch mechanism is inserted in the switch main body with the lever being in the latched state, and a second contact operated when the aforementioned latch lever inserted in the switch main body is released from the latched state.

With the arrangement of the switch assembly according to the present invention, it is possible to actuate a plurality of contacts at different time points deviated one another through a single operation such as door latch operation in an electronic cocking range. Consequently, the simultaneous supply of starting currents to associated circuits can be prevented, while the overall starting current can be supplessed to a minimum value.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a hitherto known switch assembly;

Fig. 2 is a schematic diagram showing a circuit arrangement of an electronic cocking range;

Fig. 3 is an exploded perspective view of a switch assembly according to an exemplary embodiment of the present invention;

Fig. 4 is a front view showing the same in the state before being latched;

Fig. 5 is a front view showing the same in a state taking place during an earlier of the latching process;

Fig. 6 is a front view showing the same in a state taking place during a later half of the latching process; and

Fig. 7 is a front view showing the same in the state where the latching operation has been completed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, the present invention will be described in detail in conjunction with the illustrative or exemplary embodiments thereof by referring to the drawings.

Fig. 3 shows in an exploded perspective view a switch assembly according to an exemplary embodiment of the invention. Referring to the figure, the switch assembly generally denoted by a reference numeral 25 is intended to be employed as an interlock switch for an electronic cocking range or the like. The switch assembly 25 is so arranged that contact operation timings thereof are deviated one another upon latching of the door of the electronic range.

In general, the switch assembly 25 is basically composed of a switch main body 1, first to fourth actuators 26 to 29, and a latch mechanism 2, as will be described below in detail.

The switch main body 1 is composed of an top plate 30, side plates 31 and 32 and a rear plate 33 which cooperate to constitute a housing 34 of an integral structure, and a cover 35 adapted to close the front of the housing 34. The side plates 31 and 33 have respective blackets 36 and 37 for mounting the switch main body on an electronic range, by way of example. The top plate 30 has vertical apertures 38, 39 and 40 formed therethrough. Disposed fixedly within an upper cavity portion of the housing 34 are guide means 8

and 9 serving as guides for allowing the first actuator 26 and the fourth actuator 29 to be slidably displaced in the horizontal transverse direction, a shaft 7 for supporting rotatably the second actuator 27, and a guide piece 41 for guiding the sliding movement of the third actuator 28 in the vertical direction, while a contact support 42 holding a plurality of contacts is disposed within a lower cavity portion of the housing 34. Referring to fig. 4, the aforementioned guide means 8 includes a guide piece 43 of a generally crank-like configuration, a pair of guide pieces 44 and 45 disposed at one side of the guide piece 43, and lower frames or collars 46 and 47 defining the aforementioned apertures 38 and 39 respectively. On the other hand, the guide means 9 is constituted by a part of the aforementioned guide piece 43, a pair of guide pieces 48 and 49 disposed at the other side of the guide piece 43, and a recess 50 formed at an upper corner of the housing 34. The contact support 42 includes a pair of horizontal plates 51 and 52 for supporting terminals 53 to 60 and a plurality of vertical plates 61 for separating the terminals 53 to 60 from one another. Common contacts 65 and 62 are connected to the terminals 56 and 59 respectively, while contacts 63, 64, 5, 66, 4 and 68 are connected to the terminals 53, 54, 55, 57, 58 and 60 respectively. Movement or stroke of the contact 63 is restricted by a strobe limiting bar 69. In the free stage, the contact 63 is detached from the contact 64. The common contact 65 in the free state is brought into contact with

the contact 66 whose movement is restricted by stroke limit bars 70 and 71, while the contact 65 is detached from the contact 5 whose movement is restricted by a stroke limit bar 72. When the common contact 65 is brought into contact with the contact 5, a coil of an electronic cocking range (not shown) is electrically energized. The common contact 62 in the free state is in contact with the contact 68 and detached from the contact 4, an electric motor (not shown) of the electronic range is electrically energized.

The first actuator 26 has one end (pushing end) 67 sandwiched slidably between the guide pieces 44 and 45 and the other end portion also sandwiched between the lower frame 46 and the guide piece 43. When the first actuator 26 is disposed in the direction indicated by an arrow C, the common contact 62 is bent in this direction by means of the pushing end 67. In this conjunction, it is to be noted that the stroke of the first actuator is restricted by the lower frame 47.

The second actuator 27 includes a cylindrical member 24 mounted rotatably on the shaft 7 and an actuator arm 99 mounted on the cylindrical member 24 in a tangential relation thereto. In the free state of the second actuator 27, one end of the actuator arm 99 is in contact with the contact 4, whereby the other end of the actuator arm 99 is urged to lie within the aperture 39 under a resilient force of the contact 4.

The third actuator 28 includes a slider body 73 of

a substantially rectangular configuration, a rod-like pushing portion 74 disposed on the top of the slider body 73, an actuating piece 75 of L-like cross-section disposed at one side of the slider body 73, and a compression spring 76 urging upwardly the slider body 73. When the pushing portion 74 is inserted in the aperture 40 in such a manner in which a tapered face 77 of the actuating piece 75 is brought into contact with the contact 68, while the compression spring 76 is disposed between a recess 78 formed in the lower side of the slider body 73 and a spring accommodating recess 79 formed in the housing 34, the slider body 73 is then held at an upper position thereof under the influence of the compression spring 76. In this state, the pushing portion 74 projects upwardly from the plate 30 of the switch main body 1.

Referring to Fig. 3, the fourth actuator 29 includes a plate-like member 81 having a notch 80 formed at one end, an actuator block 82 of a substantially inverted C-like configuration disposed at the other end of the plate-like member 81, and a compression spring 83 for biasing the fourth actuator 29 in the direction indicated by the arrow C. the fourth actuator 29 is slidably mounted within the recess 50 so as to be positioned by the guide pieces 43, 48 and 49. Subsequently, the compression spring 83 is placed between the actuator block 82 and a spring accommodating portion 84 formed in the housing 34. As a consequence, the fourth actuator 29 is resiliently biased or urged in the direction indicated by the arrow C under the influence of the compression spring 83 with the actuator block 82 bearing against the

guide piece 49. In this stage, the top end of the common contact 65 is brought into contact with the periphery of the notch 80, while the upper end of the contact 64 is placed in contact with a pushing edge 85 of the plate-like member 81.

The latch mechanism 2 includes a stud 86 mounted on a door 110 of an electronic range or the like, a latch lever 3 adapted to be inserted in an through-hole 87 formed in the door 11o, a shaft or pin 89 for suppoting rotatably a pushing or pressing portion 88 of the latch lever 3 on the stud 86, and a compression spring 80 interposed between the lower face of the pushing portion 88 and the upper surface of the door 110. In the free state, the latch lever 3 is held at a position at which the latch lever 3 is in contact with an edge 91 of the throughhole 87 under the urging force of the compression spring 90. In this state where the tip end of the actuator portion 92 of the latch lever 3 is not located above the aperture 38, the door 110 cannot be closed completely because the actuator portion 92 will engage the upper frame 93 defining the aperture 38. However, when the pushing portion 88 is pressed by a finger of the user, the latch lever 3 is rotated to engage the other edge 94 of the through-hole 87. In that case, the actuator portion 92 of the latch lever 3 lies above the aperture 38 in the state ready to be placed within the latter. Accordingly, the door can be closed completely.

A projection 95 is formed on the lower surface of the door 110 at a position located immediately above the

aperture 39 so as to be inserted therein upon closing of the door 110.

Next, operation of the switch assembly will be described. Before the door 110 is closed, the common contact 62 is detached from the contact 4, while no contact is made between the common contact 65 and the contact 5, as is shown in Fig.4 Consequently, neither the motor nor the coil of the electronic range is electrically energized. When the door 110 is completely closed by pressing the portion 88 of the latch lever 3, as is shown in Fig. 5, the lower surface of the door 110 bears against the pushing rod portion 74 of the third actuator 28 to move slidingly the latter downward, resulting in that the contact 68 is fixed in the direction indicated by the arrow C by means of the tapered surface 77 of the third actuator 28, while the lower end of the projection 95 inserted into the aperture 39 bears against the actuator arm 99 of the second actuator 27 to cause the arm 99 to be rotated, as shown in Fig.6. Consequently, the contact 4 is flexed in the direction indicated by the arrow C under the action of the one end of the actuator arm 99, resulting in that the contact 4 is caused to contact with the common contact 62. Thus, the electric motor of the cocking range is electrically energized. At that time, the lower end of the latch lever 3 bears against the first actuator 26 to cause the latter to slide in the direction C. This result in that the pushing end 67 of the first actuator 26 bears against the upper end of the common contact 62

which is thus flexed in the direction C. Subsequently, the finger is removed from the latch lever 3. Then, the latch lever 3 is rotated in the direction indicated by an arrow D under the spring force of the compression spring 90, as shown in fig. 7, whereby the actuator block 82 is slidingly displaced in the direction opposite to that indicated by the arrow C by means of the actuator portion 92 of the latch lever 3. As a consequence, the common contact 65 inserted in the notch of the plate-like member 81 is flexed in the direction opposite to that indiccated by the arrow C to be ultimately contacted with the contact 5, whereupon the coil of the electronic range is electrically energized. At that time, the contact 64 is flexed in the direction opposite to the arrow C by means of the pushing edge of the plate-like member 81 to be contacted with the contact 63. Further, the first actuator 26 is released from the action exerted by the latch lever 3.

For stopping the operation of the electronic range, the pushing portion 88 of the latch lever 3 is depressed by a finger of the user, being followed by disengagement of the door 110 from the switch assembly 1. In this case, the coil of the electronic range is first turned off and thereafter the electric motor is turned off through the process excuted in the sequence reverse to the operation.

As will now be appreciated from the foregoing description, the switch assembly embodying the invention is so arranged that only after the contact has been made between the common contact 62 and the contact 4 under the

action of the latch lever 3 upon closing of the door 110, the common contact 65 is brought into contact 5. Accordingly, the starting time point of the electric motor is deviated from that of the coil, whereby the simultaneous supply of the starting currents to the motor and the coil is positively inhibited.

In the foregoing description, it has been assumed that the fourth actuator 26 is not used for the contact change-over operation. However, in practical application, the fourth actuator 26 is adapted to be moved in the direction C by means of the latch lever 3, whereby a common contact disposed adjacent to the common contact 62 is flexed in the direction C to be contacted with a contact disposed in the vicinity of the contact 68, as the result of which the fourth actuator 29 is restored to the original position under the action of the common contact upon releasing of the latch lever 3 from the latched state.

Although the present invention has been described in conjunction with the exemplary embodiment, it should be understood that various changes and modifications can be added without departing from the scope and spirit of the invention.

WHAT IS CLAIMED IS:

1. A switch assembly comprising:

switch means;

a latch mechanism provided detachably relative to said switch means;

a first contact operated in response to insertion of a latch lever of said latch mechanism into a latched state; and

a second contact operated in response to the release of said latch lever from said latched state.

FIG. 1
PRIOR ART

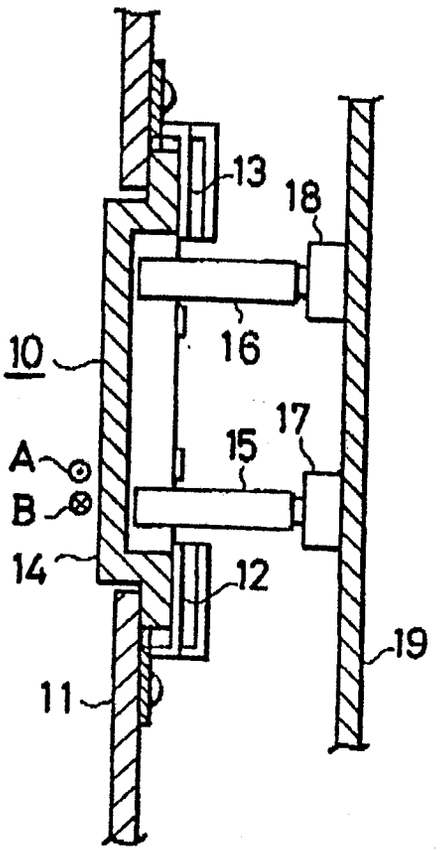


FIG. 2
PRIOR ART

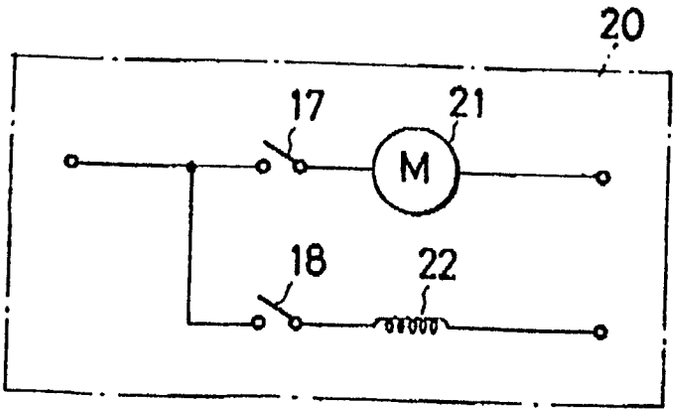
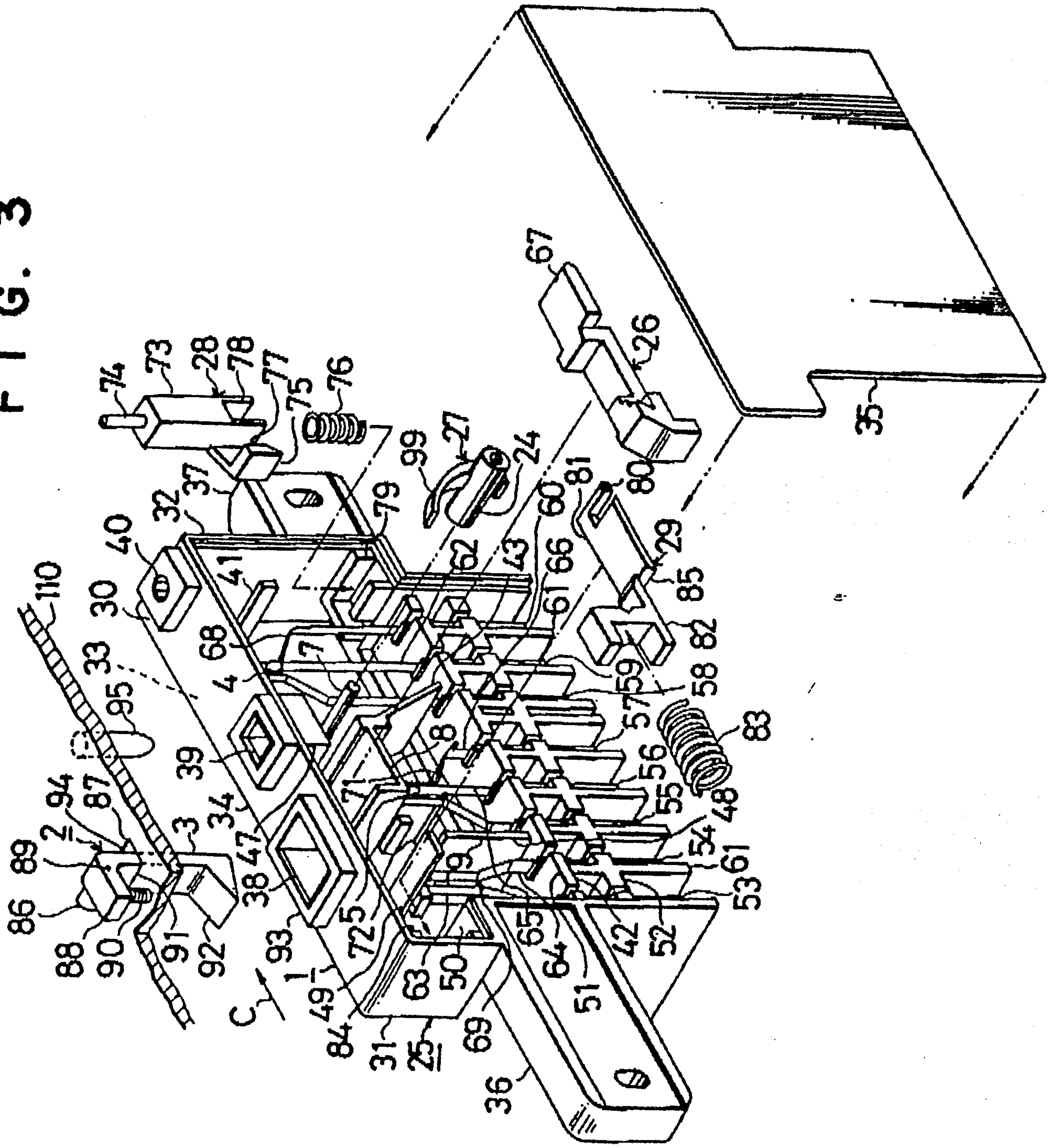
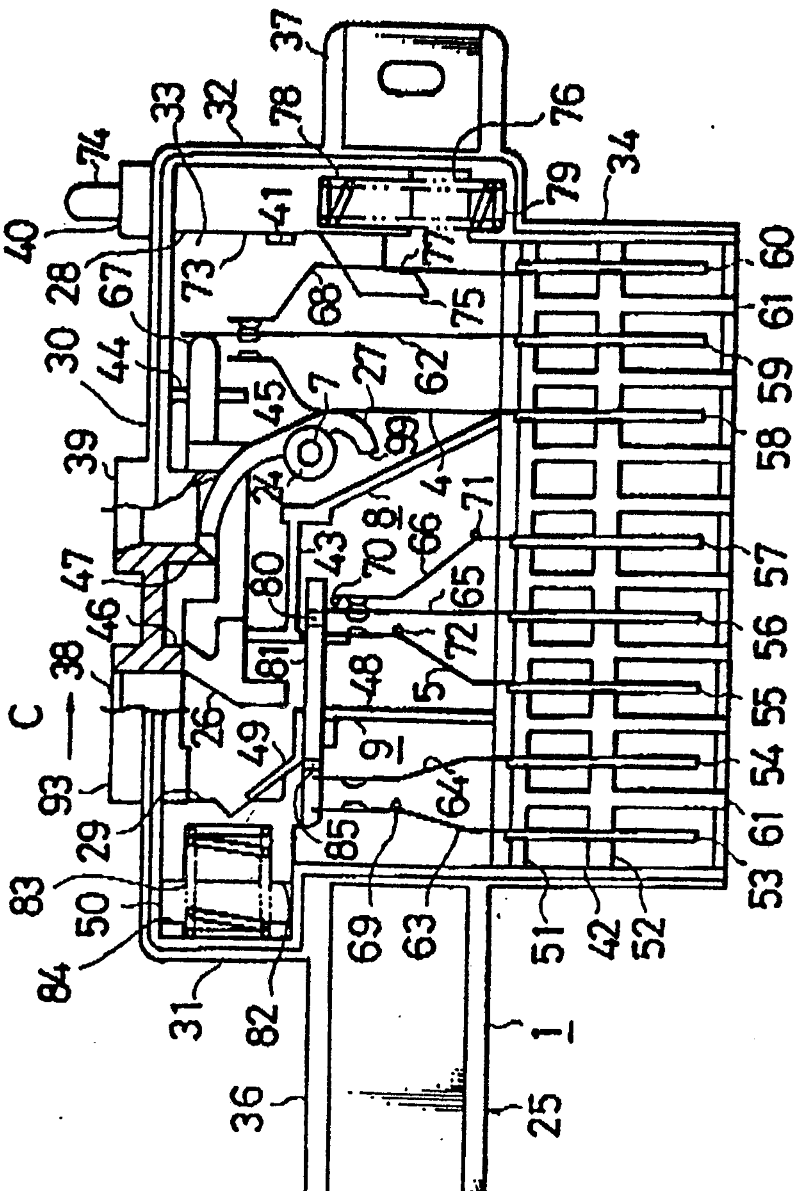


FIG. 3



F I G. 4



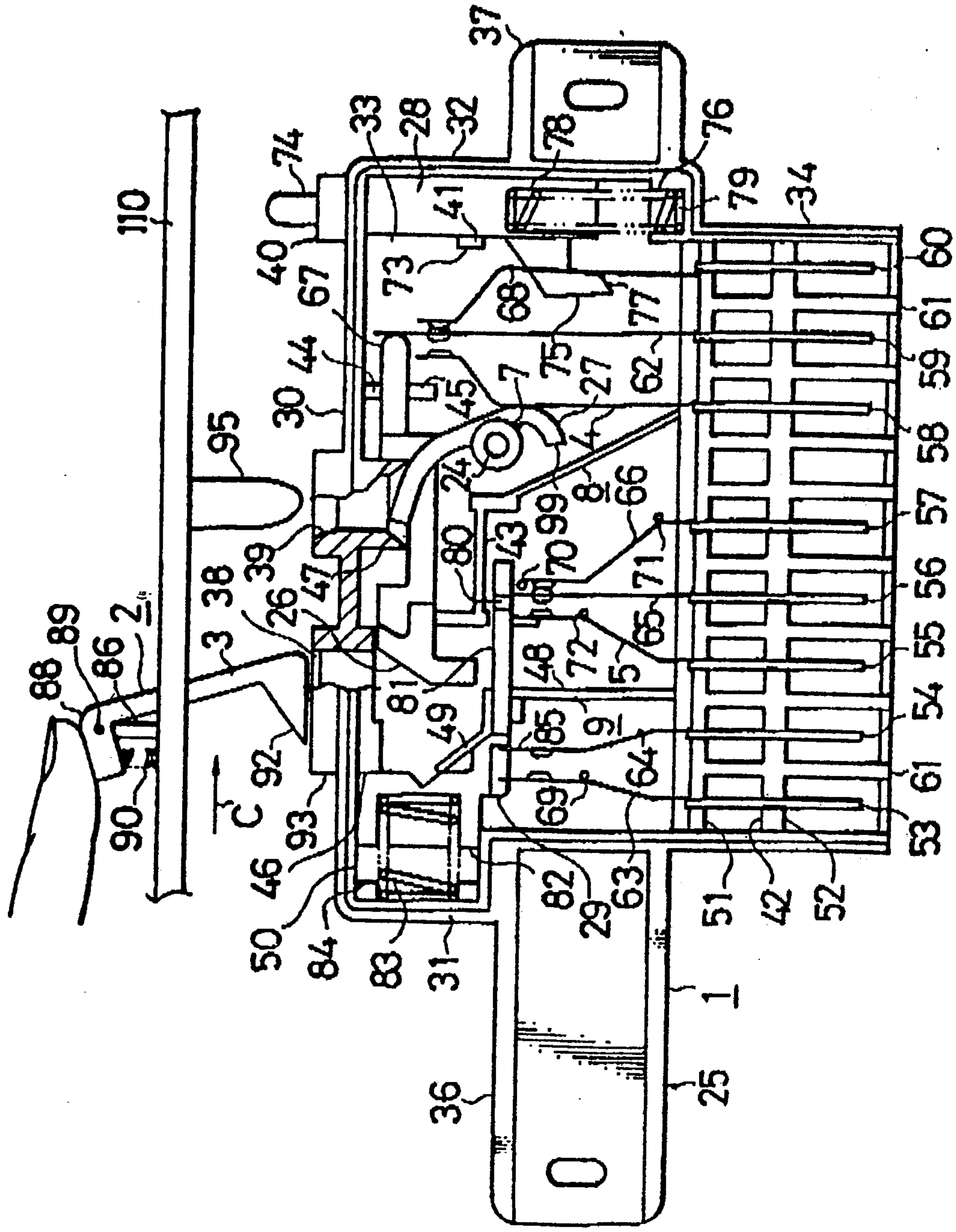


FIG. 5

FIG. 6

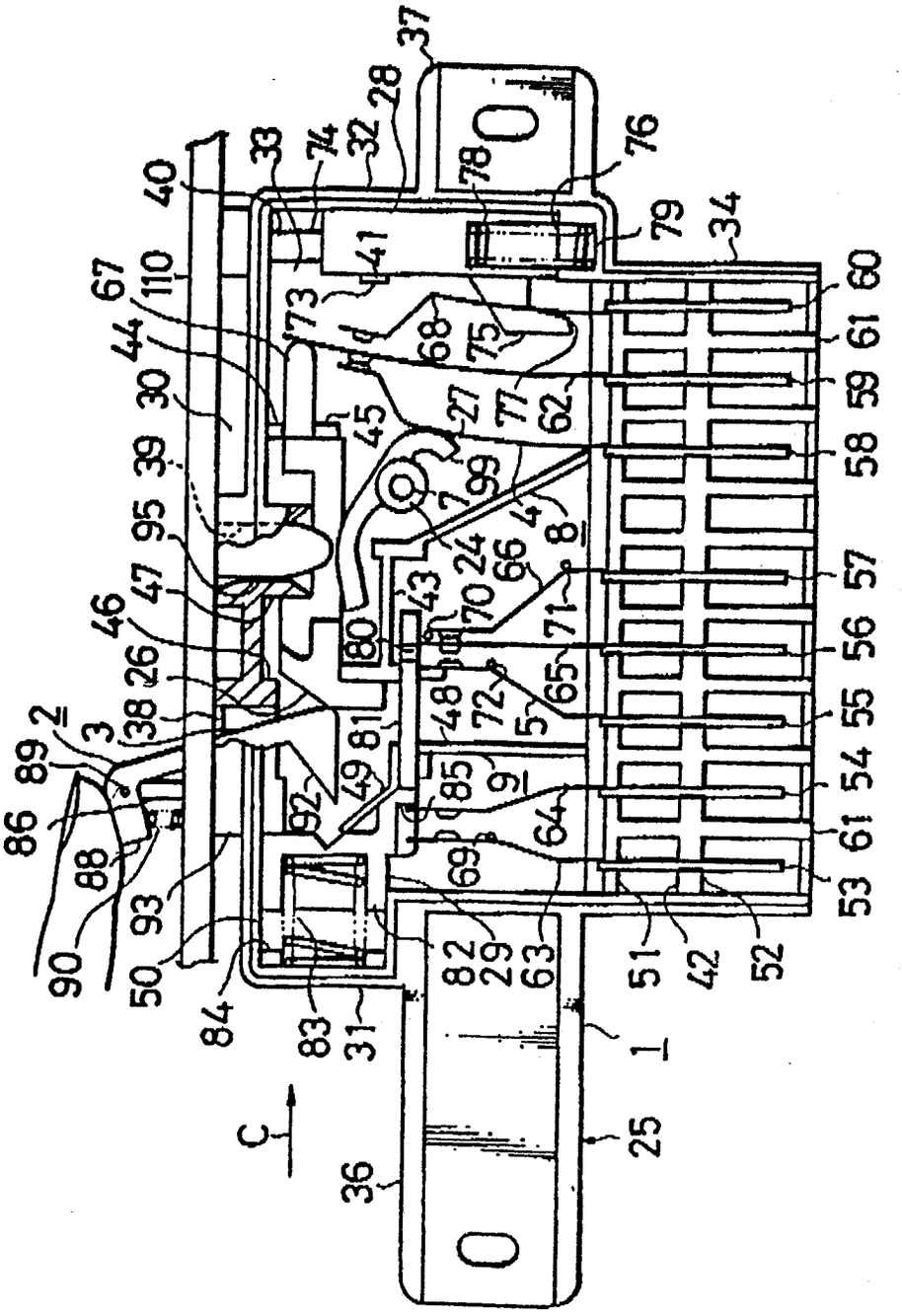
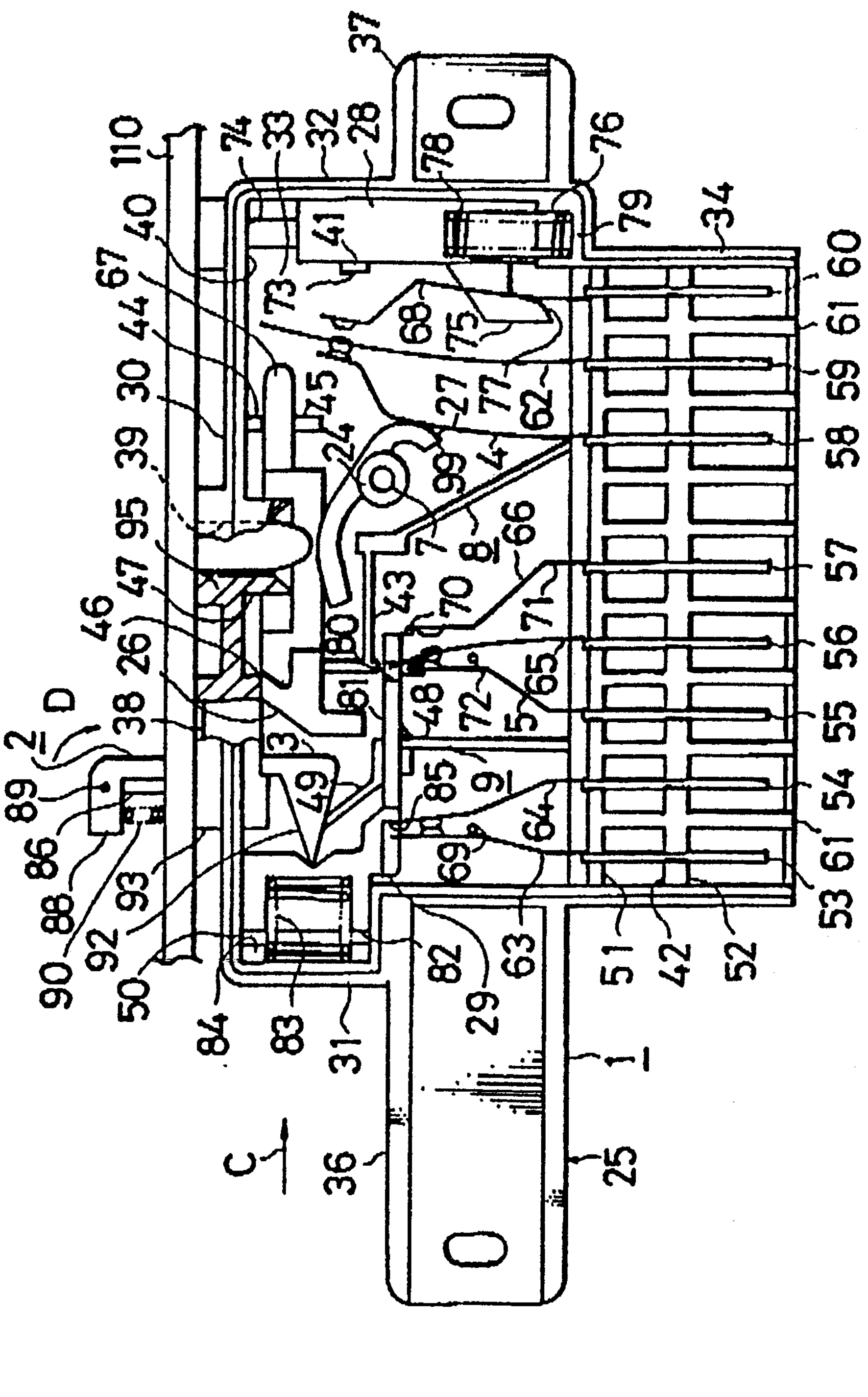


FIG. 7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