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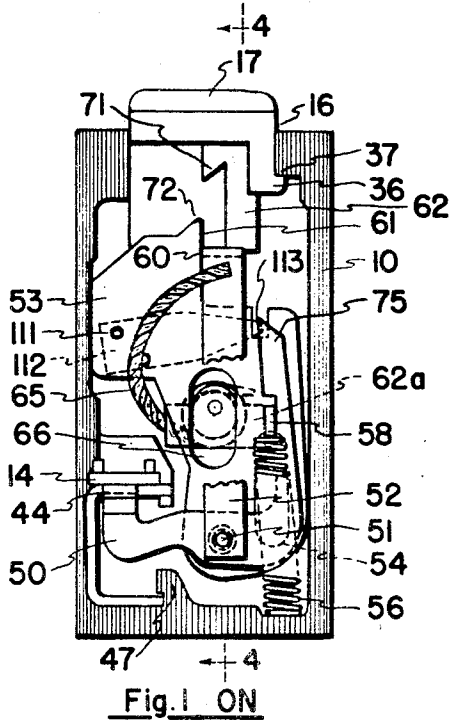
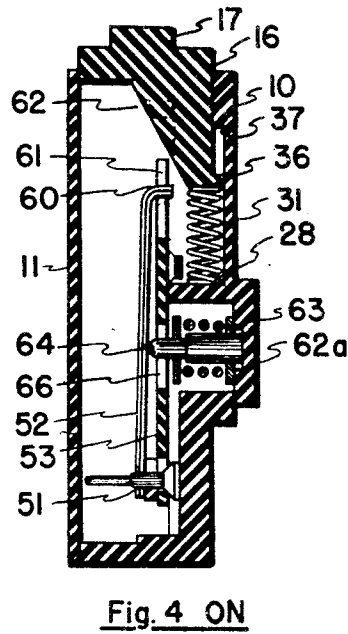
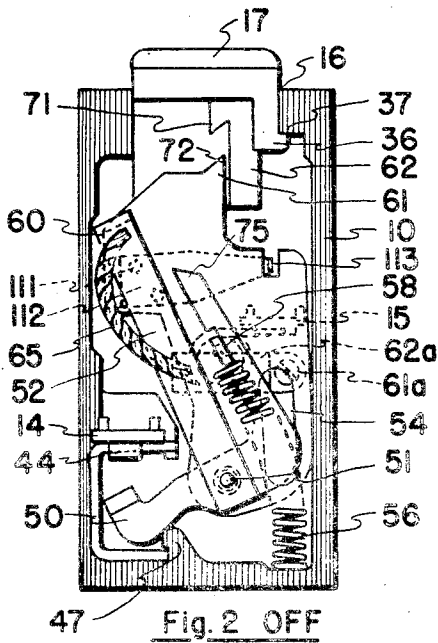
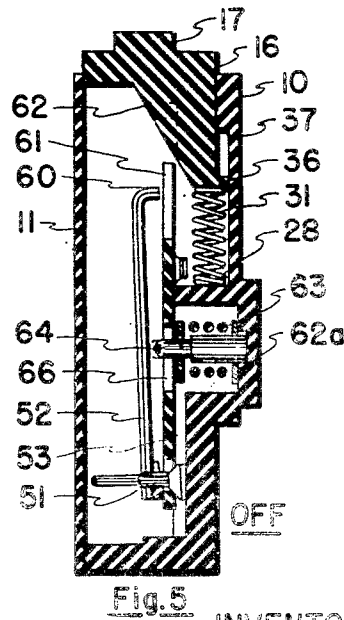
E. T. PLATZ ET AL

2,611,052

SWITCH

Filed Jan. 25, 1947

2 SHEETS—SHEET 1



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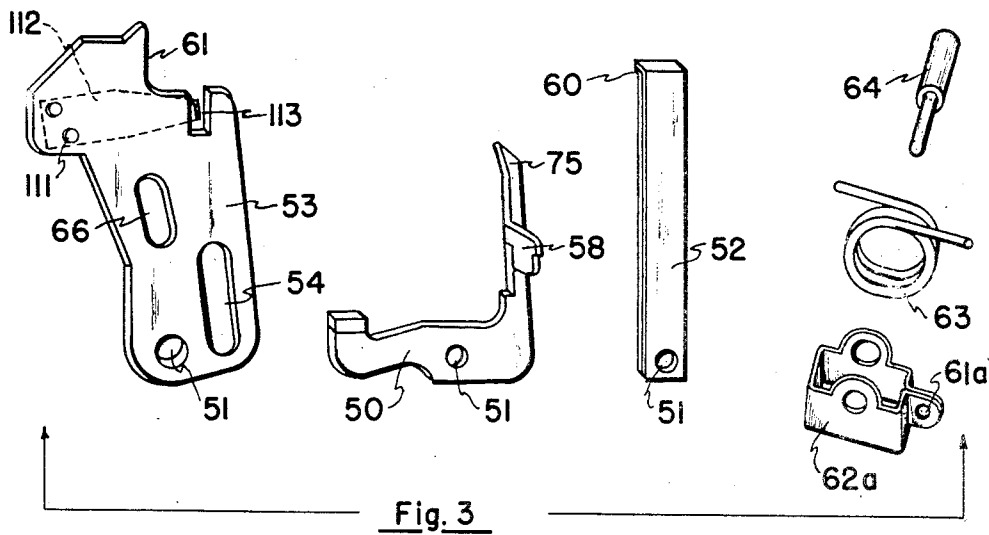
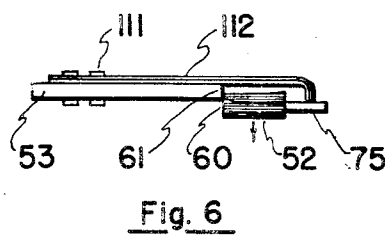
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,611,052

SWITCH

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Application January 25, 1947, Serial No. 724,430

2 Claims. (Cl. 200—88)

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This application relates to switches, and discloses a switch wherein manual operation is provided by an exposed handle, formed as a push button, to be pushed in manually from a rest-out position and then released, to be pushed out from the casing to that rest-out position by a handle-biasing spring. During its cycle of travel, it controls or causes the switch to open, if it is closed, or to close if it is open.

In the switch here shown, a latch is used to control the operation of the operating spring upon the movable contactor of the switch. The push button directly controls relatching and contact closing, through a translator. It also directly controls latch tripping for manual contact opening. Since the switch shown is of the automatic controlled circuit opening type, as well as the manual controlled circuit opening type, automatically operable and circuit condition responsive latch tripping means, operating independently of the push button, are employed.

For automatic control of the latch, two optional, different and separate latch releasing means are shown. The first includes the latch itself, the latter being formed as a bimetal strip, warping on overload to unlatch. The second is a separate means, shown as an electromagnet, for moving the latch for unlatching. While both are herein shown, either alone may be employed if desired. Thus, it will be seen that three separate and distinct means are provided to operate on the latch for unlatching: the handle, the bimetal strip and the electromagnet.

Since all movements of the push button are identical, and since the button is provided not only to control the opening of the circuit, but also to control the closing of the circuit, a translator is employed for translating successive identical button movements into successive different movable contact movements, depending on the position of the movable contact at the start of button movement. The translator position is determined by the position of the movable contact. If the circuit is open, the translator is in position to be engaged by the button and translate the next button movement into circuit closing movement of the contact. If the circuit is closed, the translator is out of position to be engaged by the button, but rather the latch will be engaged by the button for unlatching, or the latch will be unlatched automatically and then the circuit is opened, whereupon, the translator is moved to button engaging position for circuit closing on the next button movement.

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The switch herein shown also includes ambient temperature compensating means for maintaining a predetermined latch calibration, despite variations in ambient temperature.

The switch above described is shown in the appended drawings.

In these drawings,

Figs. 1 and 2 are views showing the parts in "on" and "off" positions, respectively.

Fig. 3 is an exploded view showing parts in detail.

Fig. 4 is a section on line 4—4 of Fig. 1, with parts omitted for the sake of clarity.

Fig. 5 is a view like Fig. 4, but showing the parts in "off" position.

Fig. 6 is a diagrammatic view of certain parts.

The drawings show the switch as comprising a cup-shaped casing 10, having an open front closed by a plate or cover 11, secured thereto as by screws, not shown. The back of the case is formed with two openings for line and load terminals, of which one is shown at 14. The casing has an opening 16, in which reciprocates a handle or actuator 17 formed as a push button, to be engaged by the finger of the operator for manipulation by downward pressure only.

A cross ledge 28 of the casing forms a seat for a coiled compression spring 31, which biases the handle outwardly, and a stop for handle movement is provided by a handle lug 36 formed to cooperate with a casing lug 37.

The circuit controlling parts of the switch include a stationary contact 44, formed integral with line terminal 14. Adapted to make butt contact with the stationary contact 44, is a movable contactor or arm 50 to which is riveted at 51 a latch strip 52, with rivet 51 being formed as a pin to provide a loose pivotal connection between the contactor and a plate 53 of insulation, the latter having an elongated slot 54 receiving a stop lug (not shown) formed on the back of the casing.

An operating spring 56 has its lower end in a seat of the casing, and its upper end surrounding a spring lug 58 formed from the contact arm 50. Spring 56 functions to rotate arm 50 counter-clockwise for circuit opening on the axis of pivot pin 51 when the latching hook 60 forming the free end of the strip 52 is released from engagement with the holding abutment, i.e., the latching edge 61 of the plate 53. Such release of latch 60 from the holding means 61 may be effected either automatically on overload or manually by the camming action provided by a sloping cam 62 of, and integral with,

the handle. When this cam is pushed down, it cams latch hook 60 forwardly off the abutment or holding means 61, to permit the contact arm to be rocked counter-clockwise, relative to the plate 53, by the spring 56, for circuit opening.

Spring 56 also biases contactor 50 and plate 53 upwardly, and when the latch holds, provides the force to move contact 50 towards and press it against contact 44.

Spring 56, whose lower end is forward of its upper end, also biases the upper end 60 of the contactor and strip 52 towards the plate 53 and casing back 10, to maintain the hook-end 60 in latching engagement with edge 61 of plate 53, under normal circuit closing conditions.

Strip 52 is shown as made of bimetal, and is in the circuit through contactor 50. Thus is provided one automatic control for unlatching, operating by warping of strip 52 on overload. A second and different or separate automatic control will now be described. Mounted on the back of the casing and connected through it to a load terminal (not shown), as by a screw bolt at 61a, is a yoke 62a containing a magnet coil 63 in which is a plunger 64. Connecting coil 63 and strip 52 is a flexible connector 65. A slot 66, in plate 53, aligns with plunger 64 to permit the latter to move through it towards, and engage, strip 52, and move its hook 60 out of contact with edge 61 of plate 53 for unlatching. This will take place upon the flow of a large excess of current through the switch (14-50-52-65-63-62a) and will result in an electromagnetic unlatching action, quicker than would result from the warping of strip 52 for unlatching. On small overloads, the electromagnetic action will not occur, and unlatching will be in response to warping of strip 52 so that its portion 60 will leave edge 61 of plate 53.

In a circuit opening action spring 56, through pivot axis 51, will slide the plate 53 upwardly, with the latter guided by the casing; the engagement of the lower edge of plate slot 54 with the casing stop (not shown) will limit such movement of the plate. That stop will, at that time, function as a pivot for the plate 53 and, since the line of action of spring 56 through axis 51, is to the left of that pivot, plate 53 will rock clockwise about that stop under the spring biasing force (Fig. 2).

It has been described that the unlatching movement of the latch 60 forwardly off the holding means or edge 61 permits spring 56 to rock the contactor 50-52 counter-clockwise to open the circuit. This movement terminates with the latch 60 remote from and to the left of holding edge 61, but resting on the surface of plate 53. Plate 53 will have been rocked clockwise. Handle 17 will, when released, assume its full out position (Fig. 2).

To restore the parts to the circuit closing position, the handle 17 is pushed down as far as it will go, and it will go down far enough, first to cause the cam notch 71 thereof to engage a resetting lug 72 of the plate 53; and second, to cause the pin 51 to slide downwardly. That part of plate 53 connecting lug 72 and pin 51 acts as a translator. The contactor will move downwardly with pin 51 until arm 50 reaches a resetting stop 47 of the casing, although, in many instances, that stop will have been engaged by the arm 53 at the end of the circuit opening movement of the handle, and continued downward movement of the handle, and continued downward movement of the lug 72 and pin 51, will

cause the contactor to engage stop 47 and rock clockwise on axis 51 far enough to cause latch 60 to slide over or overtravel beyond holding edge 61 for relatching. The release of the handle by the operator at that time will free the handle to be moved to its outward position by the spring 31, and, as the handle moves outwardly, the spring 56 will act on the contactor. The contactor will rock slightly counter-clockwise and assume its final "on" position, with latch 60 engaging holding edge 61, and with contactor 50 abutting contactor 44 under pressure of spring 56. Plate 53 will rock counter-clockwise to place lug 72 out of the path of cam 71.

There is but one terminated or rest or final open circuit position for the various parts. Consequently, there is but one movement of the handle required for restoring the parts to circuit closing position, regardless of the cause of circuit opening. That movement of the handle, down or inwardly, and then up or outwardly when released, recloses the circuit.

That part of plate 53, which connects and includes the resetting lug 72 and the hole for pivot pin 51, may be considered as a translator; and the holding surface 61 of plate 53 may be considered as separate and independent from the translator, though, of course, they are all integral.

It will be observed that when the latch is released whether that is caused automatically or manually, the translator moves into position to be engaged by handle cam 71 on the next handle advance for translating that handle advance into a downward push on the contactor for resetting its latch to the holding means. Inasmuch as the handle movement for circuit opening is identical with its movement for circuit closing, it is required that the translator be in the handle path, i. e., the path of handle cam 71, only when the circuit is open, and that it be out of the path of cam 71 when the circuit is closed; that it be constructed to provide an operative connection when the circuit is open, between the handle cam 71 and the latch, to translate handle advance (cam 71) into resetting of the latch. Therefore, the movement of the contactor or latch is relied upon to determine the position of the translator. When the latch holds, the translator (lug 72) is out of the path of advance of the handle (cam 71) and, when the latch releases, the translator (lug 72) moves into the path of the handle (cam 71) and, when the latch relatches, the translator lug moves out of the path of handle cam 71.

Mounted on plate 53 by rivets 111 is a bimetal compensator strip 112, whose end 113 is bent forwardly and normally in contact with the tip 75 of the contactor 50. Strip 112 controls the position of contactor 50 and strip 52 mounted thereon with respect to plate 53. Strip 112 is not in circuit, and thus, responds only to ambient temperature changes, warping on an increase of ambient temperature away from plate 53 to permit contactor 50 and strip 52 to be moved by spring 56 towards plate 53. The combined effect of the warping of strips 112 and 52, these strips warping oppositely, is to maintain the overlap of hook 60 on the edge 61 of plate 53 at the predetermined amount.

However, the tendency of strip 52 to warp in response to overload, is not offset or negated by strip 112, since the latter is not in circuit. The sole function of strip 112, therefore, is to prevent the overlap at 60-61 from varying in response to ambient temperature changes.

Now having described the switch herein dis-

closed, reference is made to the claims which follow.

We claim:

1. In a switch, a contactor, manually releasable latch means connected therewith, spring means for moving the contactor from circuit closing position when it is unlatched, a manually accessible and manually actuated means having a portion for releasing the latch means, a translator for operatively connecting the latch means and the manual means but only when the latch means is unlatched for enabling the manual means to relatch the latch means, the latch means and translator being interconnected so that unlatching movement acts to position the translator into a manual means engaging path and relatching movement acts to move it out of that path, and an operable electromagnetic means for unlatching said latch means, said translator having an aperture therein and being adjacent to and interposed between said latch means and said automatically operable electromagnetic means, said electromagnetic means including an electromagnet and a member actuable by said electromagnet arranged opposite said translator aperture whereby said member can act through the aperture to unlatch said latch means and initiate the operation of the switch to the open circuit position.

2. A switch having a movable contactor, a manually releasable latch secured to said contactor, a spring for moving said contactor out of circuit closing position when the latch releases, and for returning it to circuit closing position when the latch is reset, a single means successively manually operable in identical manner for unlatching the latch if it is latched, and for relatching the latch if it has been unlatched, means establishing an unlatching connection between the latch and the manual means, and a movable

translator for establishing an operative relatching connection between the manual means and the latch, only when the latch is unlatched, and automatically operable latch means, separate from said latch, for automatically and positively moving the latch for unlatching, said automatic unlatching means comprising an electromagnet coil and a plunger, said latch comprising a bimetal strip connected in circuit and abutting said electromagnet plunger so as to form an air gap between the plunger of the electromagnet and the electromagnet coil, and a bimetal compensator strip having one end attached to the translator and the other end abutting a portion of said contactor so as to determine the position of the contactor and therefore the position of the releasable latch relative to said translator and therefore the air gap existing between said plunger and said electromagnet coil.

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