March 15, 1960 H. P. LEWIS ET AL 2,928,920

ELECTRIC SWITCH

Filed Sept. 4, 1957 3 Sheets-Sheet 1

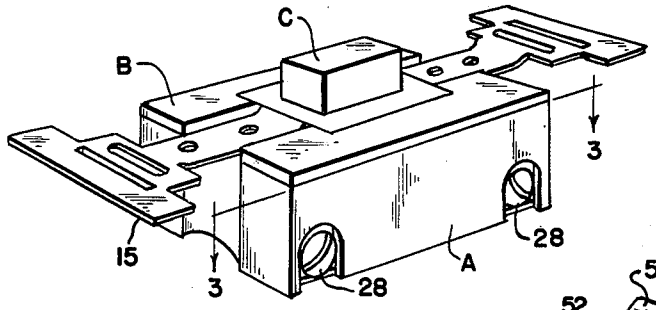


FIG. 1

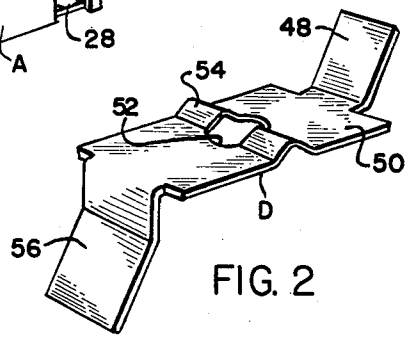


FIG. 2

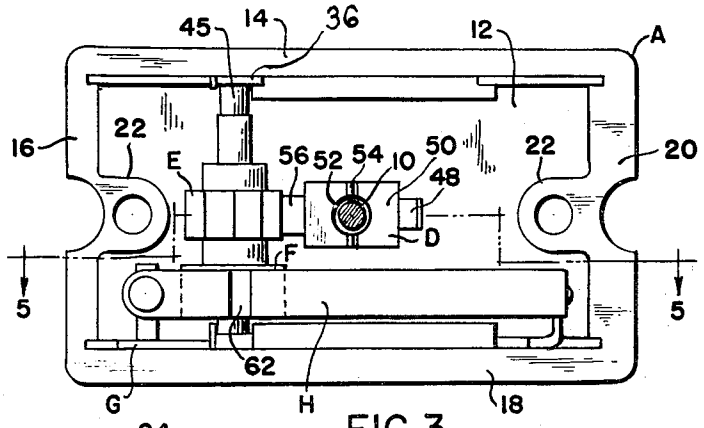


FIG. 3

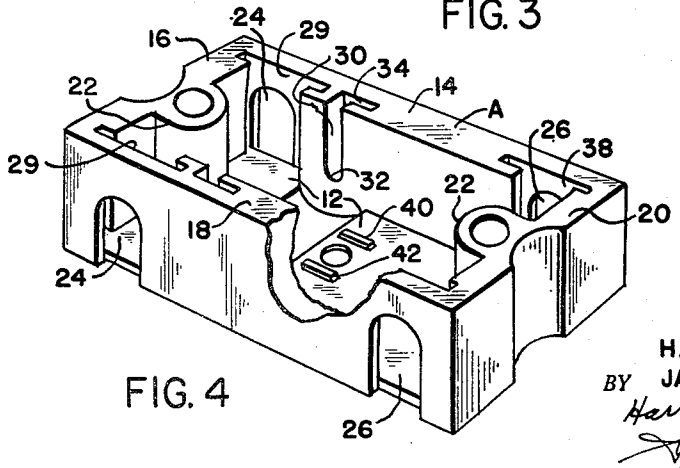


FIG. 4

INVENTORS
HAROLD P. LEWIS
BY JACOB SCHMIER
Harry Saragan
Stanley Talbert
ATTORNEYS

March 15, 1960 H. P. LEWIS ET AL 2,928,920

ELECTRIC SWITCH

Filed Sept. 4, 1957 3 Sheets-Sheet 2

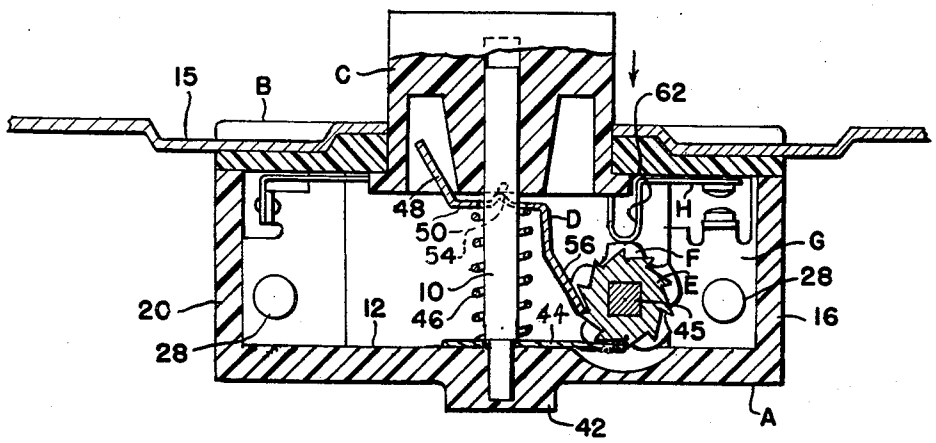


FIG. 5

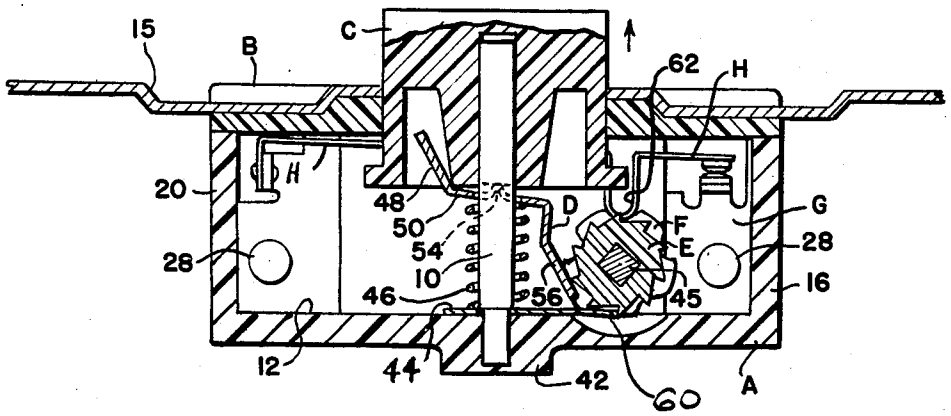


FIG. 6

INVENTORS
HAROLD P. LEWIS
BY JACOB SCHMIER
Harry Seugrane
Stanley Walker
ATTORNEYS

March 15, 1960 H. P. LEWIS ET AL 2,928,920

ELECTRIC SWITCH

Filed Sept. 4, 1957 3 Sheets-Sheet 3

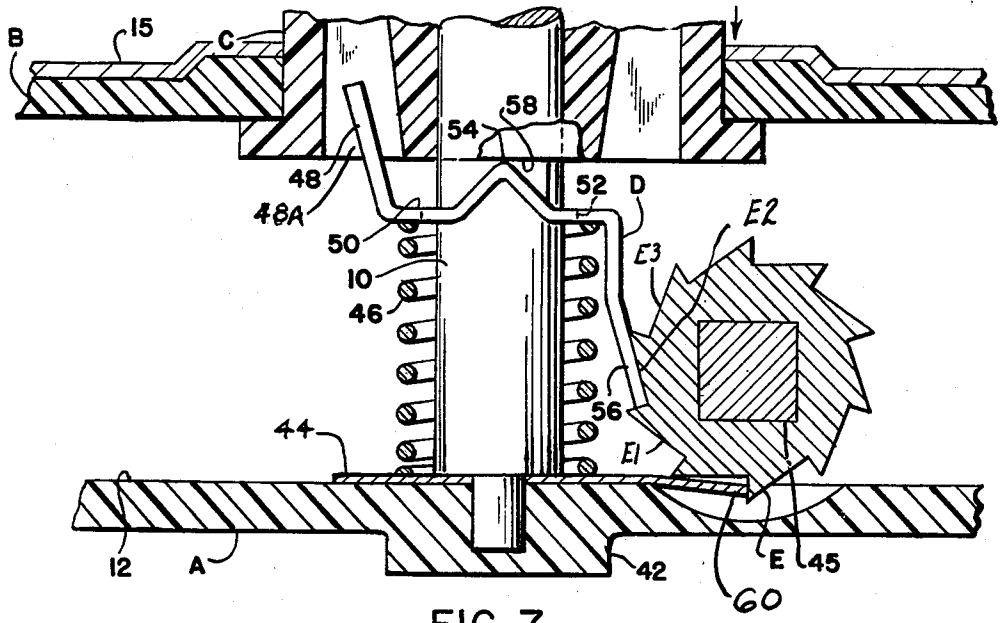


FIG. 7

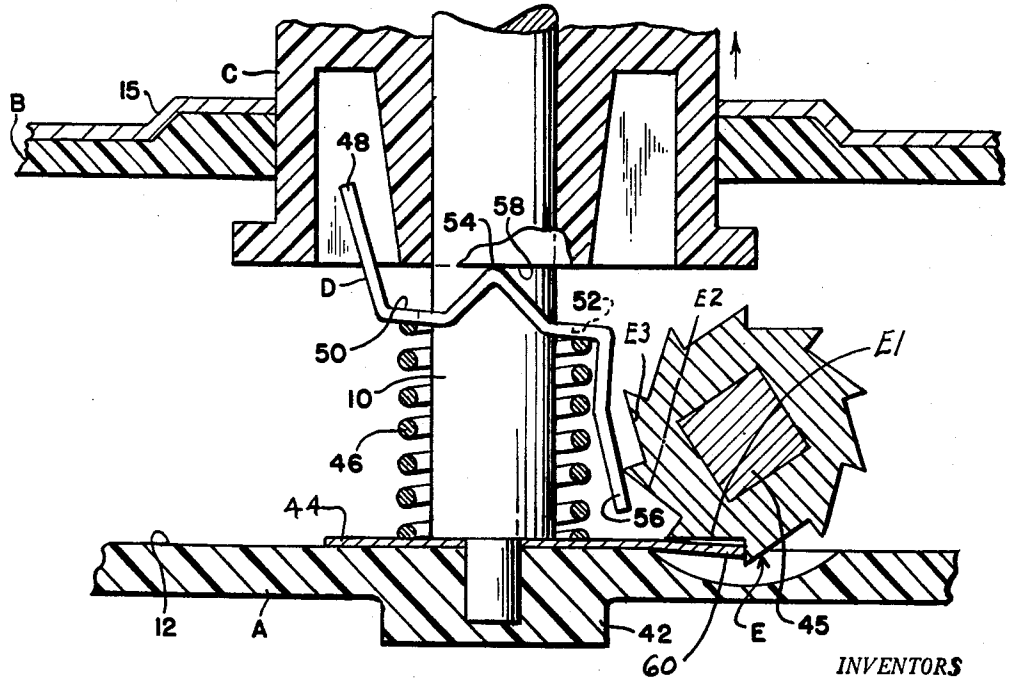


FIG. 8

INVENTORS
HAROLD P. LEWIS
BY JACOB SCHMIER
Harry Seligsohn
Stanley Silken
ATTORNEYS

United States Patent Office 2,928,920 Patented Mar. 15, 1960

2,928,920

ELECTRIC SWITCH

Harold P. Lewis, Newtown, and Jacob Schmier, Allentown, Pa., assignors to Rodale Manufacturing Co., Inc., Emmaus, Pa., a corporation of Pennsylvania

Application September 4, 1957, Serial No. 681,993

4 Claims. (Cl. 200—156)

Our invention relates to an electric switch wherein a push button controls the electrical circuit by repeatedly pressing the push button inwardly, whereby the electrical contacts alternately close and open.

The primary object of our invention is to construct a shallow electric switch wherein a ratchet wheel is securely mounted on the same shaft that carries a cam that engages one of the electrical contacts.

Another object of our invention is to provide a switch which is simple in construction and which has relatively few parts as contrasted with our switch as set forth in our prior filed application No. 570,302 now Patent No. 2,820,113, Jan. 14, 1958.

Another object of our invention is to provide a simple switch which has a relatively small number of parts and which is easily and accurately assembled.

Another object of our invention is to provide a switch which will carry a heavy load over a relatively long period of time without being rendered inoperable.

In order to achieve the objects of our invention, we provide a push button electric switch having a pawl and ratchet wheel wherein the pawl, which is formed to serve as a pivot, and also to act as a pawl whereby the push button, when moved in one direction inwardly will rotate the ratchet wheel one tooth together with its complementary cam; and the push button when returned to its initial position will enable the spring pressed pawl to pivot itself so that it will pass a consecutive ratchet tooth and then be in a position to actuate the aforementioned consecutive ratchet tooth.

Oher objects of our invention are to provide an improved device of the character described, that is easily and economically produced, which is sturdy in construction, and which is highly efficient in operation.

With the above and related objects in view, our invention consists in the details of construction and combination of parts, as will be more fully understood from the following description, when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of an electrical push button switch embodying our invention.

Fig. 2 is an enlarged perspective view of the pawl.

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 3.

Fig. 4 is a fragmentary perspective view of the casing itself.

Fig. 5 is a fragmentary sectional side view showing the ratchet wheel within its switch housing or casing with the push button in its normal position.

Fig. 6 is a view similar to Fig. 5 wherein the button has been pushed downwardly.

Fig. 7 is an enlarged fragmentary view showing the pivoted pawl and its ratchet wheel in its normal position.

Fig. 8 is a view similar to Fig. 7 but wherein the pawl has been pressed inwardly and has been released so that it passes the ratchet wheel teeth freely.

Referring now in greater detail to the drawings wherein similar reference characters refer to similar parts, we

show an electrical switch having a hollow molded housing or casing, generally designated as A; a cover, generally designated as B, for the housing, and a push button, generally designated as C, which protrudes from the housing and the cover.

The push button C is guided within the casing by virtue of an opening in the cover and by telescoping a rigidly mounted trunnion or guide 10, which is mounted within the bottom 12 of the casing A. The cover B is of plastic insulation material and has mounted thereon a metal plate 15 which is adapted to be attached to a switch box.

The casing A has a chamber therein defined by a closed bottom 12 and continuous sides 14, 16, 18 and 20 which sides generally form a rectangle. The shorter sides 16 and 20 each have a protruding boss 22, which has an opening 24 therein whereby a screw or bolt may pass therethrough to hold the cover. The sides 14 and 18 each have openings 24 and 26 (Figs. 1 and 4) through which electrical connections may be made to the terminals of the switch and then reach to the bottom 12 of the casing cover. The bottom 12 and the sides 14, 16, 18 and 20 are integrally molded to define the chamber which houses the switch mechanism. Each of the sides 14 and 18 have through openings 24 and 26 therein whereby wire attaching screws 28 may be located whereby single pole, double pole or 3-way switches may be used in the same casing. The interior of the sides 14, 18 has a T-shaped slot 29 therein which serves to locate a contact which will be hereinafter further described. A narrow wall 30 is integrally formed within the casing and it projects inwardly from one wall 14 of the casing, and one end of the wall 30, is curved upwardly to serve as a bearing 32 which hereinafter will be further described. A slot 34 in the casing serves to receive a locking strip 36 whereby the ratchet shaft will be locked in position (see Fig. 3). An inwardly extending, vertical projecting T-shaped recess 38 on the sides 14 and 18 of the casing provides a housing lock for a second terminal hereinafter to be further described. The bottom 12 of the casing has two projecting bosses 40 and 42 which prevent a flat, spring-like pawl stop 44 from moving from side to side.

The side 18 is constructed in a similar fashion to the side 14 so that a description of one side suffices for a description of the other side, each side internally is a mirror image of the other side.

The control exterior portion 42 (Figs. 7 and 8) of the bottom 12 protrudes outwardly in order to provide a better base support for the trunnion 10.

A freely mounted pawl, generally designated as D, is telescoped by the trunnion 10 to move inwardly with the movement of the push button C, since a spring 46 surrounds the trunnion and the pawl is pressed by the spring 46 against the push button to engage and to move a ratchet wheel, generally designated as E.

A shaft 45, mounted upon the bearings 32 in each wall 14 and 18 carries the ratchet wheel E and a contact actuating cam, generally designated as F. The rotation of the shaft 45 rotates the cam F and the ratchet wheel.

The helical spring 46 (Figs. 5 to 8) surrounds the trunnion 10 with one end of the spring engaging the stop 44 on the bottom of the casing A and the other end engaging the pawl D which presses the pawl against the bottom of the push button C.

A detailed description of the pawl D (Figs. 2, 7 and 8) is important to understand its operation in the switch mechanism and is as follows.

The pawl D has one end 48 inclined, at an angle of approximately 45° to rest within an opening of the push button whereby the pawl D cannot swing laterally out of position. The pawl's canter 50 is horizontally extending with respect to the bottom of the casing and it has an

opening 52 therethrough so that it is telescoped by the trunnion 10. The pawl has an off-set or pivot 54 (exaggerated in Figs. 7 and 8) therein, whose upper surfaces pivotally engage the lower surfaces 58 of the push button C in order to provide for an easy oscillation or pivotal mounting. The other end 56 of the pawl is inclined and shaped to readily engage one of the ratchet teeth E1, E2 or E3. It should be apparent at this stage that when the push button is pressed inwardly it compels the spring pressed pawl D to move a ratchet tooth. The horizontally located ratchet tooth stop 44 surrounds the trunnion 10 and is engaged by one tooth on the ratchet wheel to prevent the rotation of the ratchet wheel in one direction. When the push button is released, the pawl D of rigid material, will be oscillated away from the tooth E2 (Fig. 8) on the wheel E by virtue of the pivotal engagement 54 of the pawl with the bottom 58 of the push button C and the tension of the helical spring 46 which permits a slight oscillation of the pawl away from the ratchet teeth. In other words, the pawl being of rigid material, oscillates out of the way of the tooth which it has moved. The spring pressing against the pawl D enables the pawl always to move back into position because the normal tendency of the spring is to push the pawl whereby its center portion is substantially parallel to the bottom of the push button. The flat portion and the end or tail 48 of the pawl abuts the push button to limit its sway from side to side and its tilting against the ratchet teeth.

It is to be noted that one electrical contact, generally designated as G, fits within the T-shaped slot 29 and is stationary. The contact G is adapted to receive a terminal holding screw 28 through the opening 24 in the casing A.

A flexible terminal, generally designated as H (Figs. 5 and 6) is adapted to have one end engage the contact button on the stationary terminal G whereby the electrical circuit is closed. The flexible terminal H has a bend therein 62 which rides upon the cam surfaces of the cam F. The actuation of the cam F controls the opening and closing of the terminals G and H whereby the electrical circuit is opened or closed, as described in greater detail in our prior application, Serial No. 570,302.

Provision is made in the casing A whereby a second set of contacts G and H may be placed on the other side of the ratchet wheel E in order that the switch casing may be used as a double pole or a 3-way switch. However, when the switch is made into a double pole or a 3-way switch, another cam is added upon the shaft 45 and additional contacts G and H are added. The proper timing of the elements also is arranged.

It is to be noted that the trunnion 10 serves a multiplicity of purposes. It provides a guide for the push button to keep the motion of the push button in a rectilinear direction, it provides a guide for the spring 46, and it firmly anchors the cam stop 44 against the bottom 12 of the casing A.

In operation, two wires of a single line may be connected to the contacts G and H of the switch by virtue of the screws 28, 28. In Fig. 5 the contacts H and G are shown to be in open circuit position and to close the circuit the button C is pressed inwardly whereby the bottom 58 of the push button C abuts the pivot 54 of the pawl D. The pawl D moves along the trunnion. The free edge of the pawl end 56 engages a tooth on the ratchet wheel E and movement of the pawl D inwardly towards the bottom 12 of the casing moves the ratchet wheel one tooth whereby the cam F is moved a distance to enable the U-shaped portion 62 (Figs. 5 and 6) of one contact H to drop thereby closing the circuit through the G and H contacts. The push button in its outward movement permits the end of the pawl D to rock slightly around the pivot 54 and the end 60 of the stop strip 44 prevents any motion of the ratchet wheel E. The end 56 of the pawl D passes a tooth on its upward movement of the push button so that the pawl D will be in position to move another ratchet tooth.

In order to open the circuit the push button C again is pressed inwardly so that the pawl D moves the ratchet and its cam F so that an elevation on the cam F moves the flexible electrical contact H away from the stationary electrical contact G; hence the circuit would be opened. This cycle of events is repeated.

The trunnion 10, having a recessed end portion, firmly anchors the stop spring 44, and the projections 40, 42 prevent the stop spring from moving laterally. The ratchet E is always in contact with the stop spring 44 whereby the end 60 is able to flex to abut the ratchet teeth to prevent their movement in one rotary direction only.

Although our invention has been described in considerable detail, such description is intended as being illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

We claim as our invention:

1. A switch, comprising a casing of molded insulation having a chamber therein, a shaft, having a ratchet wheel and a cam securely mounted thereto, a trunnion securely mounted at substantially the center of the bottom of the casing, a separable molded casing having a central opening therein and adapted to complete the enclosure for said casing, a push button, a helical spring surrounding said trunnion, a pawl mounted between said push button and said spring and guided by said trunnion, said push button having a recess therein, said pawl having a portion protruding in said recess, an off-set on said pawl engaging the inner surface of said push button whereby said pawl may rock, a pair of electrical contacts, one of said contacts being securely mounted in said casing and a second complementary electrical contact being flexibly mounted in said casing, a ratchet wheel stop mounted on the bottom of said casing and adapted to have one end abut the edges of the ratchet wheel teeth, said push button adapted to be moved inwardly within said casing against the outer force exerted by said helical spring whereby said pawl will move said ratchet wheel and upon the release of said push button said pawl will move by the ratchet tooth it previously was in engagement with by rocking about said opening as a spring pressed pivot point.

2. An electrical switch comprising a casing having a pair of electrical contacts, a rectilinear movable actuating button, a trunnion having a spring encircling said trunnion, a ratchet wheel, a cam, a shaft having said ratchet and said cam secured thereto, a cam actuating pawl being freely pivoted against the bottom portion of said button and telescoped by said trunnion, one end of said spring pressing against an intermediate portion of said pawl, and one end of said pawl being adapted to actuate said ratchet wheel when said button is pressed inwardly and to move away from said ratchet when the direction of movement of said pawl is outwardly.

3. An electrical switch actuated by a linear movement of a push button, either to open or to close the electrical circuit, comprising a molded casing having a bottom and sides defining a chamber, a trunnion securely mounted at one end within the bottom of said casing, a push button having an opening to interfit with one end of said trunnion, a cover having a push button opening therein and being adapted to close said casing, a pawl loosely mounted upon said trunnion, a spring encircling said trunnion, a pivotal projection on said pawl and being adapted to press said pawl against the bottom of said push button, a ratchet wheel adapted to be actuated by said pawl, a shaft on which said ratchet wheel is mounted, a cam mounted upon said shaft, and an electrical contact adapted to be actuated by said cam, a spring held in position by said trunnion and being adapted to prevent the rotation of said ratchet wheel in one direction.

4. An electrical switch comprising a casing having a pair of electrical contacts, a rectilinear movable actuat-

ing button, a ratchet wheel, a cam, a shaft having said ratchet wheel and said cam secured thereto, a cam actuating pawl freely and flexibly pivoted against said button, a spring in said casing, guide means for said spring, said spring resiliently urging both said button and said pawl outwardly of said casing, and one end of said pawl being adapted to actuate said ratchet wheel when said button is pressed inwardly and to move away from said ratchet wheel when the direction of movement of said pawl is outwardly.

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