

April 19, 1960

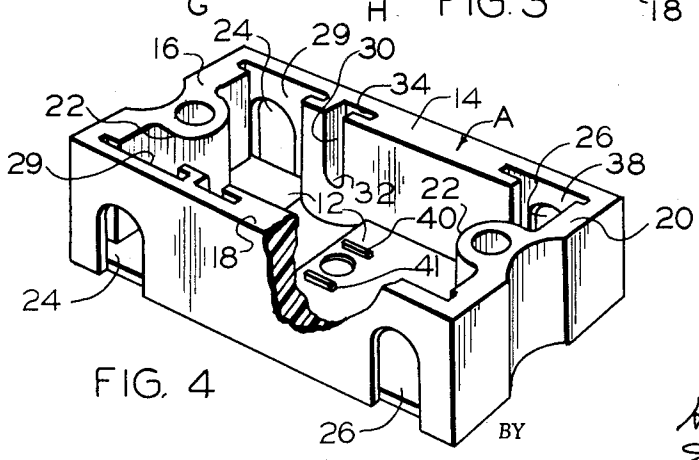
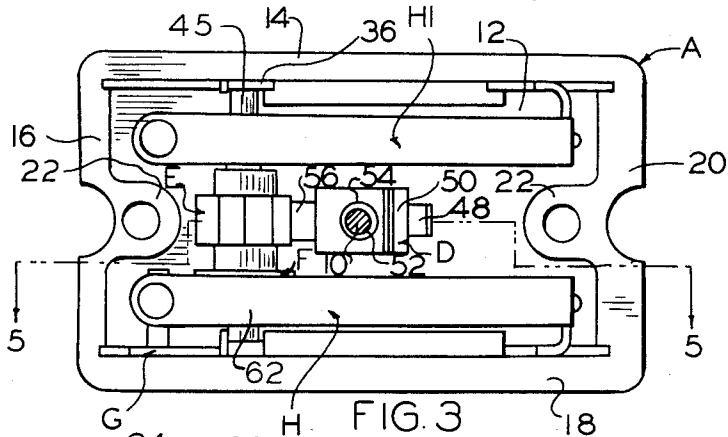
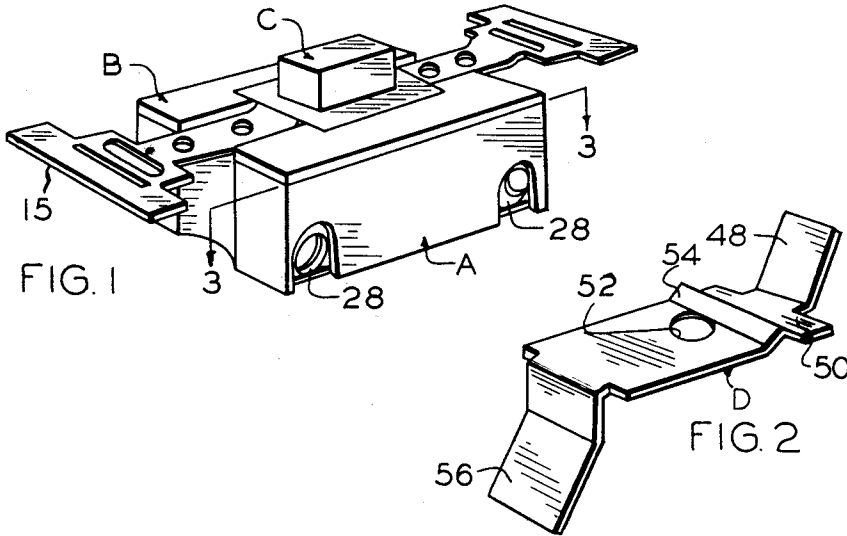
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2,933,579

MULTIPLE CIRCUIT PUSH BUTTON ROTARY SWITCH

Filed March 10, 1958

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

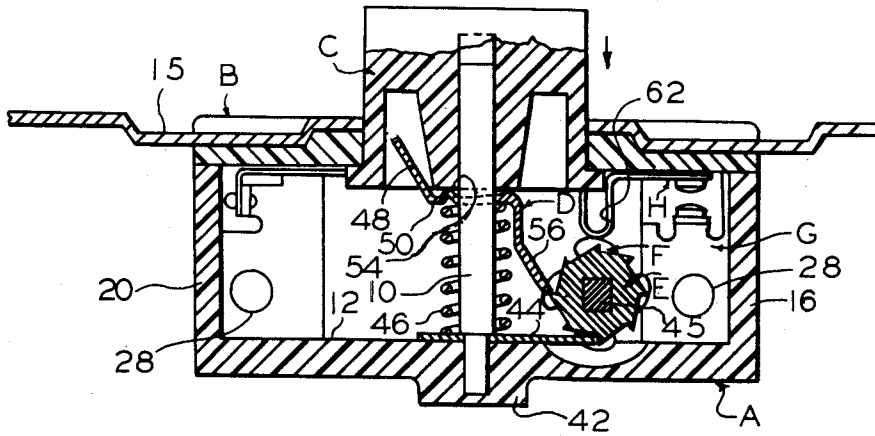


FIG. 5

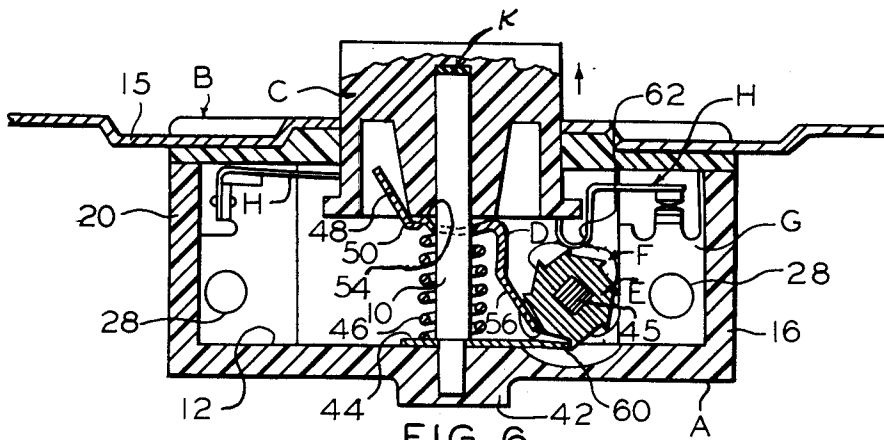


FIG. 6

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Filed March 10, 1958

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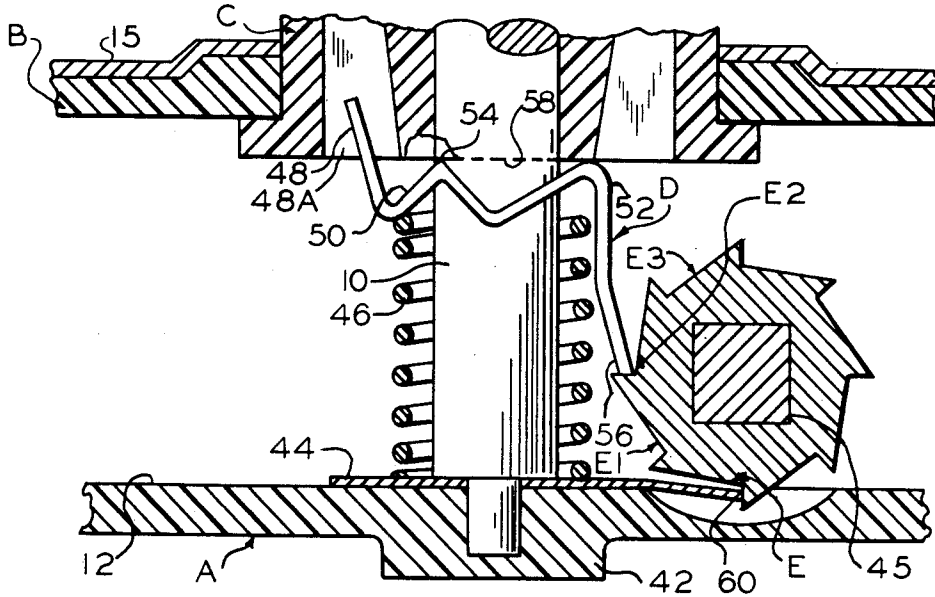


FIG. 7

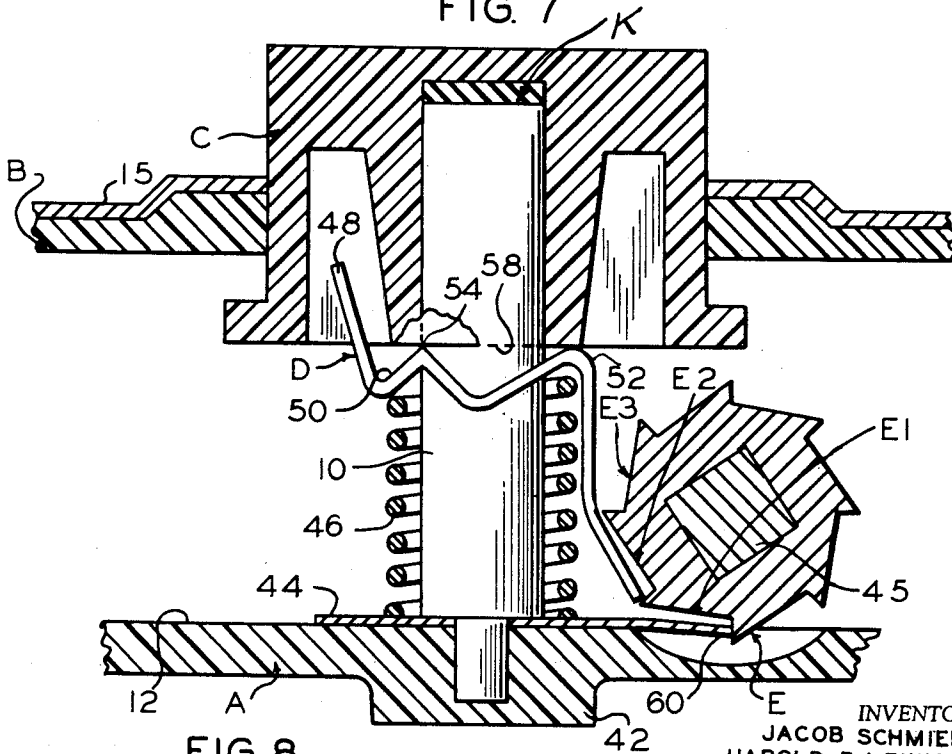


FIG. 8

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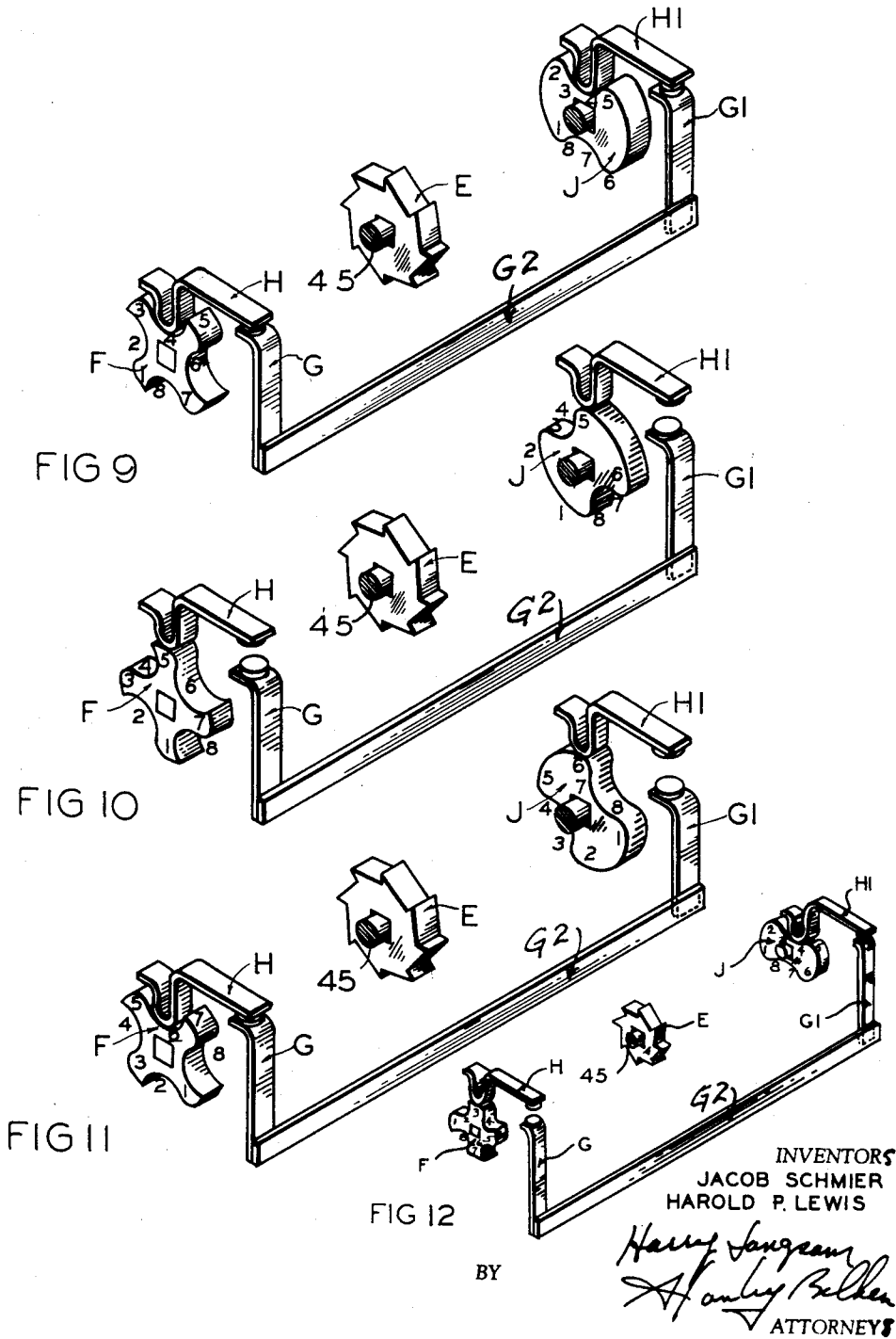
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6 Sheets-Sheet 4



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J. SCHMIER ET AL

2,933,579

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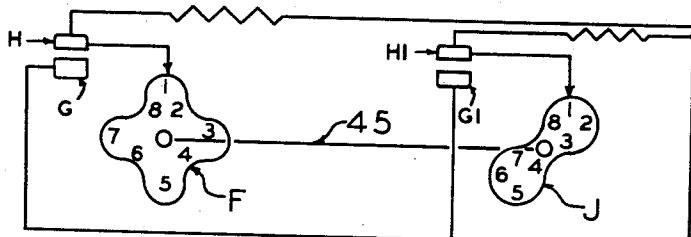


FIG 13

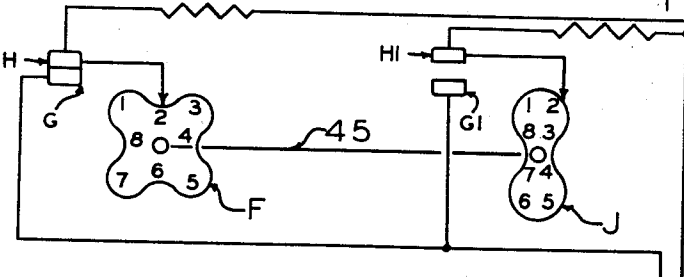


FIG 14

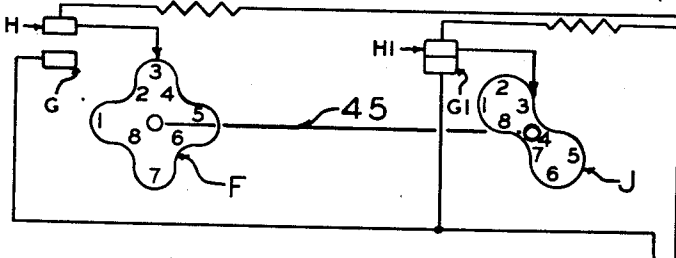


FIG 15

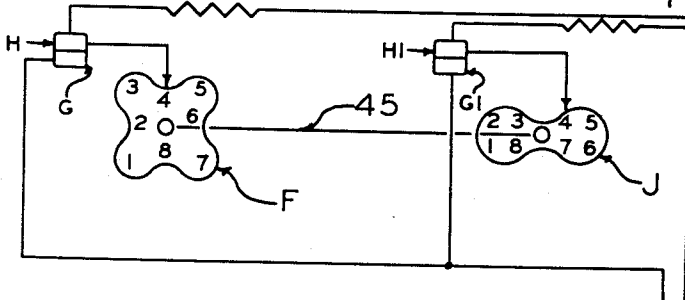


FIG 16

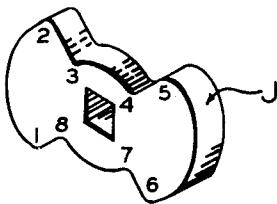


FIG 17

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MULTIPLE CIRCUIT PUSH BUTTON ROTARY SWITCH

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6 Sheets-Sheet 6

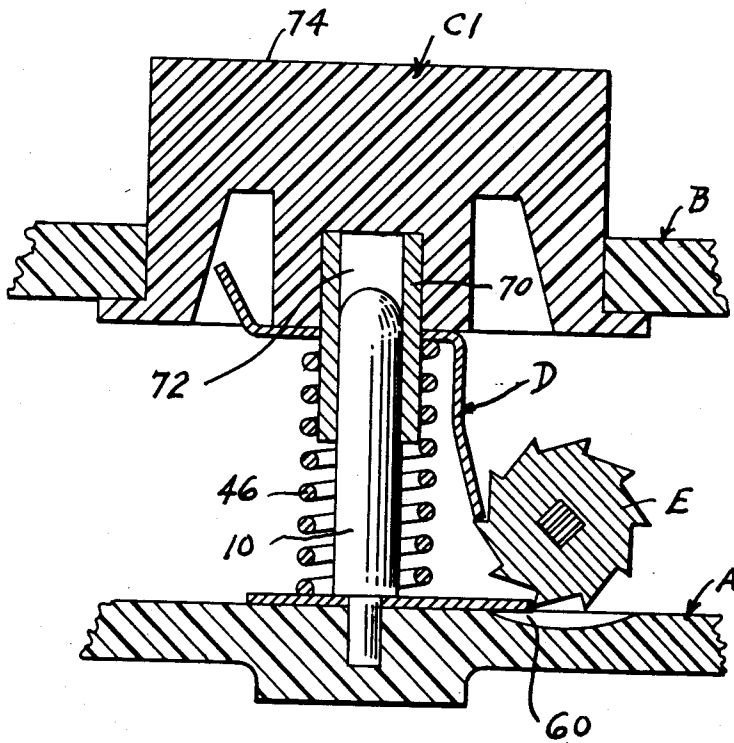


FIG. 18

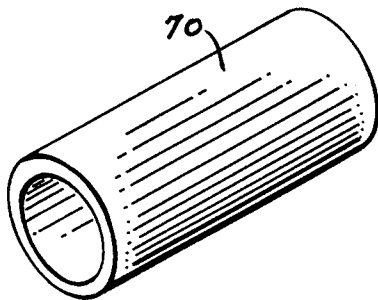


FIG. 19

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## MULTIPLE CIRCUIT PUSH BUTTON ROTARY SWITCH

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Application March 10, 1958, Serial No. 720,300

4 Claims. (Cl. 200—156)

Our invention relates to an electric switch wherein a single push button controls multiple electrical circuits in a predetermined sequence when repeatedly pressed inwardly, whereby the electrical contacts alternately close and open and wherein the conventional type of wall box and the conventional wall plate are used. This is a continuation-in-part of co-pending application Serial No. 681,993, filed September 4, 1957.

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 plurality of cams, one cam controlling one set of the electrical contacts and the other cam controls a different set of contacts wherein a multiplicity of electrical circuits are controlled in a predetermined sequence.

Another object of our invention is to provide an electrical switch which is simple in construction and which has relatively few parts as compared with our switch as set forth in our prior Patent No. 2,820,113, granted January 14, 1958.

Another object of our invention is to control a plurality of circuits from a single wall switch which is adapted to be mounted in a conventional switch box wherein a first circuit is actuated, a second circuit is actuated while the first circuit is opened, and then the first and second circuits are actuated simultaneously. This switch may be used to actuate electrical devices, namely electric lights, electric motor circuits, or loud speakers.

Another object of our invention is to control and actuate a single three-way electric light bulb from a single gang wall switch whereby one, two, or three filament combinations in the three way electric light bulb will be controlled.

Another object of our invention is to provide a single gang wall switch which may control in a predetermined sequence a plurality of different circuits such as lighting or power circuits.

Another object of our invention is to provide an electrical switch for controlling a plurality of circuits which has a relatively small number of parts and which is easily and accurately assembled.

Another object of our invention is to provide an electrical 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 shaft that carries cams, a spring pressed pawl and a ratchet wheel wherein the pawl has a portion that serves as a pivot and also serves to move the ratchet wheel when the push button is moved inwardly, whereby the ratchet wheel moves an arcuate distance of one tooth together with its complementary cams; and the push button when returned to its initial position will enable the spring pressed pawl to move about its pivot so that the pawl will pass a consecutive ratchet tooth and then be in a position to repeat the actuation of the aforementioned ratchet.

2

Other 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.

5 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:

10 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. 1.

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

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

20 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 pawl and its ratchet wheel in its normal position.

25 Fig. 8 is a view similar to Fig. 7 wherein the pawl has been pressed inwardly and the pawl has been released from the engagement with the ratchet teeth. The view shows the detent preventing the ratchet wheel moving in one direction.

30 Fig. 9 is a schematic view illustrating the relationship of complementary sets of electrical contacts.

Fig. 10 is another schematic view showing the relationship of the cams with each set of contacts when the ratchet wheel has been moved one ratchet tooth.

35 Fig. 11 is another schematic view showing the relationship of the cams with each set of contacts when the ratchet wheel has been moved another ratchet tooth following the movement of Fig. 11.

Fig. 12 shows the relationship of the contacts when the ratchet wheel has again been moved one ratchet tooth.

40 Fig. 13 is a schematic view showing the cams and their complementary sets of contacts connected in a plurality of circuits (H1, G1 open and HG open).

Fig. 14 is a schematic view showing the cams and their complementary sets of contacts connected in a plurality of circuits (HG closed and H1, G1 open).

45 Fig. 15 is a schematic view showing the cams and their complementary sets of contacts connected in a plurality of circuits (HG open and H1, G1 closed).

Fig. 16 is a schematic view showing the cams and their complementary sets of contacts connected in a plurality of circuits (HG closed and H1, G1 closed).

50 Fig. 17 is a perspective view of one of the cams.

55 Fig. 18 is a fragmentary, sectional view showing a "nylon" sleeve which is mounted upon the control button and which moves upon the fixed shaft. The "nylon" sleeve prevents the spring from pinching or being caught between the pawl and the control button.

Fig. 19 is a perspective view of the "nylon" sleeve itself.

60 Referring now in greater detail to the drawings wherein similar reference characters refer to similar parts, we show an electrical switch adapted to fit into the conventional metal wall box wherein the electrical switch embodies a hollow molded housing or casing, generally designated as A; a cover for the housing, generally designated as B, and a push button, generally designated as C, which protrudes from the housing and the cover, and which controls the switch mechanisms. The switch may close one electrical circuit (HG) when actuated, while a second circuit (H1, G1) is open. Upon further actuation of the switch, the second circuit (H1, G1) would be closed and the first circuit (HG) would be opened.

When the switch is further actuated, the first and second circuits are closed, and upon further actuation both circuits (HG and H1, G1) are opened.

The push button C is guided within the opening by virtue of a cover and by telescoping a rigidly mounted pin 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 has ears whereby it may be securely attached by means of screws, not shown, to a wall switch box of metal.

The casing A has a chamber therein defined by a closed bottom 12 and continuous sides 14, 16, 18 to which, which sides are in a rectangular formation. The shorter sides 16 and 18 each have an internally protruding boss 22, which has an opening therein, whereby a screw or bolt may pass therethrough to hold the cover.

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 slot 30 is integrally formed within the casing and it projects inwardly from walls 14 and 18 of the casing, and the lower end of the slot 30 is semi-circular in configuration to serve as a bearing 32 which hereinafter will be further described. A groove 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 41 which prevent a flat, springlike detent 44 from moving from side to side.

The side 18 of the casing 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 projection of the exterior portion 42 (Figs. 7 and 8) of the bottom 12 provides a better base support for the pin 10.

A freely mounted pawl, generally designated as D, is telescoped by the pin 10 to move inwardly with the movement of the push button C. A spring 46 surrounds the pin 10 and presses the pawl against the push button so that movement of the pawl inwardly engages and moves a ratchet wheel, generally designated as E, one ratchet tooth at a time.

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

The helical spring 46 (Figs. 5 to 8) surrounds the pin 10, with one end of the spring engaging the detent 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 ratchet actuating pawl D (Figs. 2, 7 and 8) is important to understand its operation in the switch mechanism and is as follows:

The actuating pawl D of rigid material 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. In Fig. 7, we shown a wall 48A which defines a part of the cavity in the push button C. The wall 48A prevents the pawl D from rotating about the shaft 10 but it does not prevent the end 48 of the pawl from moving upwardly and downwardly. It should be recalled that there must be a second small wall 48A in the push button C to prevent the rotation about the shaft 10.

The center section 50 of the pawl is horizontally ex-

tending with respect to the bottom of the casing and it has an opening 52 therethrough so that it is telescoped by the pin 10. The actuating pawl has an off-set or fulcrum 54 (exaggerated in Figs. 7 and 8) therein, whose upper surface pivotally engages the lower surfaces 58 of the push button C to one side of the center of the pin 10 in order to provide for an easy rocking motion or pivotal action. The other end 56 of the pawl is inclined and shaped to readily engage one of the ratchet teeth E1, E2 or E3, and to move the ratchet circumferentially on shaft 45. It should be apparent at this time that when the push button is pressed inwardly it compels the spring pressed pawl D to move the ratchet one tooth. The horizontally located ratchet tooth stop or detent 44 surrounds the pin 10 and is engaged by one tooth on the ratchet wheel to prevent the rotation of the ratchet wheel in one direction, which direction is contrary to the movement of the pawl actuated ratchet. When the push button is released, the pawl D from rigid material will be rotated away from the tooth E2 (Fig. 8) on the ratchet wheel E by virtue of the pivotal engagement 54 of the pawl with the bottom 48 of the push button C caused by the tension of the helical spring 46 which permits a slight oscillation of the pawl way from the ratchet teeth. In other words, the pawl, being of rigid material, rotates 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 a position to move the ratchet wheel because the normal tendency of the spring is to push the pawl whereby its center portion 50 is substantially parallel to the bottom of the push button. The flat portion and the upper end or tail 48 of the pawl abuts the recessed wall of 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 circuit controlled by the terminals G and H, and is described in greater detail in our prior application, Serial No. 570,302, now Patent No. 2,820,113, granted January 14, 1958.

Provision is made in the casing whereby a second set of contacts G1 and H1, to control a second circuit, may be placed on the other side of the ratchet wheel in order that the switch may be used as a multiple circuit controller. The contacts G and G1 are joined by a strip connector or wire G2.

A second cam, generally designated as J, mounted upon the shaft 45 has a configuration whereby the movement of three ratchet teeth are required to index from one "on" position of contacts G1 and H1 to the next "on" position of said contacts G1 and H1.

The ratchet wheel E has eight teeth thereon so that the pawl moves the ratchet wheel E 45° upon each complete movement of the push button inwardly. Mounted upon the shaft 45 is the four lobed cam F and the two lobed cam J (Figs. 9 to 17). Since the ratchet wheel has eight teeth thereon, it means that for the cams F and J to make one complete revolution, the ratchet wheel must be pushed with eight strokes of the push button. In Figs. 10 and 13, both circuits are open. Movement of the ratchet wheel 45° causes one circuit to be closed and the other circuit open. In Figs. 11 and 14, further movement of 45° of the ratchet wheel causes one circuit to be closed and the other circuit to be opened.

In Figs. 13 to 16, we show a schematic illustration



wherein two electric light bulbs having a 50-watt light output and a 100-watt light output are connected in parallel. When the ratchet wheel rotates the shaft 45 a distance of 45°, in Fig. 13 both circuits are opened. Movement of 45° reveals that the 50-watt circuit is closed while the 100-watt circuit is opened (Figs. 11 and 14). Then further movement of the shaft 45° causes the cam F to open the circuit while the 100-watt unit is closed, and with a movement again of 45° it reveals that both circuits are closed (Figs. 9 and 16).

In Fig. 8 is shown a rubber cushion, generally designated as K, whereby the push button C, telescoping the upper end of the shaft 10, will not create noise. This provides for a silent operation of the switch.

In Figs. 9 we show the shaft 45, the ratchet wheel E and the cams F and J as being separable members, but it is within our invention to make these parts of a single, integrally molded unit.

In the illustration, we have shown the invention as applied to a two circuit bulb, but two different electrical circuits may be controlled in the same off-on sequence with this switch. The configuration of the cam J is to have a two lobed figure. This invention may be further used to control lamps when it is placed in a conventional wall box.

In Figs. 18 and 19, we show another modification of our invention wherein a nylon sleeve 70 has one end fitted in the opening 72 of a control button C1 and the sleeve 70 rides up and down the shaft 10 to prevent the coil spring 46 from pinching between the control button and the shaft 10. This enables pressure to be applied at any point on the outside surface 74 of the push button without causing the push button to tilt.

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:

1. An electrical switch comprising a casing having a pair of electrical contacts, a rectilinear movable actuating button, a ratchet wheel, a shaft having said ratchet wheel mounted thereon, a pair of cams mounted on said shaft coaxial with said ratchet wheel and with each other, one of said cams being a two-lobed cam and the other of said cams being a four-lobed cam, 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.

2. An electrical switch comprising a casing of molded insulation having a chamber therein, a shaft having a ratchet wheel and a pair of cams securely mounted thereon, said cams comprising a two-lobed cam and a four-lobed cam, 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 encircling 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 for each of said cams, 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 at the bottom of said casing and adapted to have one end abut the edges of the ratchet wheel teeth, said push button being adapted to move 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 was previously in engagement with by rocking about said opening as a spring pressed pivot point.

3. 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 pair of cams, one of said cams having a two-lobed configuration and the other of said cams having a four-lobed configuration, a shaft having said ratchet and said cams secured thereto, a cam actuating pawl 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 wheel when the direction of movement of said pawl is outwardly.

4. An electrical switch actuated by a linear movement of a push button either to open or to close an electrical circuit, said switch 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 pair of cams mounted upon said shaft, one of said cams having a two-lobed configuration and the other of said cams having a four-lobed configuration, a pair of electrical contacts, each being adapted to be actuated by the corresponding one of said cams, and a spring held in position by said trunnion and being adapted to prevent the rotation of said ratchet wheel in one direction.

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