April 18, 1950 M. E. PORTER 2,504,873

CORD-TYPE ELECTRIC SWITCH

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Fig. 1

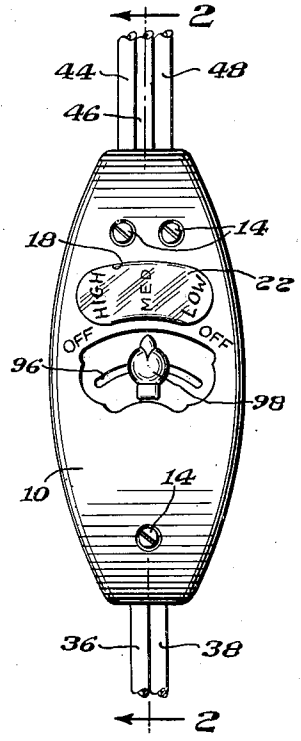


Fig. 2

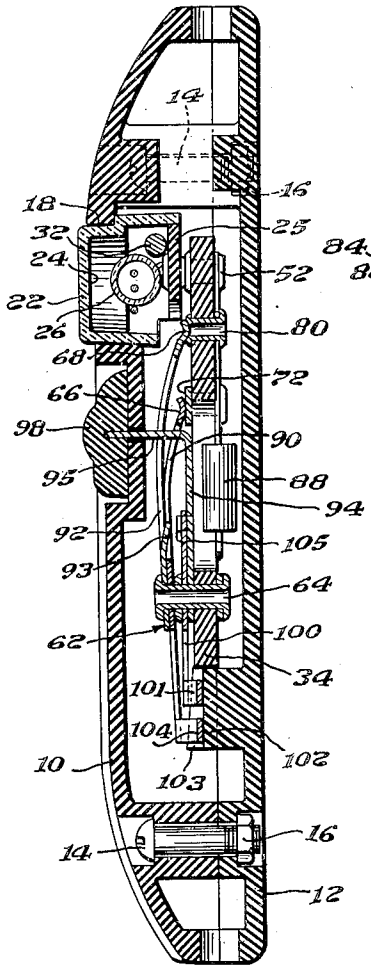


Fig. 3

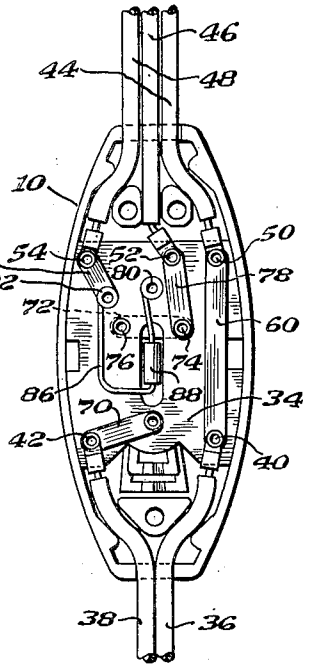


Fig. 4

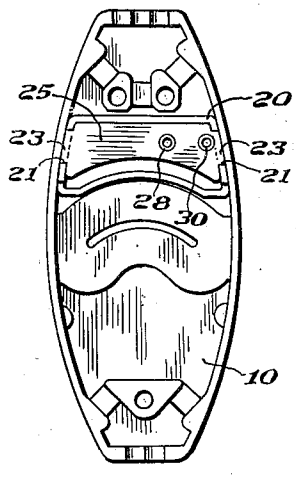


Fig. 6

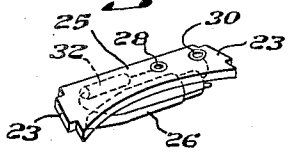


Fig. 5

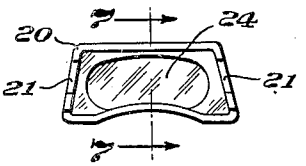
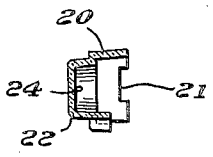


Fig. 7



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Fig. 8

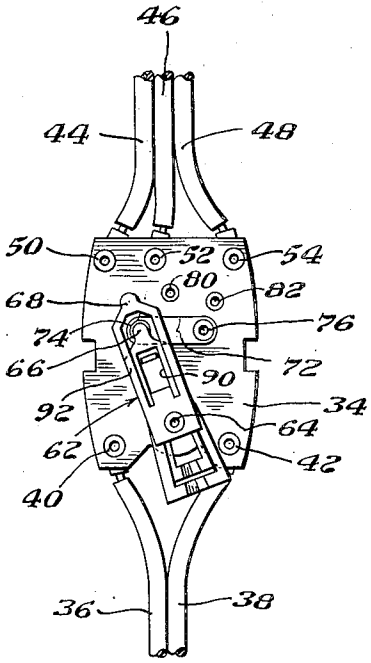
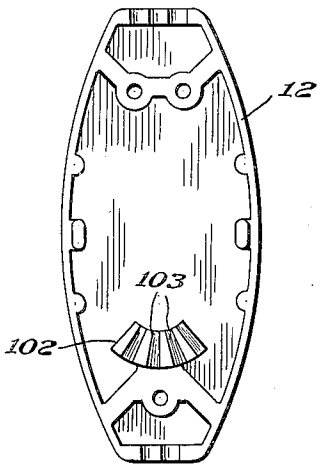


Fig. 9



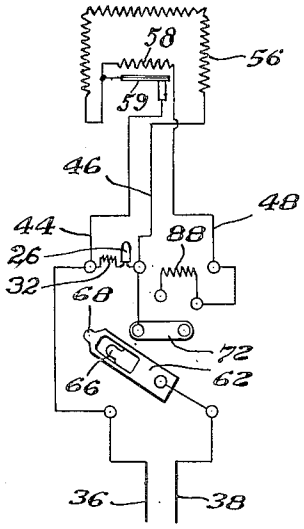


Fig. 10

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CORD-TYPE ELECTRIC SWITCH

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Application May 2, 1947, Serial No. 745,600

7 Claims. (Cl. 201—48)

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This invention relates to improvements in electric switches of the general type which are adapted to be mounted on the flexible conductor cord of electric heating pads, electric blankets and other electrical devices for controlling and varying the operating characteristics of the pad or blanket or other electrical device in response to manual operations of the switch. More particularly it provides improvements in switches of the type, and for the same general purposes, as disclosed in United States Letters Patent No. 2,117,966, granted May 17, 1938, to Frederick Lobl, wherein a contact member is manually movable with a snap action to any one of three circuit-closing positions and to either of two circuit-opening positions, with the contact member effecting a change in the operating characteristics of the device which is being controlled with each movement thereof from one circuit-closing position to another circuit-closing position.

It is among the objects of my present invention to improve the structure of such switches and to simplify the manufacturing and assembly procedures with considerable saving in both material and labor costs.

Another object is to provide an improved snap-acting manually movable contact member having two contact arms moving in unison of which one continues constantly engaged with a fixed contact in all circuit-closing positions of the movable contact member and the other is selectively engageable with either of a plurality of other fixed contact members, whereby one circuit continues generally uniform in all circuit-closing positions of the movable contact member and another parallel circuit may be varied as to current flow therein or may be opened in response to particular movements of the movable contact member while said first mentioned circuit continues generally uniform.

A further object is to provide a manually operable cord-switch having an insert indicating dial and having a lamp bulb for illuminating the dial, with terminals on the insert, there being a main switch unit laid over the insert with terminals resting in contact with said light bulb terminals on the insert, whereby said light bulb is energized whenever a circuit is closed through the switch.

Yet another object is to provide a manually operable cord-switch wherein the conductors of the cord are clinched interiorly of the switch in a manner to relieve interior electrical connections of all tensional strains applied to the cord.

It is, moreover, my purpose and object generally to improve the structure and operational efficiency of switches and more especially so-called cord-switches.

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In the accompanying drawings:

Fig. 1 is a face view of a switch embodying features of my invention;

Fig. 2 is a cross-sectional view on line 2—2 of Fig. 1, on a larger scale;

Fig. 3 is a view looking at the rear of the switch of Fig. 1 with the rear section of the casing removed;

Fig. 4 is a view looking at the interior of the front section of the switch casing, with the dial insert in place therein;

Fig. 5 is a view looking into the interior of the dial insert, with the light bulb removed;

Fig. 6 is a perspective view of the light bulb and its mounting plate;

Fig. 7 is a cross-sectional view on line 7—7 of Fig. 5;

Fig. 8 is a face view of the assembled switch unit which is insertible as a unit within the casing sections;

Fig. 9 is a view looking at the interior of the rear section of the switch casing; and

Fig. 10 is a wiring diagram of the switch in operative association with two resistance heating elements to be manually controlled by the switch.

Referring to the drawings, the illustrated embodiment of the invention comprises an insulating casing made in two sections 10, 12 which may be secured together in any conventional manner, as by the screws 14 and nuts 16. The section 10 has the relatively large opening 18 therethrough which is closed by the insert member 20 of transparent or translucent material which preferably has a portion 22 fitting within the opening 18 within which a strip of paper 24 or the like may be positioned with suitable informative matter thereon, such as "Low," "Med." and "High," visible through the insert material, for indicating three different circuit-closed positions of the switch.

According to the invention, the insert member 20 is hollow with two opposite end walls nicely fitting between two opposite edge walls of the casing section 10, and each of the said end walls of the insert is notched as at 21 for seating projecting tongues 23 of an insulating plate 25 which extends across the open side of the insert. Plate 25 has mounted thereon, at its inner side, a light bulb 26 whose terminal wires are connected to the contacts 28, 30, respectively, on the plate 25. Preferably, a protective resistance 32 is provided in the connection of one bulb terminal to the contact 28 or 30, the resistance being shown

in the connection to contact 28. It will be apparent that bulb 26 is supported within the hollow of insert member 20 where it can effectively illuminate the informative matter on the strip 24.

Preferably, although not necessarily, the plate 25 and supported bulb 26 will be assembled in the insert member 20 prior to insertion of the latter in casing section 10 so that the insert with its contained bulb may be inserted as a unit in section 10.

All of the contacts and connections of the switch proper conveniently and economically are on a main insulating plate element 34 which fits within the edge walls of casing section 10 and which is retained within section 10 by the casing section 12.

Referring to Figs. 3 and 8, the insulating plate element 34 has the two conductors 36, 38 connected thereto at one end by the rivets 40, 42, respectively, and has the three conductors 44, 46 and 48 connected thereto at the other end by the rivets 50, 52 and 54, respectively. The conductors 36, 38 may lead to any suitable source of electrical energy, as by having a conventional cord plug (not shown) connected thereto for plugging into a conventional electrical outlet. The conductors 44, 46 and 48 may lead to the resistance heater elements, usually two, of an electric pad, electric blanket, or other electrical device or apparatus, as indicated diagrammatically in Fig. 10, where the two resistance elements 56, 58 may be considered to be the main and the auxiliary heating elements of an electric heating pad, for example, with which a thermostatic switch 59 ordinarily is associated.

A straight strip or bar 60 of conducting material directly connects the rivet 40 with the rivet 50 whereby the conductor 36 is permanently connected to conductor 44.

According to the invention, a movable contact member, indicated generally at 62, is pivoted at 64 on plate element 34 and has the two contacts 66, 68 thereon at different radial distances outward from the pivot 64. Rivet 42 and conductor 38 are permanently connected to the movable contact member 62 at the pivot 64 by a strip or bar 70 of conducting material so that the two movable contacts 66, 68 constantly are connected to conductor 38.

A fixed contact strip or bar 72 is mounted on plate element 34 by the two rivets 74, 76, each of which is outward from pivot 64 a radial distance corresponding to the radial distance that the movable contact 66 is outward from pivot 64, so that the said movable contact 66 may be moved in contact with contact bar 72 from one rivet 74 to the other rivet 76. Rivet 74 is permanently connected by strip or bar 78 to rivet 52 and thus is constantly connected to conductor 46.

Two other spaced apart rivets 80, 82 constitute fixed contacts on plate element 34 each radially outward from pivot 64 a distance equal to the radial distance that movable contact 68 is outward from pivot 64. Also, the fixed contacts 76 and 82 are on the same radial line from pivot 64 so that movable contact 68 will be engaged with fixed contact 82 whenever movable contact 66 is engaged with fixed contact 76. The fixed contact 80 preferably is located so that it will be engaged by movable contact 68 when the movable contact member 62 is in a position equi-distant from the rivets 74, 76 of the contact bar 72.

The rivet contact 82 is permanently connected to rivet 54 and conductor 48 by the conducting strip or bar 84, and also is permanently connected

by wire 86 to the rivet contact 80, with a resistance element 88 in the latter connection.

It is a feature of the invention that the rivet contacts 50, 52 on the plate element 34 are located for contacting the contacts 28, 30, respectively, on the insulating plate 24 when the plate element 34 is mounted within the casing sections 10, 12. Hence, in the assembled switch, the lamp bulb 26 is connected in parallel across the conductors 44, 46 to be lighted whenever a circuit is completed through these conductors by engagement of the movable contact 66 with any portion of the contact bar 72 or with its rivets 74 or 76.

All of the rivet-connecting strips or bars 60, 70, 78 and 84 preferably will be on one side of plate element 34 while contact bar 72 and the movable contact member 62 preferably will be mounted on the other side of plate element 34. Also, the rivets preferably will be of the eyelet tubular variety whereby each headed rivet which serves as a fixed contact of the switch presents an annular contact surface in which the convex surfaces of the movable contacts 66, 68 effectively can engage and be arrested following snap action resulting from the structure of the movable contact member 62 now to be described in detail in connection with coacting means on the casing section 12.

As best seen in Figs. 2 and 8, the movable contact member 62 comprises a spring arm 90 which carries movable contact 66, and a spring arm 92 which carries the movable contact 68. Also, it includes the relatively stiff actuating member 94 having the portion 95 extending through an arcuate slot 96 in casing section 10, with a knob 98 on its outer end for manual shifting of the actuator. Both of the spring arms 90, 92 and the actuating member 94 are pivotally mounted on the plate element 34 by the rivet 64 with the actuating member next to plate element 34 and with the spring arms engaged together at the pivot in spaced relation to the actuating member.

Between the spring arms and the actuating member, a spring arm 100 is pivotally mounted on rivet 64 and has substantial extent from the pivot in direction opposite to the extent of the contact-carrying portions of spring arms 90, 92. Casing section 12 has an interior projection 102 with radial V-grooves 103 in its inner surface, and the spring arm 100 has its terminal part depressed into generally V-shape at 101, for engaging in the V-grooves 103 of projection 102. Spring arm 100, at the other side of the pivot, has depending ears 105 at opposite side edges of the actuating member 94, whereby the spring arm 100 moves with the actuating member 94 and its V-shaped terminal resiliently snaps from one V-groove to another on projection 102 as the actuating member is moved about pivot 64. Also, the resilience of spring arm 100 maintains the actuating member 94 pressed against plate element 34.

The contact-carrying spring arm 90 also has a V-shaped terminal part 104 for resiliently engaging in the V-grooves 103 of projection 102 and snaps from one groove to another during movements of the actuating member 94. Also, the resilient engagement of the V-shaped terminal of spring arm 90 with projection 102 is such that its opposite contact-carrying end constantly is resiliently urged relatively strongly against plate element 34 or against the contact bar 72 or rivets 74 or 76, in particular positions of the movable contact member 62.

The other contact-carrying spring arm 92 overlies contact arm 90 and has one end terminating only slightly beyond the pivot 64. However, the

resilience of the underlying spring arm 90 constantly acts on spring arm 92 so that its contact-carrying end too constantly is urged relatively strongly against plate element 34 or against the fixed terminals 80 or 82 in particular positions of the movable contact member 62. A depressed tongue 93 on spring arm 92 engages in the opening in spring arm 90 through which the actuator extends, thereby ensuring that the two spring arms 90, 92 will move in unison notwithstanding any slight play there may be as between the actuating members and the spring arms.

In the assembling of my improved switch, the transparent or translucent insert 20 first is inserted in casing section 10, with its preliminarily assembled insulating plate 25, carrying light bulb 26, mounted therein. As previously explained, all of the connections of the switch proper may be made on the plate element 34, so that this prepared plate 34, as seen in Figs. 3 and 8, may be inserted as a unit in the casing section 10, after the insert 20 is in place therein, it overlying the insert as clearly shown in Figs. 2 and 3. The conductors 36, 38, 44, 46 and 48 are depressed into clinching grooves at their respective ends of the section 10, as best seen in Fig. 3, and the rivets 50, 52 on plate element 34 engage the rivets 28, 30 on the plate 25 of the insert thereby to connect the light bulb 26 in parallel across the conductors 44, 46 so that the bulb will be lighted whenever a circuit is completed through conductors 44, 46 by engagement of the movable contact member 62 with the contact bar 72 or its rivets 74 or 76.

When casing section 12 is secured in place over the plate element 34, all of the interior elements are held securely in place and the clinched conductors relieve the interior connections of all strain incident to tension which may be applied to the conductors exteriorly of the casing.

Referring to Fig. 1, the knob 98 may be moved to either of the two indicated "Off" positions to open the switch circuits, and the light bulb 26 will be de-energized and out in either of the "Off" positions. Assuming that the switch is connected for control of an electric heating pad, an operation of the pad at maximum temperature may be effected by moving knob 98 to the indicated "High" position. This moves movable contact 66 into contact with rivet 74 of contact bar 72 to complete a circuit through the heater element 56 (Fig. 10), and, simultaneously, the light bulb 26 is energized to illuminate the indications at 22. In this position, only heat from the main heating element 56 affects the thermostatic switch and the pad can attain maximum temperature before the switch responds to open the circuit.

If a lower operating temperature of the pad is desired, a movement of the knob 98 to the indicated "Med." position will bring movable contact 68 into contact with fixed contact 80 thereby to complete a circuit through the heater element 58 (Fig. 10), with the resistance element 88 in this circuit. The other heater element 56 continues energized as before due to continued engagement of movable contact 66 with contact bar 72. Now, if a still lower operating temperature is desired, a movement of knob 98 to the indicated "Low" position will move the movable contact 68 into engagement with fixed contact 82, thereby cutting out resistance element 88, and both heater elements 56, 58 will be connected for maximum heating with the auxiliary heater more strongly influencing the thermostatic switch so that the circuit opens while the overall temperature of the pad is relatively low.

It will be obvious that light bulb 26 is energized in each of the three on positions of the switch and that the movements of the actuator from one to another of its positions is attended by a desired snap action as the V-shaped tail portions of spring arms 90, 100 ride on projection 102 from one of its V-grooves 103 to another. Also, it will be readily apparent that important manufacturing economies are attained, both as to materials and labor costs, as a result of my improved structure as compared with prior comparable proposals.

I claim as my invention:

1. An electric switch comprising a plate, a switch member pivotally mounted on the plate and having a pair of movable contacts at different radial distances from the pivot at one side of the pivot, a pair of spaced apart fixed contacts on the plate permanently electrically connected together with a resistance element in the connection, a third fixed contact on the plate having substantial surface extent, said fixed contacts being located relative to the paths of travel of said movable contacts and relative to each other so that one of the movable contacts constantly engages said third fixed contact throughout a substantial arcuate movement of the switch member and the other movable contact engages one of said pair of fixed contacts at one intermediate point in the same said substantial arcuate movement of the switch member and engages the other of said pair of fixed contacts at another point in the same said substantial arcuate movement of the switch member, there being at least one other position of the switch member in which its said movable contacts are disengaged from all of said fixed contacts on the plate, and casing members within which said plate, switch member, and contacts are insertible as a unit, there being an opening in a wall of one casing member, and said switch member having an operating portion projecting out through said opening.

2. An electric switch comprising a casing, means supporting a light bulb within the casing and having a pair of contact terminals thereon, a plate within the casing having a pair of contact terminals on its side which is toward the light bulb and pressed against said terminals on the bulb-supporting means, a switch member pivotally mounted on the opposite side of said plate and having a pair of movable contacts at different radial distances from the pivot at one side of the pivot, a pair of spaced apart fixed contacts on that side of the plate on which said switch member is mounted, a third fixed contact on the same side of the plate having substantial surface extent, said fixed contacts being located relative to said movable contacts and relative to each other so that one of the movable contacts constantly engages said third fixed contact during a substantial movement of said switch member about its pivot and the other movable contact engages each of said pair of fixed contacts in succession at different stages of the same said substantial movement of the switch member, said plate, switch member and fixed contacts being insertible as a unit within said casing, there being an opening in a wall of the casing, and the switch member having an operating portion projecting out through said opening.

3. An electric switch comprising a casing defining an interior chamber having an opening

in a wall thereof, a generally hollow member within the casing closing said opening and having a portion constituting a window across said opening, means supporting a light bulb within said hollow member and having a pair of terminals thereon, a plate within said chamber of the casing engaged between said bulb-supporting means and a wall of the casing, said plate having a pair of terminals at one side thereof pressed into electrical engagement with said pair of terminals on the bulb-supporting means, a switch member pivotally mounted at the other side of said plate and having a pair of movable contacts radially aligned at different radial distances outward from the pivot at one side of the pivot, a pair of fixed contacts on the plate arranged to be engaged selectively by only one of said movable contacts in response to movements of the switch member about its pivot, said fixed contacts on the plate being permanently electrically connected together with a resistance element in the connection, a third fixed contact on the plate in position to be constantly engaged by the other of said movable contacts during a substantial movement of the switch member and adapted to maintain a circuit through said light bulb so long as said third fixed contact is engaged by said other movable contact, the selective engagement of either of said pair of fixed contacts on the plate by said one of the movable contacts being adapted to close a parallel circuit respectively with and without said resistance element therein, said plate, switch member and fixed contacts being insertible, as an assembled unit, within the casing, and said hollow member, light bulb and bulb supporting means being also insertible, as an assembled unit within the casing.

4. An electric switch comprising an insulating plate having a pair of fixed contacts on one side thereof, a switch member pivoted on the plate at the other side thereof, said switch member having two contact-carrying spring arms clamped together at the pivot, and having a relatively stiff actuating member between said spring arms and the plate with an angular part extending through the spring arms whereby the spring arms move in unison about the pivot in response to actuations of said actuating member, each said spring arm having a contact thereon respectively at different radial distances from the pivot at one side of the pivot, and at least one of said spring arms extending a substantial distance at the other side of the pivot, fixed contacts on the plate arranged for coaction with said contacts on the spring arms, a casing enclosing said plate, switch member and contacts, and coacting means on a wall of the casing and on a said spring arm at its portion extending on that side of the pivot opposite the contact-carrying portion of said spring arm resiliently urging the contact-carrying portions of the spring arms toward said plate and including means for snap action increment movements of the spring arms in response to actuations of the switch member, said plate, switch member and fixed contacts being insertible, as an assembled unit, within the casing, and there being a portion of the switch member projecting out through a casing wall for manually actuating the switch member.

5. An electric switch comprising a support, a switch member pivotally mounted on the support and having two radially aligned contacts at different radial distances from the pivot at one side of the pivot, a relatively long fixed contact on the plate in position to be constantly engaged

by one of said switch member contacts throughout a substantial movement of the switch member about its pivot thereby to close one circuit and to maintain it closed through a said substantial movement of the switch member, a pair of arcuately arranged fixed contacts on the plate in position to be selectively engaged by the other switch member contact while said one switch member contact continues engaged with said relatively long fixed contact, said pair of fixed contacts being permanently electrically connected together with a resistance element in the connection, and the engagement of either of said pair of fixed contacts by said other switch member contact being adapted to close a parallel circuit respectively with and without said resistance element in said parallel circuit, and casing members within which said support, switch member and fixed contacts are insertible as an assembled unit, said switch member having an actuating portion projecting out through a said casing member.

6. An electric switch comprising a supporting plate, a pair of stationary contacts on the plate arranged in an arcuate series, another relatively long stationary contact adjacent to said pair of contacts, a pivot pin on said plate having a headed end outward from the plate, a movable switch member on said pivot pin and having a resilient member pivotally and slidably mounted on the pivot pin with substantial extent on opposite sides of the pivot pin, said resilient member having a contact at one end and having its other end formed in V-shape at its side toward the plane of said plate, a stationary notched member engaging the V-end of the resilient member and maintaining the resilient member under tension with its contact-carrying end biased toward said plate, its mid-part biased toward the said headed end of the pivot pin, and its V-end biased against said notched member, a second resilient member radially aligned with the first mentioned resilient member and pivotally and slidably mounted on the pivot pin between the first mentioned resilient member and the headed end of the pivot pin, said second resilient member having a contact thereon in radial alignment with the contact of the first mentioned resilient member but at a greater radial distance from the pivot pin at one side of the pin, whereby the said tension of said first mentioned resilient member maintains said second resilient member under tension with its contact biased toward said plate, and an actuator engaging both said resilient members for moving them in unison about said pivot pin with increment snap movement thereof as said V-end of a resilient member travels from one notch to another of said stationary notched member, and casing members within which said plate, switch member and stationary contacts are insertible as an assembled unit.

7. An electric switch comprising a hollow casing having a window in a wall thereof, a member supporting a light bulb within said casing generally opposite said window, said member having a pair of terminals thereon, a plate within said casing clamped between a wall of the casing and said bulb-supporting member, said plate having a pair of terminals pressed by said clamping into electrical engagement with said pair of terminals on the bulb supporting member, a switch member pivotally mounted on the plate and having two movable contacts radially aligned at different radial distances from the pivot of

the switch member at one side of the pivot, a pair of fixed contacts on the plate spaced a predetermined distance apart and permanently electrically connected together with a resistance element in the connection, said pair of fixed contacts being adapted to coact with only one of said movable contacts to close one circuit respectively with and without said resistance element in the circuit, a third relatively long fixed contact on the plate adapted to be constantly engaged by the other movable contact throughout a substantial movement of the switch member thereby to maintain a parallel circuit through said light bulb closed so long as said relatively long fixed contact is engaged, a pair of flexible conductors leading into said casing at one end thereof, three flexible conductors leading out of the casing at the other end thereof, and means on the casing clinching each said flexible conductor at two spaced locations therealong thereby relieving interior conductor connections of all

tensional strains applied exteriorly to said flexible conductors, said plate, switch member, fixed contacts and terminal ends of the flexible conductors being insertible, as an assembled unit, within said hollow casing.

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