Nov. 8, 1932. W. C. TREGONING 1,886,433

ELECTRIC SWITCH

Filed Feb. 27, 1931

Fig. 1

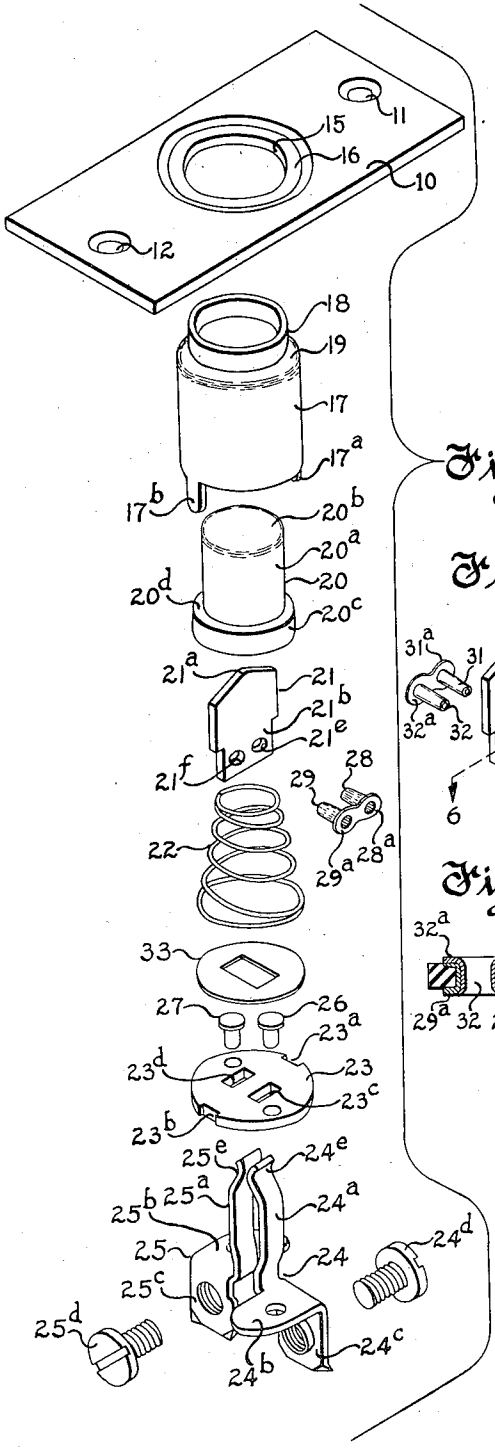


Fig. 2

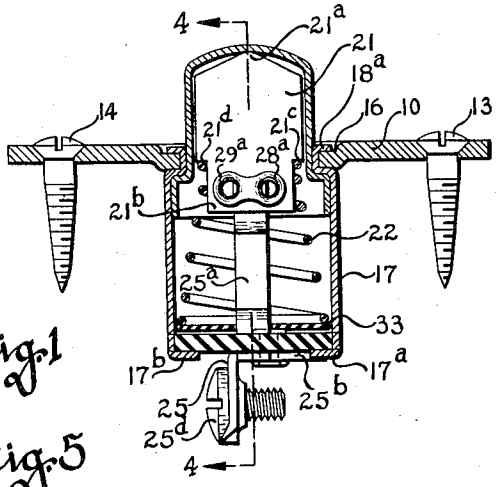


Fig. 5

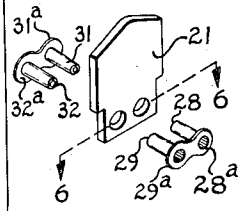


Fig. 3

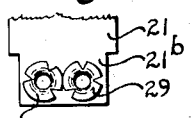


Fig. 4

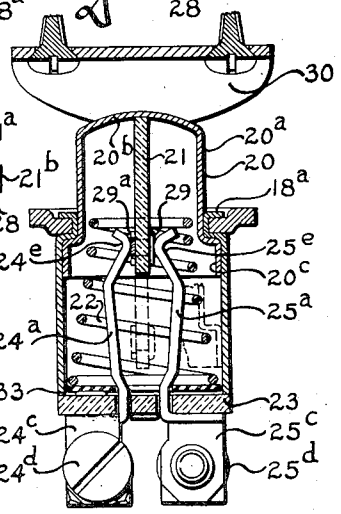
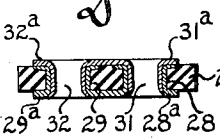


Fig. 6



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1,886,433

UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed February 27, 1931. Serial No. 518,677.

This invention relates to improvements in electric switches, and more particularly to improvements in door-operated switches for automobiles and the like.

An object of the invention is to generally improve the details of construction and operation of switches of the aforementioned character.

Another object is to provide combined stationary contact and terminal members of novel form, and a bridging contactor of novel form for cooperation therewith.

Another object is to provide a novel form of actuating spring for the contactor, together with novel means to insure proper positioning of the spring with respect to the live parts of the switch mechanism.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the invention is susceptible of embodiment in other forms without departing from the scope of the appended claims.

In the drawing, Figure 1 is an enlarged perspective view, in separated relation, of the several parts of a switch mechanism constructed in accordance with my invention.

Fig. 2 is a vertical sectional view of the switch parts in assembled relation,—the contactor and the insulating carrier therefor being shown in elevation.

Fig. 3 is a fragmentary elevation of the contactor and carrier, looking in a direction opposite to that of Fig. 2.

Fig. 4 is a vertical sectional view, on the line 4—4 of Fig. 2, the striker plate being shown associated therewith.

Fig. 5 is a perspective view of a modified arrangement wherein two twin-eyelet contactor elements are to be attached to the insulating carrier, and

Fig. 6 is a sectional view, on the line 6—6 of Fig. 5, with the contactor elements attached to the carrier.

Referring to the drawing, the numeral 10 designates a punched sheet metal plate which is adapted for flush mounting within the door-jamb (not shown) of an automobile or the like,—said plate being provided at opposite ends thereof with openings 11 and 12 to accommodate the fastening screws 13 and 14 (Fig. 2). Plate 10 is provided with a centrally located substantially circular opening 15, and the annular portion 16 around said opening is offset downwardly, as shown. I provide a hollow cylindrical shell 17, the reduced upper end portion 18 of which is adapted to penetrate and fit snugly within the opening 15, with the annular shoulder 19 bearing against the lower face of plate 10. The end portion 18 is spun outwardly or upset over the offset portion of said plate, as shown at 18^a in Figs. 2 and 4, whereby said parts are rigidly and permanently secured to each other, with said upset end 18^a lying flush with or slightly below the upper surface of the main body of plate 10.

The substantially cylindrical hollow sheet metal actuating button 20 is insertable upwardly through shell 17,—the reduced portion 20^a of said button having a closed and dome-shaped end 20^b which normally projects a substantial distance above the upper surface of plate 10. Said reduced portion 20^a of the button slidably or telescopically engages the reduced portion 18 of shell 17, and said button is provided with an enlarged portion 20^c which is slidable within the main body of shell 17,—the shoulder 20^d on said button being engageable with the inner surface of shoulder 19 on shell 17 to limit outward displacement of said button.

Seated edgewise loosely within button 20 is a flat punched plate 21 of fiber or other suitable insulating material, said plate having a width only slightly less than the internal diameter of the reduced portion of said button and the angular upper edges of said plate preferably converging centrally of the width thereof, as shown at 21^a for engagement with the dome-shaped end of said button. Button 20 is thus free to rotate with respect to shell 17 and with respect to plate 21. Plate 21 extends substantially throughout the length of button 20, and the lower end portion of said plate is reduced in width, as shown at 21^b, to fit within or accommodate the coils of re-

duced diameter at the upper end of compression spring 22,—said reduction in width of plate 21 providing horizontal shoulders 21^c and 21^d against which the end coil of said spring is adapted to abut.

The coils of spring 22 are of gradually increasing diameter toward the lower end thereof,—the lower end coil being of a diameter only slightly less than the internal diameter of shell 17. In this manner proper positioning of spring 22 is insured in all positions of the switch parts.

Spring 22 is retained within shell 17 under a given degree of compression by means of the flat punched plate 23 of fiber or other suitable insulating material,—said plate preferably being circular and having a diameter substantially equal to the external diameter of shell 17, whereby the former is adapted to bear against the lower edge of the latter. Plate 23 is provided with two or more peripheral notches 23^a, 23^b and the shell 17 is provided at its lower edge with integral lugs 17^a, 17^b to fit within said notches,—said lugs being bent inwardly over the lower surface of plate 23, as shown, to secure the switch parts in assembled relation to shell 17.

Carried by plate 23 are a pair of identically formed one-piece combined contact and terminal members 24 and 25, the elongated strip contact portions 24^a, 25^a of said members extending upwardly through correspondingly shaped openings 23^c, 23^d in plate 23 and the terminal portions 24^b, 25^b of said member being adapted to underlie said plate,—headed rivets 26 and 27 extending downwardly through registering openings in said plate and said terminal portions and upset over the latter to rigidly and permanently secure said members to said plate. Lugs 24^c, 25^c extend downwardly at right angles to portions 24^b, 25^b, said lugs being tapped to receive the usual binding screws 24^d, 25^d. As shown the contact portions 24^a, 25^a are bent or bowed outwardly from each other intermediate of the length thereof,—the curved upper ends 24^e, 25^e of said contact portions being biased toward each other by the assembly of members 24 and 25 to base 23. For this reason the contact ends 24^e, 25^e are biased into continuous engagement with insulating plate 21.

The plate 21 as shown is provided adjacent to the lower end thereof with a horizontally alined pair of openings 21^e, 21^f which are respectively adapted to receive the tubular shanks 28, 29 of a pair of eyelets the flanges 28^a, 29^a of which are formed integrally with each other and lie in the same plane. The free ends of shanks 28, 29 are riveted or upset over the opposite side of plate 21, whereby relatively wide contactor surfaces are provided on both sides of said plate.

Thus as shown in Figs. 2 and 4 the twin-eyelet contactor 28, 29 is normally biased to its upper extreme position wherein it bridges the curved ends 24^e, 25^e of contact portions 24^a, 25^a. On the other hand, upon inward movement of button 20 to the position indicated by the dotted line fragment thereof in Fig. 4 the twin-eyelet contactor is moved out of engagement with the curved ends 24^e, 25^e and the insulating plate 21 is interposed between the latter to interrupt the controlled circuit.

As is well understood a switch of the character herein described is particularly adapted for automatic control of the dome-light or other lights within an automobile body in accordance with the position of a door of the automobile. A striker-plate 30 of suitable form may be attached to the automobile door (not shown).

In the modification of the contactor shown in Figs. 5 and 6, the insulating plate 21 is identical in all respects with that aforedescribed. Moreover, the twin-eyelet contactor 28, 29 may be identical with that aforedescribed, and attached to plate 21 in the same manner. Thereafter the tubular shanks 31, 32 of another twin-eyelet contactor are inserted from the opposite side of plate 21 through the shanks 28 and 29, respectively, and flared outwardly or upset in a relation substantially flush with the flanges 28^a 29^a aforementioned. As a final operation the two sets of assembled twin-eyelet contactors may have the respective flanges thereof pressed tightly against opposite sides of insulating plate 21. The arrangement last described insures an extremely long life of the bridging contactor without substantially increasing the cost of the switch as a whole.

Interposed between the insulating plate 23 and the lower end of spring 22 is a thin punched plate 33 of insulating material whereby contact of said spring with the heads of rivets 26 and 27 is prevented. Plate 33 is provided with a rectangular opening, as shown, to accommodate the contact portions 24^a, 25^a of members 24 and 25.

What I claim as new and desire to secure by Letters Patent is:

1. An electric switch comprising a supporting plate having a circular opening, a hollow cylindrical metal shell having a reduced and shouldered end portion penetrating said opening and tightly upset over said plate to rigidly secure said parts to each other, an actuating button comprising a hollow metal member slidable within said shell and having an intermediate shoulder to limit outward displacement thereof with respect to the latter, said button having a closed outer end, a flat punched plate of insulating material seated edgewise within said button and extending substantially throughout the length of the latter, a conducting element penetrating said insulating plate and having portions exposed on opposite sides of the latter, a flat punched base of insulating material se-

cured to the lower end of said metal shell, a pair of terminal members secured to the lower surface of said base, spring contact elements formed integrally with said terminal members and extending into said shell through corresponding openings in said base, the upper ends of said contact elements being biased toward each other for continuous engagement with said insulating plate, and a helical compression spring interposed between said base and said insulating plate whereby said conducting element is biased into bridging engagement with said contact elements.

2. A door-operated switch for automobiles and the like, comprising a supporting plate having a circular opening, a hollow cylindrical metal shell having a reduced and shouldered end portion penetrating said opening and tightly upset over said plate to rigidly secure said parts to each other, an actuating button comprising a hollow metal member slidable within said shell and having an intermediate shoulder to limit outward displacement thereof with respect to the latter, said button having a closed and dome-shaped outer end, a flat punched plate of insulating material seated edgewise within said button and extending substantially throughout the length of the latter, a conducting element penetrating said insulating plate and having portions exposed on opposite sides of the latter, a flat punched base of insulating material secured to the lower end of said metal shell, a pair of terminal members secured to the lower surface of said base, spring contact elements formed integrally with said terminal members and extending into said shell through corresponding openings in said base, the upper ends of said contact elements being biased toward each other for continuous engagement with said insulating plate, and a helical compression spring interposed between said base and said insulating plate whereby said conducting element is biased into bridging engagement with said contact elements, the coils of said spring being of gradually increasing diameter toward the lower end of the latter and the lower end coil being of a diameter only slightly less than the internal diameter of said shell, whereby proper positioning of said spring at all times is insured.

3. In an electric switch, in combination, a substantially cylindrical metal shell having an inwardly extending flange at one end thereof, a hollow metal button slidable within said shell and having a shoulder engageable with said flange to limit outward displacement of the button, a flat punched plate of insulating material positioned edgewise within said button, said plate having shoulders formed at opposite edges thereof, an insulating base attached to said shell at the opposite end of the latter, a coiled compression spring interposed between said base and said shoulders, said spring being wound to substantially frusto-conical form for the purpose set forth, a plurality of resilient contacts carried by said base and biased into engagement with opposite faces of said plate, and a contactor carried by said plate and movable therewith into and out of bridging relation to said contacts.

4. In an electric switch, in combination, a substantially cylindrical sheet metal shell having an annular flange providing an opening of reduced diameter at the upper end thereof, a hollow metal button having an upper portion slidable within said opening and an enlarged lower portion slidably engaging the inner surface of said metal shell, an annular shoulder connecting said upper and lower portions of said button and engageable with said flange to limit outward movement of the button, an insulating base member secured to the lower end of said metal shell, a pair of stationary spring contacts extending upwardly from said base member and having the free ends thereof biased toward each other, a flat punched plate of insulating material interposed between the free ends of said contacts, said plate being adapted to seat within said button and having shoulders formed thereon, a coiled compression spring surrounding said stationary contacts and engaging said shoulders to bias said plate and said button to one extreme position thereof, and a contactor carried by said plate and movable therewith into and out of bridging relation to said stationary contacts.

5. In an electric switch, in combination, a substantially cylindrical sheet metal shell having an annular flange providing an opening of reduced diameter at the upper end thereof, a hollow metal button having an upper portion slidable within said opening and an enlarged lower portion slidably engaging the inner surface of said metal shell, an annular shoulder connecting said upper and lower portions of said button and engageable with said flange to limit outward movement of the button, an insulating base member secured to the lower end of said metal shell, a pair of stationary spring contacts extending upwardly from said base member and having the free ends thereof biased toward each other, a flat punched plate of insulating material interposed between the free ends of said contacts, said plate being adapted to seat within said button and having shoulders formed thereon, a coiled compression spring surrounding said stationary contacts and engaging said shoulders to bias said plate and said button to one extreme position thereof, and a contactor carried by said plate and movable therewith into and out of bridging relation to said stationary contacts, the lower end portion of said spring being of a diameter substantially equal to the internal diame-

ter of said metal shell to provide for centering thereof by the latter, the upper end portion of said spring being of relatively smaller diameter to provide for clearance thereof with respect to said button.

6. In an electric switch, in combination, a substantially cylindrical sheet metal shell having an annular flange providing an opening of reduced diameter at the upper end thereof, a hollow metal button having an upper portion slidable within said opening and an enlarged lower portion slidably engaging the inner surface of said metal shell, an annular shoulder connecting said upper and lower portions of said button and engageable with said flange to limit outward movement of the button, an insulating base member secured to the lower end of said metal shell, a pair of stationary spring contacts extending upwardly from said base member and having the free ends thereof biased toward each other, a flat punched plate of insulating material interposed between the free ends of said contacts, said plate being adapted to seat within said button and having shoulders formed thereon, a coiled compression spring surrounding said stationary contacts and engaging said shoulders to bias said plate and said button to one extreme position thereof, and a contactor carried by said plate and movable therewith into and out of bridging relation to said stationary contacts, said contactor comprising a pair of metal eyelet members penetrating said plate and upset to provide conducting flanges on opposite faces of the latter.

7. In an electric switch, in combination, an insulating base, a pair of resilient contact elements projecting upwardly from said base and having the free ends thereof biased toward each other, an insulating plate interposed between said free ends of the contacts and slidable with respect thereto, a conducting element penetrating said plate and having portions exposed on opposite faces of the latter, said element being movable by said plate into and out of bridging engagement with said contacts, a coiled compression spring surrounding said contacts and engaging said plate to bias the latter to a given extreme position, and means associated with said plate to provide for movement thereof to its opposite extreme position against said bias.

8. As an article of manufacture, a combined contact and carrier member for electric switches, said member comprising a flat punched plate of insulating material having a pair of openings formed therein, and a pair of metal eyelets having the flanges at one end thereof formed integrally with each other, the shanks of said eyelets penetrating said openings and being upset over said plate, whereby relatively wide conducting portions are provided on opposite faces of the latter.

9. In combination, a flat punched plate of insulating material having a substantially triangular-shaped upper end portion and a substantially rectangular lower end portion of reduced width providing horizontal shoulders at opposite edges thereof, said plate having a pair of openings formed therein on opposite sides of the longitudinal center line thereof, a pair of metal eyelets having the flanges at one end thereof formed integrally with each other, the shanks of said eyelets penetrating said openings and being upset over said plate, and a second pair of metal eyelets the flanges at one end of which are likewise formed integrally with each other, the shanks of said second pair of eyelets penetrating said openings from the opposite face of said plate and being upset over the integral flanges of said first mentioned pair, whereby relatively wide and substantially smooth conducting surfaces are provided on opposite faces of said plate.

10. In an electric switch, in combination, a base comprising a flat punched plate of insulating material, said plate having two pairs of openings formed therein, one opening of each pair being circular and the other opening of each pair being rectangular, a pair of one piece combined contact and terminal members of identical form, each of said members having a flat base portion seated upon one face of said plate, rivets penetrating said circular openings in the plate and said base portions of said members and upset over the latter to rigidly secure the same in position, said members also having resilient contact portions extending upwardly through said rectangular openings and respectively biased toward each other, wiring terminal portions bent downwardly at substantially right angles to the respective base portions and tapped to receive the usual binding screws, a flat punched plate of insulating material interposed between the free ends of said contacts, a contactor carried by said last mentioned plate and movable therewith into and out of bridging relation to said contacts, and spring means interposed between said base and said last mentioned plate to bias the latter and said contactor to a given extreme position.

11. In an electric switch, in combination, a base comprising a flat punched plate of insulating material, said plate having two pairs of openings formed therein, one opening of each pair being circular and the other opening of each pair being rectangular, a pair of one piece combined contact and terminal members of identical form, each of said members having a flat base portion seated upon one face of said plate, rivets penetrating said circular openings in the plate and said base portions of said members and upset over the latter to rigidly secure the same in position, said members also having resilient contact

portions extending upwardly through said rectangular openings and respectively biased toward each other, wiring terminal portions bent downwardly at substantially right angles to the respective base portions and tapped to receive the usual binding screws, a flat punched plate of insulating material interposed between the free ends of said contacts, a contactor carried by said last mentioned plate and movable therewith into and out of bridging relation to said contacts, spring means interposed between said base and said last mentioned plate to bias the latter and said contactor to a given extreme position, and a relatively thin disk of insulating material interposed between said base and one end of said spring to insure against contact of the latter with said rivets, said disk having a substantially rectangular central opening to facilitate assembly thereof with respect to the stationary contacts of the switch.

In witness whereof, I have hereunto subscribed my name.

WILLIAM C. TREGONING.