

May 25, 1943.

E. G. GAYNOR

2,320,072

TWO BUTTON SWITCH

Filed Dec. 6, 1940

2 Sheets-Sheet 1

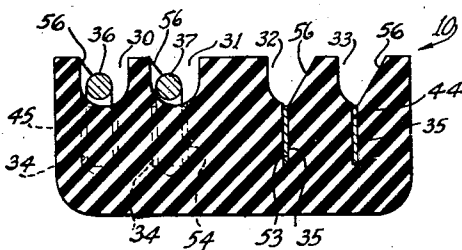
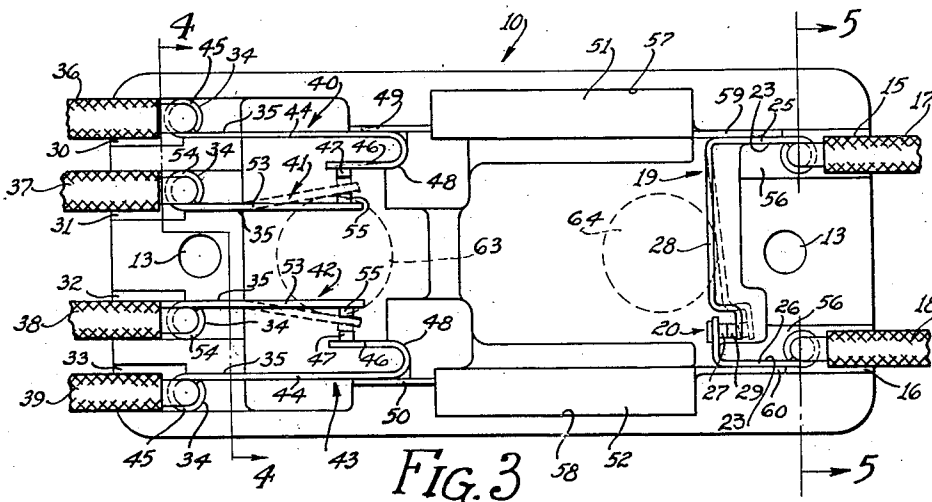
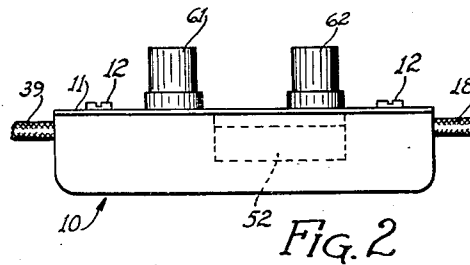
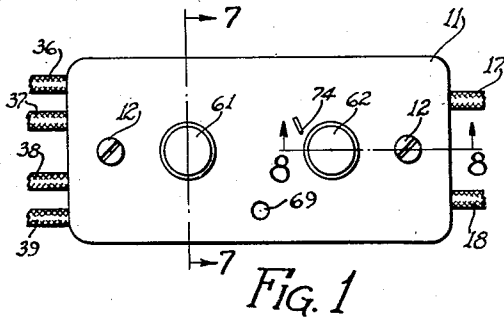


FIG. 4

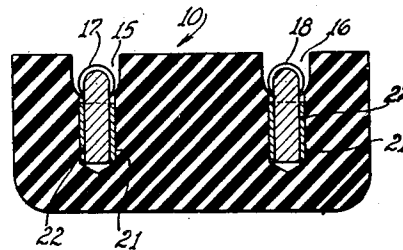


FIG. 5

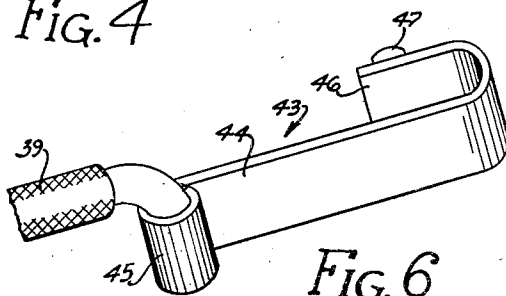


FIG. 6

INVENTOR
EDWIN G. GAYNOR
BY *John H. Haurahan*
ATTORNEY

May 25, 1943.

E. G. GAYNOR

2,320,072

TWO BUTTON SWITCH

Filed Dec. 6, 1940

2 Sheets-Sheet 2

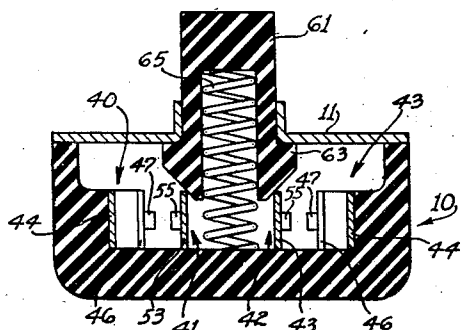


Fig. 7

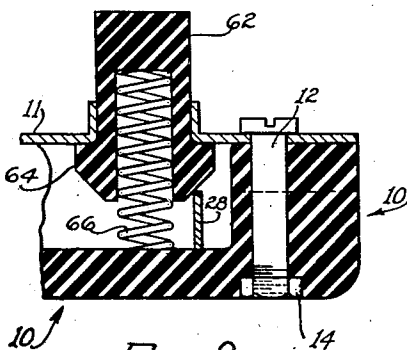


Fig. 8

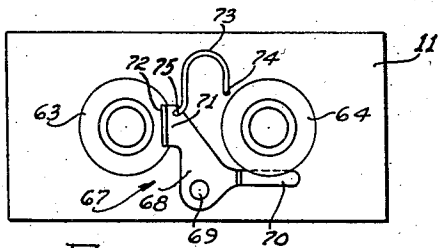


Fig. 9

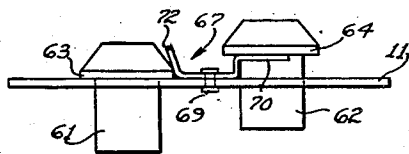


Fig. 10

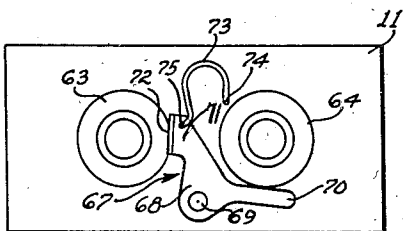


Fig. 11

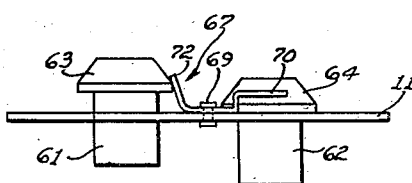


Fig. 12

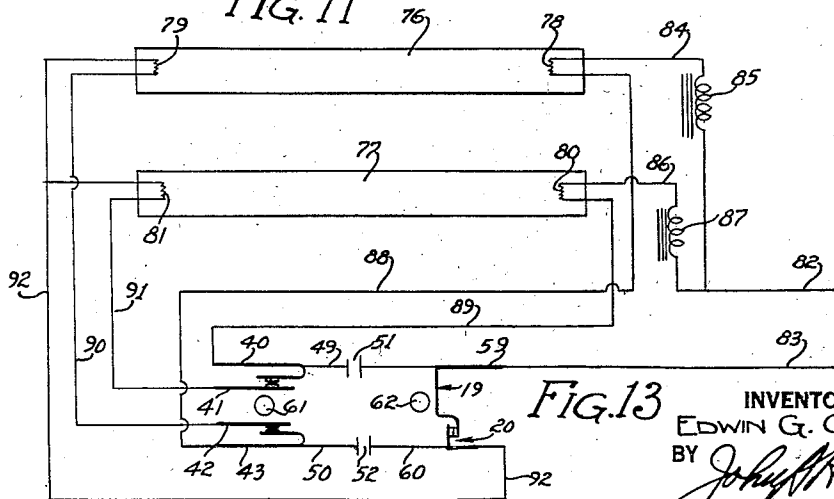


Fig. 13

INVENTOR
EDWIN G. GAYNOR

BY *John H. Hurehan*
ATTORNEY

UNITED STATES PATENT OFFICE

2,320,072

TWO BUTTON SWITCH

Edwin G. Gaynor, Fairfield, Conn., assignor to
The Wheeler Insulated Wire Company, Bridge-
port, Conn., a corporation of Connecticut

Application December 6, 1940, Serial No. 368,747

7 Claims. (Cl. 200—5)

This invention relates to new and useful improvements in fluorescent lighting apparatus and has particular relation to a switch for the control of fluorescent lamps.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings—

Fig. 1 is a top plan view of the switch of the invention;

Fig. 2 is a side elevational view of said switch;

Fig. 3 is an enlarged top plan view of the switch body and contacts the cover and the push-buttons of the switch being omitted;

Fig. 4 is a sectional view taken as along the plane of the line 4—4 of Fig. 3;

Fig. 5 is a similar view taken as along the plane of the line 5—5 of Fig. 3;

Fig. 6 is a perspective view, on an enlarged scale, of a contact employed;

Fig. 7 is an enlarged sectional view taken as along the plane of the line 7—7 of Fig. 1;

Fig. 8 is a similar view taken as along the plane of the line 8—8 of Fig. 1;

Fig. 9 is a bottom plan view of the cover and parts carried thereby with the "off" push-button latched in open circuit position;

Fig. 10 is an elevational view taken as looking from the lower edge of Fig. 9;

Fig. 11 is a view similar to Fig. 9 but with the "off" push-button released and in normal or closed circuit position;

Fig. 12 is an elevational view taken as looking from the lower edge of Fig. 11; and

Fig. 13 is a wiring diagram.

Referring in detail to the drawings the switch of the invention comprises a body generally designated 10 and made of electrical insulating material such as rubber, porcelain or a plastic, for example, a condensation plastic although it will be appreciated that any suitable electrical insulating material may be used. The body 10 is elongated and rather shallow and in the complete switch the open upper side of the body is closed by a cover 11 held in place in any suitable manner as by bolts 12 passing through the cover and openings 13 in the body and threaded into nuts 14.

At one end the body 10 in its upper edge is provided with a spaced pair of notches 15 and 16 opening through its end wall and receiving leads 17 and 18 which at their inner ends are connected with contact elements 19 and 20 respectively. Notches 15 and 16 accommodate the leads when the cover 11 is in place, it being understood that the cover lies flat against the upper edges of the body. In the bottom wall of each of the notches is a socket 21 and these sockets snugly receive eyelets 22 formed at the ends of the contact elements and snugly embracing the inner ends of the leads 17 and 18.

Extending inwardly of the body through the end wall thereof from each socket 21 is a channel 23 and these channels snugly receive the shank portions 25 and 26 respectively of the contact elements 19 and 20. Thus since the eyelets 22 are snugly received in the sockets 21 and since the shanks of the contact elements are snugly received in the channels 23 it will be understood that the contact elements are mounted in the body without the aid of any secondary securing means, such as screws or the like. The contact elements are simply wedged in the proper places provided for them in the body and no other fastening or securing means are used or required.

In addition to its shank 26 the element 20 includes a short arm portion carrying a contact point 27. Element 19 includes a relatively long yielding or spring arm 28 passing transversely of the body 10 and which has its free end disposed to one side of the contact point 27 and itself carries a contact point 29. The construction is such that the contact points 27 and 29 are normally in engagement whereby the pair of elements 19 and 20 comprise normally closed switch elements. Spring arm 28 is adapted to be sprung or forced from the full line to the dotted line position of Fig. 3 thereby to space the points 27 and 29 and open any circuit through them.

The other end wall of body 10 is, in its upper edge, provided with four notches numbered respectively 30, 31, 32 and 33 and arranged in pairs. In the bottom wall of each of the mentioned notches is a well-like socket 34 from the inner side of which extends a channel 35. The notches receive the leads 36, 37, 38 and 39 whereby the latter do not interfere with the proper fit of the cover 11 on the upper side of the body when the complete switch is assembled. Leads 36, 37, 38 and 39 are connected with contact elements 40, 41, 42 and 43 respectively of which the contact elements 40 and 43 are identical while

the elements 41 and 42 are identical. It will be noted that the identical contact elements are arranged in reverse relation to one another.

Elements 40 and 43 each include a shank portion 44 one end of which is bent into an eyelet 45 receiving the inner end of a lead as possibly best shown in Fig. 6. The said elements have their other end portions bent to a substantially U-shape providing a shorter arm 46 which toward its free end carries a contact point 47. Eyelets 45 have snug fits in the sockets 34 in the bottom walls of notches 30 and 33 and the shanks 44 have snug fits in the channels 35 extending from said sockets. In addition the U-shaped portions of the elements are snugly received between shoulders 48 and the side walls of the body. Leads or contact extensions 49 and 50 on condensers 51 and 52 are interposed between the U-shaped portions of the elements and the side walls of the body. In the described way the elements 40 and 42 are secured in place in the body 10 without the use of secondary means it being merely necessary to force the eyelets into the sockets 34 and the shanks 44 into the channels 35 made to receive them.

Contact elements 41 and 42 each include a shank 53 one end of which is bent into an eyelet 54 snugly receiving the inner end of one of the leads 37 and 38. Toward their other ends the elements carry contact points 55 and it is noted that the arrangement is such that these points are normally spaced from contact points 47 but are adapted to be engaged therewith as suggested by the dotted lines in Fig. 3. All of the contact elements are of the same material having the ability to flex when that is necessary. Elements 41 and 42 have their eyelets snugly received in the proper sockets 34 and have their shanks snugly received in the proper channels 35. In this way the elements are secured in place in the body 10 without the use of screws or other separate fastening means. At each end of the body 10 inclined wall portions 56 lead to the upper open ends of the channels 25 and 35 respectively. These inclines serve to guide the shank portions of the contact elements into the channels when the switch is being assembled.

Condensers 51 and 52 are snugly received in pockets 57 and 58 respectively, located within the body 10. Thus the condensers are contained within the switch and protected from physical damage during handling and form an assembled unit with the switch. In addition to the extensions 49 and 50 the condensers 51 and 52 are provided with extensions 59 and 60 respectively. As extensions 49 and 50 are clamped against side walls of the body 10 by the U-shaped portions of the elements 40 and 43 so also are the extensions 59 and 60 clamped against wall portions of the body by the contact elements 19 and 20. Thus it will be seen that condenser 51 is electrically connected at all times with the elements 19 and 40 while the condenser 52 is at all times electrically connected with the elements 20 and 43. These condensers serve to suppress radio interference from a fluorescent lamp or lamps with which the switch is used.

The switch of the invention is operated by manual means and in the drawings a push-button 61 is shown for operating the contact elements 41 and 42 and may be described as the starting or "on" push-button while a similar push-button 62 is provided for moving the element 19 in one direction and this may be described as the "off" or stop button. Buttons 61 and 62 extend through

the cover 11 and at the inner side thereof button 61 is provided with an enlargement or head 63 while the button 62 is provided with a similar head 64. As shown these heads are somewhat in the shape of truncated cones whereby they have or include portions having inclined side walls.

Sockets opening through the inner ends of the buttons 61 and 62 partly receive coil springs 65 and 66 respectively and these springs tend to hold the buttons in positions with their heads against the under side of the cover 11 and constantly tend to move such buttons back to the mentioned positions when moved therefrom. From the drawings it will be clear that on the push-button 61 being depressed against the tendency of coil spring 65 the head 63 of said button will engage the contacts 41 and 42. As the head is forced between said contacts its inclined wall portions move the contacts away from one another and bring the contact points 55 into engagement with the contact points 47 of the elements 40 and 43. When button 61 is depressed as described and then released it is immediately returned to normal position by the spring 65 and the contact elements 41 and 42 are then free and return to their normal positions spacing points 55 from points 47.

Similarly as button 62 is depressed against the tendency of spring 66 the inclined portions of head 64 engage contact element 19, as suggested by the dotted lines in Fig. 3, and cam or spring said contact in a direction to carry its point 29 away from the point 27 of the element 20. On button 62 being thereafter released spring 66 returns it to normal position and the element 19 returns to normal position returning point 29 to engagement with point 27. Thus it will be understood that the contacts 19 and 20 comprise parts of a normally closed switch whereas the pairs of elements 40 and 41 and 42 and 43 comprise parts of normally open switches.

It is also noted that the coil springs 65 and 66 simply engage the bottom wall of the body 10 and are simply partly received in the sockets 45 which open through the inner ends of the push-buttons. From this it will be understood that the assembly requires only that the push-buttons be inserted through the cover 11 from the inner side thereof, the springs be dropped into the sockets in the push-buttons and thereafter the cover secured to the body. This is best accomplished by holding the cover in inverted position and disposing the body thereon.

Mounted on the cover 11 and disposed or located against the inner surface thereof is a latch means generally designated 67. As shown the latch is somewhat in the form of a bell-crank and includes a body 68 pivoted to the cover as by a rivet or the like 69. One arm 70 of the latch is slightly off-set inwardly while the other arm 71 includes a depending inclined extension 72. A spring 73 has one end 74 anchored to the cover 11 and has its other end 75 secured to the arm 71 of the latch. Thus spring 73 constantly tends to rock the latch about its pivot 69 in a direction to carry latch arm 70 toward button head 64 and latch arm 71 toward button head 63.

When the off push-button 62 is in normal position the latch arm 70 is against the inclined head of such button as shown best in Fig. 12 and when the push-button 61 is in normal position the latch arm 71 has its extension 72 approximately against the inclined head of said button as best shown in Fig. 10. With both of the push-buttons in what is herein described as their nor-

mal positions a fluorescent lamp controlled by the herein disclosed switch is energized or lighted. Now to extinguish the lamp the push-button 62 is depressed. This results in flexing of element 19 as to the dotted line position of Fig. 3 with the result that contact point 29 is carried away from contact point 27 opening the circuit between such points and extinguishing the lamp.

On push-button 62 being depressed as described the upper side of its head 64 was carried below the latch arm 70 with the result that the spring 73 rocked the said latch about its pivot 69 carrying the arm 70 into a position above the push-button head as best shown in Fig. 10. Now push-button 62 is locked or latched in a depressed position and thus retains the contact points 27 and 29 in spaced relation. To again start a lamp controlled by my improved switch it is but necessary to depress the push-button 61.

This results in flexing of the contact elements 41 and 42 and the closing of the circuits as above suggested. In addition as push-button 61 is depressed its inclined head portion 63 engages the extension 72 of the latch arm 71 and having a cam-like action thereon rocks the latch about its pivot in opposition to the tendency of the spring 73 with the result that the latch arm 70 is withdrawn from above the push-button head 64 and the spring 66 associated with such push-button acts to return the same to normal position permitting the contact element 19 to return to normal position and bring contact point 29 into engagement with contact point 27.

Referring now to the diagram of Fig. 13 at 76 and 77 are shown two fluorescent lamps connected in circuit to be controlled by the switch of the invention. Lamp 76 includes filaments 78 and 79 while lamp 77 includes similar filaments 80 and 81. Leads from a suitable source of current are shown at 82 and 83 and the contact elements of my switch included in the circuit are given the same identifying numerals as above. From lead 82 a line 84 including a choke coil 85 connects with filament 78 while a line 86 including a choke coil 87 connects with the filament 80. From filament 78 a line 88 connects with contact element 43 and a similar line 89 connects filament 80 with contact element 40. Lines 90 and 91 connect contact elements 42 and 41 with the filaments 79 and 81 respectively and such filaments are connected by line 92 with contact element 20 whose companion contact element 19 is connected with the lead 83.

Now if it be assumed that the lamps 76 and 77 are in use and it is desired to extinguish them the push-button 62 is depressed to move element 19 from element 20 and thus open the lamp circuits. When the button is depressed it will be latched in that position by latch arm 70 as above described. To again energize the lamps the push-button 61 is depressed and moves the elements 41 and 42 into engagement with the elements 40 and 43 respectively and at the same time rocks the latch 67 to a position releasing the push-button 62 so that it is returned to normal position and the element 19 is permitted to return to engagement with element 20.

The circuits then may be described as through connections 84 and 86 to filaments 78 and 80, respectively, through connections 88 and 89 to elements 43 and 40 respectively, connections 90 and 91 to filaments 79 and 81 respectively, through line 92 to element 20 and through ele-

ment 19 to line 83. Thus the circuit is completed through the lamps and this circuit is maintained while the push-button 61 is retained in depressed position. The said button is held depressed only long enough to have the filaments heat up the mercury of the lamps to a vapor and then on the push-button being released the circuit is through the mercury vapor from filaments 78 and 80 to the filaments 79 and 81 respectively. The return at this time is through the line 92 and switch elements 19 and 20 as previously described. To again extinguish the lamps the push-button 62 is depressed opening contact elements 19 and 20.

The latch 67 constitutes means to maintain the line circuit open when the lamps are not in use. When the switch is to be used with a single lamp one pair of the normally open contacts may be omitted. Fluorescent lamps are sensitive to transient voltages in the line due to loads on the line at distant places and also due to lightning. These transient voltages are apt to cause the lamps to glow slightly and sometimes to fully light if the line circuit of the lamp is not maintained open when the lamp is not in use. Thus I have the latching means above set forth and including the latch 67.

Heretofore in these fluorescent lamp circuits the condenser, which is put in parallel with the lamp in order to suppress radio interference from the lamp, has been put directly across the switch in the starting circuit. In this position the condenser is frequently subjected to an extremely high momentary voltage. I have arranged the condenser so that this condition is softened. These condensers are necessarily small in physical dimensions and will only withstand a moderate voltage. A high voltage might rupture the condenser and the lamp would then not light. It will be noted in Fig. 13 that the filaments 78 and 80 are in series with the condensers 52 and 51 respectively when the starting switches (contact elements 40, 41, 42 and 43) are open. Thus any high transient voltage generated at the starting switches is checked by the filament resistance and its full force does not act on the condensers. This is important.

Attention is also directed to the fact that I have provided a shallow construction of switch. This is very desirable in switches for the present purpose. The movable contact elements of the present switch are all adapted for lateral movements to and from circuit closing positions and therefore the body 10 need not include any extra depth to allow for the circuit opening and closing movements of the contact elements. The flat surfaces of the contact elements are all parallel with the sides of the body 10 and are all given movements toward and from the sides of the body as the circuits are opened and closed.

It is another feature of the present switch that all contact elements as well as the push-buttons and condensers are mounted without the use of soldering, welding, clamping by screws, bolts, or other secondary means. These various parts are simply pushed into place. After the contact elements are in the body and the latch is on the cover and the push-buttons are disposed through the openings provided in the cover, the body is disposed on the cover and the parts secured together by the above described nuts 14 and bolts 12.

Having thus set forth the nature of my invention, what I claim is:

1. In a switch, a body of insulating material, two pairs of contact elements in said body and of

which one pair is normally open and the other pair normally closed, one contact element of each of said pairs including a shank, a pocket in said body, a condenser snugly fitting in said pocket, and leads on said condenser extending therefrom and urged into good electrical engagement with the respective shanks to series connect said shanks, said shanks pressing the leads against the body to hold the condenser in position.

2. In a switch, a body of insulating material, two pairs of contact elements in said body and of which one pair is normally open and the other pair normally closed, one contact element of each of said pairs including a shank, a pocket in said body, a condenser snugly fitting in said pocket, said body including wall portions, leads on said condenser and disposed against said wall portions, and said contact shanks being urged into good electrical engagement with said leads and pressing them against said wall portions to thereby hold the condenser in position.

3. A switch unit comprising a body of insulating material having a plurality of blade-receiving slots therein; a normally open switch at one end and a normally closed switch at the other, the normally open switch comprising a pair of resilient blades having ends forced into the slots to frictionally hold the blades therein, said body having a shoulder to clamp the other end of one of the blades and hold it against movement, the other end of the other blade being movable into engagement with the fixed blade to close the circuit, and manually operable means for simultaneously operating said movable blade to temporarily close the circuit, the normally closed switch comprising a pair of resilient blades each having one of their ends forced into slots in the body to frictionally hold the blade therein, at least one of said slots being in substantial alignment with the slots at the other end, the other ends of the blades being in electrical engagement, and a second manually operable means for separating said blades to open the circuit therebetween; a condenser carried by the body and electrically connecting the blades in the aligned slots; means for locking the second manually operable means in open-circuit position; and means actuated in response to the operation of said first manually operable means for releasing said locking means.

4. A switch unit comprising a body of insulating material having a plurality of blade-receiving slots therein; a pair of normally open switches at one end and a normally closed switch at the other, the normally open switches each comprising a pair of resilient blades having one of their ends forced into the slots to frictionally hold the blades therein, said body having a shoulder to clamp the other end of the outside blade of each switch and hold it against movement, the other ends of the inner blades being movable into engagement with the outer blades to close the circuit, and manually operable means for simultaneously operating said inner blades to tempo-

5 rarely close the circuit, the normally closed switch comprising a pair of resilient blades each having one of their ends forced into slots in the body to frictionally hold the blade therein and the other ends in electrical engagement, and a second manually operable means for separating said blades to open the circuit therebetween; means for locking the second manually operable means in open-circuit position; and means actuated in response to the operation of said first manually operable means for releasing said locking means.

5. A switch unit comprising a body of insulating material having a plurality of blade-receiving slots therein; a pair of normally open switches at one end and a normally closed switch at the other, the normally open switches each comprising a pair of resilient blades having one of their ends forced into the slots to frictionally hold the blades therein, said body having a shoulder to clamp the other end of the outside blade of each switch and hold it against movement, the other ends of the inner blades being movable into engagement with the outer blades to close the circuit, and manually operable means for simultaneously operating said inner blades to temporarily close the circuit, the normally closed switch comprising a pair of resilient blades each having one of their ends forced into slots in the body in substantial alignment with the outside blades of the normally open switches to frictionally hold the blades therein and the other ends in electrical engagement and a second manually operable means for separating said blades to open the circuit therebetween; means for locking the second manually operable means in open-circuit position; means actuated in response to the operation of said first manually operable means for releasing said locking means, said body having a pair of pockets therein disposed between ends thereof; and a condenser in each pocket having a contact prong pressed into good electrical engagement with one of the aligned blades of the normally open switch and the normally closed switch to connect the same.

6. A switch unit comprising a body of insulating material, switch means at the opposite ends of the body each comprising pairs of contact elements disposed in said body, one pair being normally open and the other normally closed; a condenser supported by the body and extending along the body between the two switch means and being connected to a contact of each of said switches; and separate means for actuating each switch.

7. A switch unit comprising a body of insulating material having a pair of normally open switches at one end and a normally closed switch at the other, means for actuating the switches, the body between the switches at each end having a pair of pockets therein and a condenser mounted in each pocket to extend between the switches and connected to a contact of a switch at each end.

EDWIN G. GAYNOR