

July 4, 1944.

J. F. O'BRIEN

2,352,653

ELECTRIC SWITCH MEANS

Filed Aug. 27, 1940

3 Sheets-Sheet 1

Fig. 1.

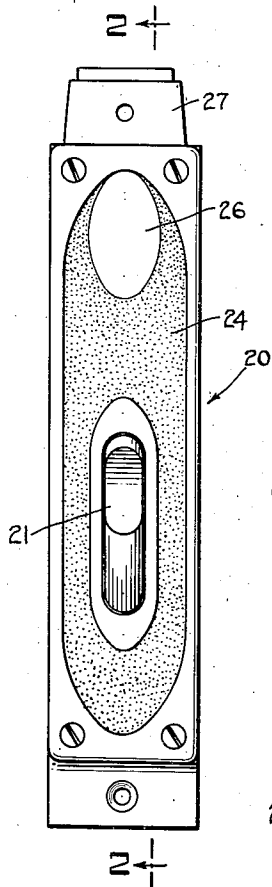


Fig. 2.

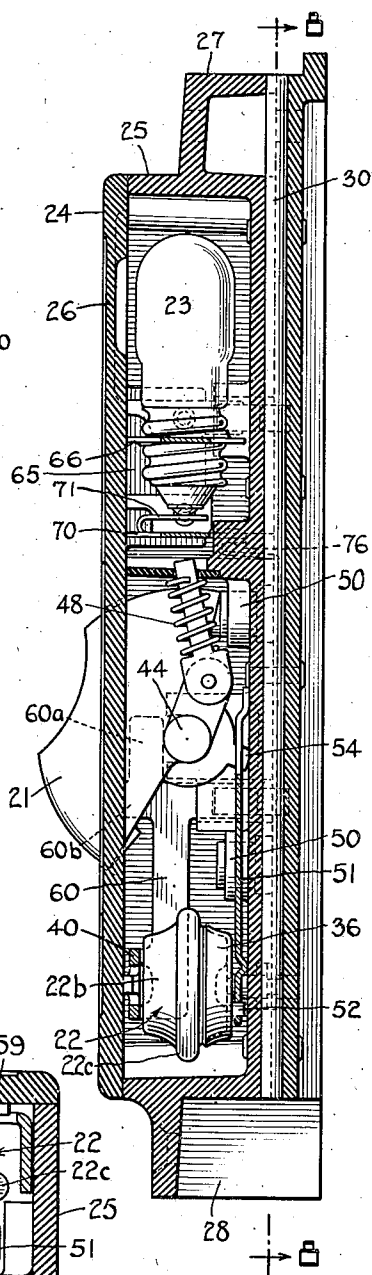


Fig. 3.

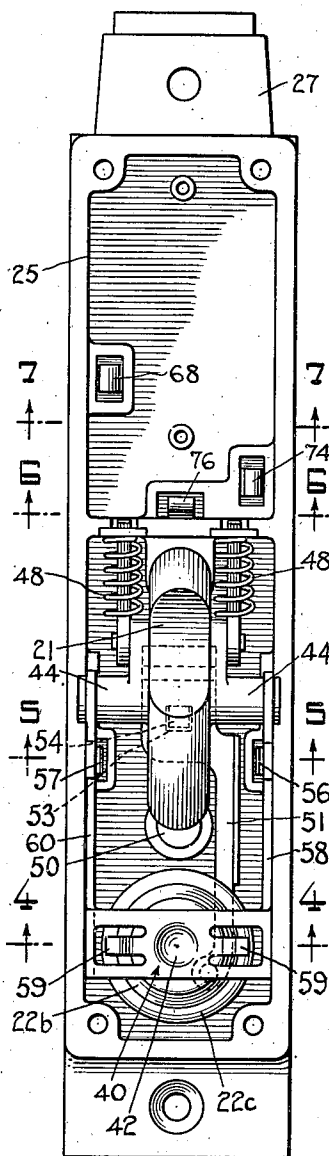
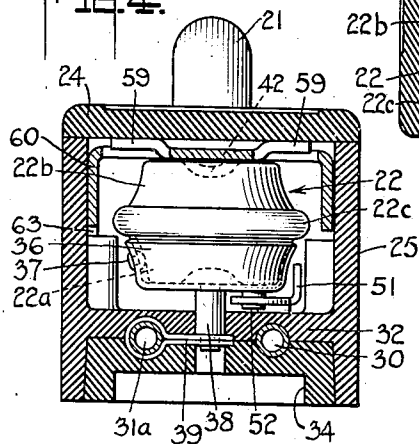


Fig. 4.



INVENTOR

Joseph F. O'Brien

Henry J. Lucke
HIS ATTORNEY

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Fig. 5.

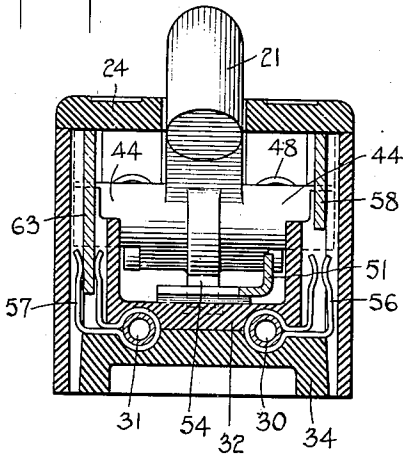


Fig. 6.

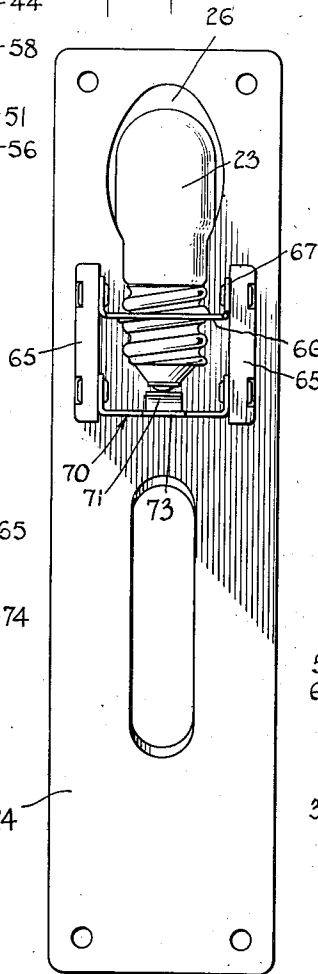


Fig. 7.

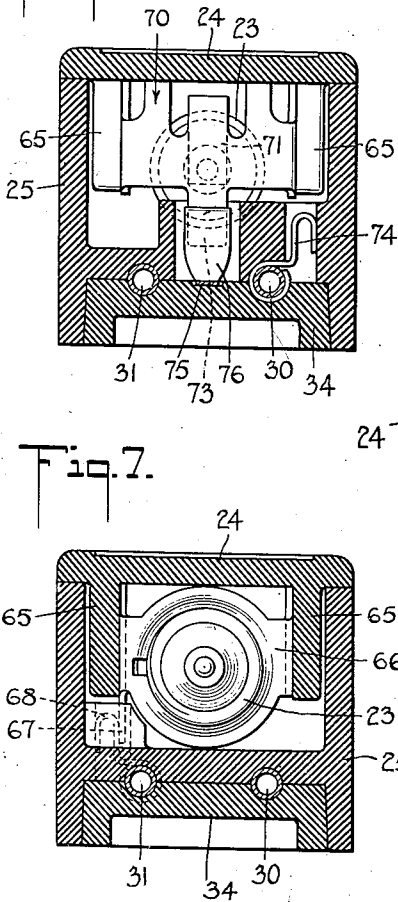
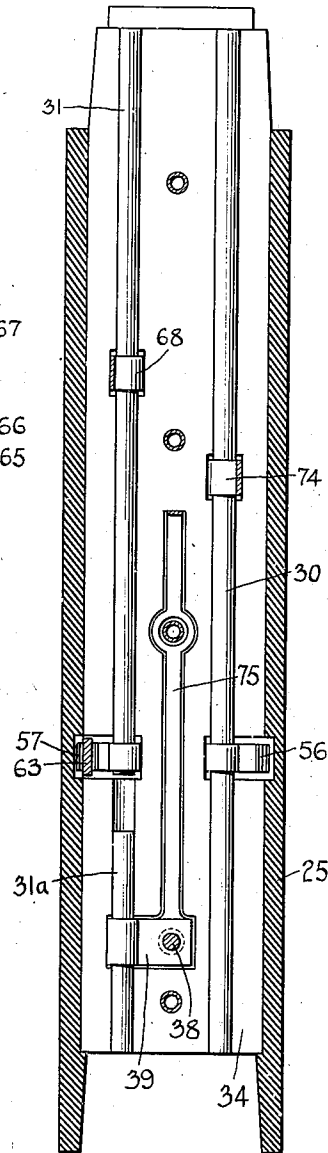


Fig. 8.



INVENTOR
Joseph F. O'Brien
BY *Henry J. Lucke*
HIS ATTORNEY

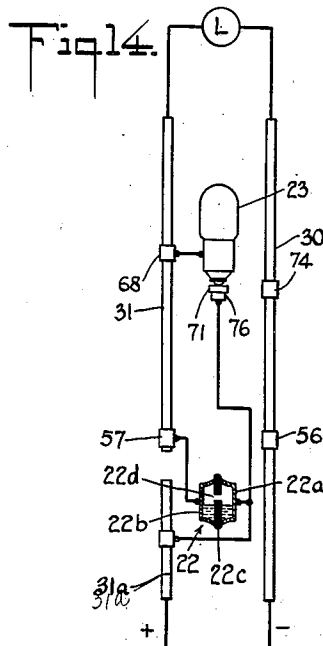
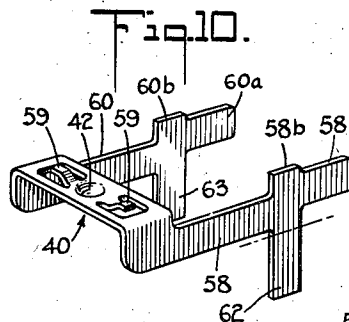
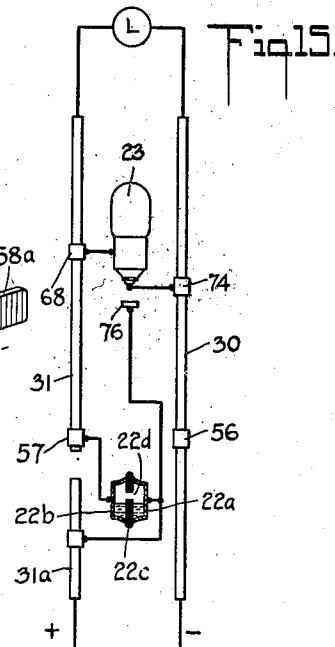
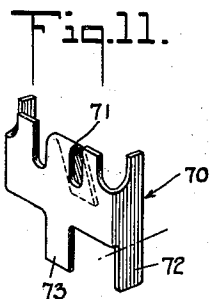
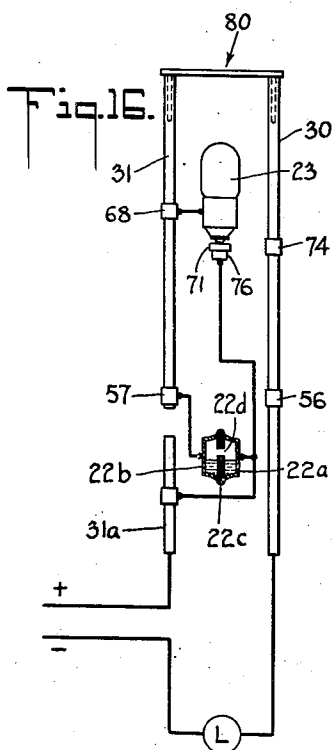
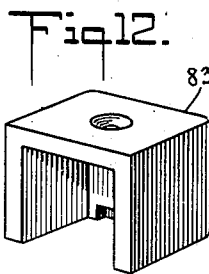
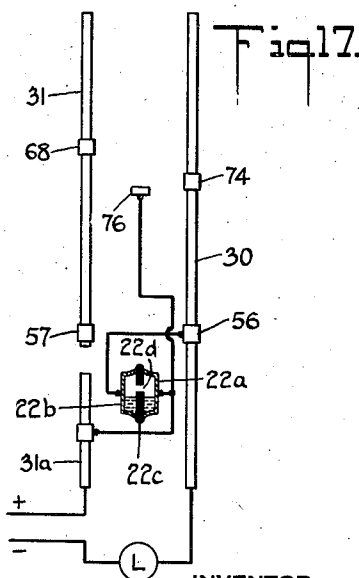
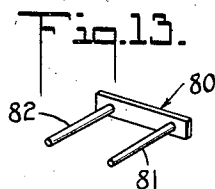
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3 Sheets-Sheet 3



INVENTOR
Joseph F. O'Brien
Henry J. Rucke
HIS ATTORNEY

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ELECTRIC SWITCH MEANS

Joseph F. O'Brien, Jersey City, N. J., assignor to
John B. Pierce Foundation, New York, N. Y., a
corporation of New York

Application August 27, 1940, Serial No. 354,354

6 Claims. (Cl. 177-311)

The present invention relates to improvements in electric switches.

In particular, the present invention relates to improved switch means wherein standardized parts may be assembled and adapted by simple adjustments at the stage of manufacture, to any one of a variety of electrical circuits.

It is an object of the invention to provide an improved electric switch of standardized construction, embodying means whereby its electric circuit characteristics may be readily altered.

It is an object of the invention to provide switch means incorporating a signal lamp or the like, said signal lamp functioning, optionally, as a "beacon" or a "pilot" lamp, pursuant to a simple alteration of certain of the switch elements during the stage of assembly of the switch.

It is an object of the invention to provide an improved switch of the "toggle" or tumbler type, said switch being substantially completely silent in its operation.

It is an object of the invention to provide improved switch means whereby the circuit breaking element thereof may be readily removed for inspection or replacement, without special tools or equipment.

Pursuant to the present invention, the improved switch includes a mercury type of circuit breaking mechanism, suitably mounted for rotation into open or closed circuit status. Preferably, the mounting means for the circuit breaking mechanism includes a saddle structure arranged to connect a contact of said mercury switch optionally to one or another of a pair of conductors within the switch. Further, the switch may include signal lamp means so mounted and arranged that at the option of the assembler of the switch, the lamp means may be included in the switch circuit to act as a beacon light, in which the lamp means is illuminated when the mercury switch is in open-circuit status, or a pilot light, wherein the lamp means is illuminated only during closed-circuit periods of the mercury switch.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

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

Fig. 2 is an elevation in section on the line 2-2 of Fig. 1, enlarged to show structural details;

Fig. 3 is a top plan view of the switch, with the cover plate removed;

Fig. 4 is a vertical section taken on the line 4-4 of Fig. 3;

Fig. 5 is a vertical section taken on the line 5-5 of Fig. 3;

Fig. 6 is a vertical section taken on the line 6-6 of Fig. 3;

Fig. 7 is a vertical section taken on the line 7-7 of Fig. 3, it being assumed in Figs. 4 through 7 that the switch cover plate has been replaced;

Fig. 8 is a bottom plan view of the switch, with the bottom closure plate removed to show the arrangement of conductors therein;

Fig. 9 is a bottom view of the cover, showing the lamp mounting;

Figs. 10 and 11 are perspective views of switch contacts, the broken lines indicating a line of severance of one of the conductor elements thereof;

Fig. 12 is a perspective of a cap for the male end of the switch body;

Fig. 13 is a perspective of a jumper for effecting a change in an electric circuit incorporating the present invention; and

Figs. 14 through 17 are schematic wiring diagrams indicating typical electrical circuits in which the switch may be employed.

Referring to the drawings, 20 represents a preferred embodiment of an electric switch comprising the present invention. Said switch is desirably of the tumbler type, wherein the rotation of a finger member 21 over a limited arc is effective to open or close an electric circuit according to the direction in which the finger piece is rotated. A mercury button 22 is employed in preference to the usual open electric contacts. Lamp means 23, to operate either as a "pilot" or a "beacon" according to whether the lamp is in series or parallel with the switch conductors, as later described, is secured to a cover 24 for support within a suitable cavity of the switch body 25 when the cover is in operative position. Said lamp is suitably arranged with respect to a window 26 formed in the cover 24. Preferably, the lamp 23 is of the miniature "neon" type, said lamps using an almost undetectable amount of electric current when in illuminated status.

The switch body 25 is formed with a male end portion 27 and a female socket portion 28, suitable for seriatim interconnection with electric wiring means of the type exemplified by the presently pending application of Louis G. Morten, Serial No. 286,734, filed July 27, 1939, and entitled Electrical unit. As appears from said Morten application electrical interconnection of conductors of the seriatim interconnected units

may be made through the agency of metallic pins inserted into and frictionally engaging the tubular conductors of the adjacent units.

The switch unit conductors, see Figs. 2 and 3, comprise a tubular conductor 30 extending the full length of the switch body and complementary tubular conductors 31, 31a, the latter being in insulated spaced relationship with conductor 31 although in alignment therewith. The conductors are arranged within grooves provided in a lower wall 32 of the body 25, and in complementary grooves provided in a sub-base 34, the latter being secured to the body by any suitable means, such as tubular rivets or the like.

Desirably the body members of the switch unit, including its cover portion, base, and sub-base, are wholly of electrical insulation material, certain of the moldable plastic materials being excellent for the purpose.

The mercury button 22 is advantageously of the type wherein opposed metallic body shells 22a, 22b, are separated by a central insulating partition 22c, provided with an aperture 22d. In open circuit position, as represented by Fig. 14, the mercury content of the button separates into disconnected pools, one on each side of the insulating partition 22c. Rotation of the button displaces mercury to a position whereby it flows through the partition wall aperture to afford a path of current flow from body shell 22a to shell 22b.

For mounting the button 22 for rotation, I prefer to employ a metallic cup 36, see Fig. 4, within which the button is placed, and which is in electrical contact with body shell 22a, only, of the mercury button. The cup 36 is rotatively secured by means of a rivet or pin 38, the latter being electrically connected to conductor 31a as by the illustrated strap 39.

The button 22 is removably positioned within the cup 36, and to insure that rotation of the cup effects rotation of the button, a rivet or bead 37 provided on a side wall of cup 36 is adapted to fit within a suitable groove formed in the shell 22a.

In electric contact with the shell 22b of the mercury button and cooperating with the pin 38 to pivotally mount the button, I provide a metal saddle 40, see Fig. 10, adapted to overlie the mercury button. The saddle 40 is held in position by the cover 24 and has bead 42 fitting into a matching depression in mercury button shell 22a to cooperate with rivet 38 in providing a pivotal mounting. The mercury button 22 may be removed from the cup 36, at will, by removing the cap 24 and the saddle 40.

The finger member 21 is pivotally supported on trunnions 44, 44, positioned in suitable open-topped bearings formed at the side walls of body 25. Paired overthrow springs 48, 48 may be employed, and rubber surfaced bumpers 50, 50 serve to limit the extent of movement of the switch finger piece.

To translate the vertical rotative movement of member 21 into a horizontal rotative movement of the mercury button 22, I find it advantageous to employ a link 51 having at one end an aperture in engagement with a pin 52 on the underside of the button-retaining cup 36, and at its opposite end, a slot 53 in operative association with which is an ear 54 of the member 21.

Means are provided for electrically connecting a terminal of the mercury switch 22 optionally

to conductor 30 or conductor 31, the selection of the connection being determined by the type of switch circuit to be employed. The conductors 30, 31, are provided with contact means 56, 57, respectively, extending upwardly as shown in Figure 5, and housed within insulating pockets formed by suitable wall means of the switch body construction. For cooperation with such contacts 56, 57, the saddle 40 is formed, see Fig. 10, with rearward extensions 58, 60, intermediate the ends of which are downwardly projecting blades 62, 63 of suitable length to make electric contact with the contact means 56, 57. It is understood, however, that it is not contemplated that the blades 62, 63 shall simultaneously be in electric connection with the contact means 56, 57; according to the type of circuit selected, one or the other of the blades 62, 63 is cut off, a typical line of cut being illustrated by the broken line in Figure 10. Figure 5 assumes that blade 62 has been cut from the saddle structure, and hence blade 63 is in electrical connection with contact 57, whereas contact 56 is out of service.

Advantageously, the saddle 40 is employed to hold the switch finger piece trunnions in their cradles, and to this end said saddle has rearward extensions 58a, 60a slightly vertically offset from the members 58, 60, thereof and adapted to overlie the stated trunnions 44 as indicated in Figure 2. Advantageously, the saddle has upwardly projecting portions 58b, 60b which bear firmly against the under side of the switch cover 24 when the latter is secured in position. Also, it is desirable to provide spring means 59, 59 at the transverse member of the saddle 40, said spring means bearing against the under side of the switch cover to resiliently hold the transverse member of the saddle in position whereby the bead 42 thereof is maintained in operative engagement with the depression formed in the switch shell 22b.

Referring now to Figures 7 and 9, the lamp 23 is advantageously mounted between spaced walls 65, 65 formed on the under side of the cover 24. One member, 66 of the lamp socket means is riveted or otherwise secured to said walls; said socket member is provided with a downwardly extending blade 67 adaptable for engagement with a spring contact 68 provided on the conductor 31 and extending upwardly within a suitable insulating pocket, see Figure 3. Said blade 67 provides electrical connection means for the shell conductor element of the lamp 23.

To complete the circuit to the lamp, bridge conductor means 70, see Figure 11, is provided, said bridge means being suitably permanently secured to the insulating wall structures 65, 65. As is shown in Figure 11, the conductor 70 is formed with a central spring contact 71 for resilient engagement with the terminal contact of the lamp 23, and with two downwardly extending blades 72, 73, any one of which is used in various lamp circuit arrangements.

For cooperation with blade 72 of bridge member 70, switch conductor 30 is provided with an upstanding electric contact 74, as shown in Figure 6, said contact 74 being positioned within a suitable insulating housing, as appears in Figure 3.

For cooperation with blade 73 of bridge member 70, the switch unit is provided with a bus bar 75, said bus bar terminating in an electric contact 76 as also shown in Figure 6.

It is apparent from Figure 8 that the bus bar

75 is part of an integral structure which includes the strap 39 and the rivet 38 which forms the means of electrical contact with body shell 22a of the mercury button 22.

According to which of the blades 72, 73 is severed from the bridge 70, therefore, the lamp 23 may be electrically connected to conductor 31 and conductor 30 of the principal switch conductors, or, alternately, may be in a circuit comprising conductor 31, bus bar 75, and conductor 31a.

In Figures 14 through 17, are illustrated several typical circuit arrangements, made possible by selection of the electrical connection at the mercury switch 22 and at the lamp 23. For example, in Figure 14 the lamp 23 operates as a "beacon," said lamp being "on" when the mercury switch is in open circuit status; in other words, the lamp 23 is illuminated when the load L is off. In the circuit of Figure 14, the path of current is from the positive conductor of the main lighting circuit into conductor 31a of the switch, then through strap 39 to bus bar 75 whence it passes, through blade 73 and contact 71, to the end terminal of the lamp. The lamp circuit is completed through the socket member 66 and blade 67, which is electrically connected through contact 68 to conductor 31. As shown in Figure 14, the load L is shunted across the switch conductors 31, 30, and hence the path of electric current is through the load, through switch conductor 30 and then to the negative pole of the power source. When the switch 22 is thrown to closed circuit condition, the path of electricity is through switch conductor 31a, through rivet 38, then through the switch to conductor 31, for in the Figure 14 type of circuit, it is assumed that the blade 62 of saddle 40 has been severed, and blade 63 is in electrical circuit with contact 57. According to this circuit, the lamp 23 is shunted out, and as the switch is thrown to closed circuit status, thereby energizing the load L, the lamp 23 is extinguished.

In the Figure 14 circuit, therefore, the lamp 23 serves as a beacon, glowing in the darkened room for example, to attract attention to a switch.

In Figure 15, the switch circuit is set up in such manner as to cause the lamp 23 to operate as a "pilot" light, such as to indicate that a cellar or closet lamp is on. In this circuit, the arrangement of the conductors of bridge member 40 is as described with respect to the circuit of Figure 14, but with respect to the lamp bridge member 70, the blade 73 thereof has been severed and blade 72 is in contact with the contact 74 of switch conductor 30. In the Figure 15 circuit, therefore, the lamp 23 is in parallel with the load L, and will not be energized until the load is energized; in other words, the lamp 23 is off when the mercury switch 22 is in open circuit status and is energized when said switch is in closed status, said closed circuit status effecting an energized status of the load L.

Figure 16 represents an electric circuit wherein the switch is at one end of a line and the load is intermediate the point of entry of the electric power source and the switch. For example, a circuit arranged according to Figure 16 may be used in a long hall or room wherein the point of electrical entry to the room is remote from the entrance to the room, at which the switch is placed, and electric lamps or other load are distributed throughout the length of the room. In the Figure 16 circuit, a jumper 80, see Figure 13, is used, the pins 81, 82, of the jumper being inserted into

the switch conductors 30, 31, to bridge the conductors.

According to the Figure 16 circuit, the bridge member 40 is arranged as in the Figure 14 circuit; the blade 62 has been severed and blade 63 is in electrical contact with contact 57. In the lamp circuit, blade 72 of bridge 70 has been severed, and blade 73 is in electrical contact with the terminal 75 of the bus bar 74. In such arrangement, the lamp 23 operates as a beacon, because as clearly appears in Figure 16, with the switch 22 in open circuit status, current may nevertheless flow through the lamp, the jumper 80 completing the path of current flow from the positive to the negative terminal of the electric current source. However, as is the situation with respect to Figure 14, when the switch 22 is closed, the lamp circuit is by-passed and the lamp is extinguished.

Figure 17 is suggestive of an electric circuit wherein for any reason it is not desirable to include the lamp 23 either as a beacon or a pilot in the electrical circuit, and wherein it may be undesirable or impracticable to employ the jumper 80. In such arrangement, it is noted that there is no connection whatever between the switch conductor 31 and the switch conductor 30. To complete the electric circuit, therefore, the saddle member 40 is treated to sever the blade 63 therefrom leaving blade 62 for electrical engagement with the contact means 56 associated with lamp conductor 31. The path of electric current, therefore, is from the switch conductor 31a through the switch 22 to the switch conductor 30, thence to and through the load L.

For the switch 20 when employed in the Figure 16 or Figure 17 circuit, wherein the switch may be at the end of the circuit, I provide a cap 83 of electrical insulation material, said cap fitting snugly over the male projection 27 of the switch body and providing an insulating closure which protects against accidental short circuit or other hazard.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. An electric switch comprising a body portion, electricity conductor means arranged therein, one of said conductor means extending continuously from end to end of said body portion, another of said conductor means comprising a pair of conductor elements mutually spaced and electrically insulated one from the other, rotatable electric circuit breaking means having one terminal electrically connected to one of said pair of conductor elements, electrically conductive saddle means adapted to rotatably secure said circuit breaker and having means whereby a second terminal of said circuit breaking means may be optionally connected to the second of said pair of conductor elements or to said continuously extending conductor, finger piece means rotatably mounted within said body, link means operatively associating said finger piece means and said circuit breaking means, means associated with said saddle means to retain said finger piece means within said body, and cover means operatively associated with said saddle means to maintain the latter in operative position, said saddle means having spring members arranged to bear resiliently against the underside of said cover means.

2. An electric switch comprising a body portion, electricity conductor means arranged therein, one of said conductor means extending continuously from end to end of said body portion, another of said conductor means comprising a pair of conductor elements mutually spaced and electrically insulated one from the other, rotatable electric circuit breaking means having one terminal electrically connected to one of said pair of conductor elements, electrically conductive saddle means adapted to rotatably secure said circuit breaker and having means whereby a second terminal of said circuit breaking means may be optionally connected to the second of said pair of conductor elements or to said continuously extending conductor, finger piece means rotatably mounted within said body, link means operatively associating said finger piece means and said circuit breaking means, means associated with said saddle means to retain said finger piece means within said body, and cover means operatively associated with said saddle means to maintain the latter in operative position.

3. An electric switch comprising a body portion, electricity conductor means arranged therein, one of said conductor means extending continuously from end to end of said body portion, another of said conductor means comprising a pair of conductor elements mutually spaced and electrically insulated one from the other, rotatable electric circuit breaking means having one terminal electrically connected to one of said pair of conductor elements, electrically conductive saddle means adapted to rotatably secure said circuit breaker and having means whereby a second terminal of said circuit breaking means may be optionally connected to the second of said pair of conductor elements or to said continuously extending conductor, finger piece means rotatably mounted within said body, link means operatively associating said finger piece means and said circuit breaking means, means associated with said saddle means to retain said finger piece means within said body, cover means, and lamp means mounted on said cover means, and adapted optionally to be connected to a selected two of the three body portion conductors, said cover means maintaining the saddle means and the lamp connection means in operative position.

4. An electric switch comprising a body portion, electricity conductor means arranged therein, one of said conductor means extending continuously from end to end of said body portion, another of said conductor means comprising a pair of conductor elements mutually spaced and electrically insulated one from the other, rotatable electric circuit breaking means having one terminal electrically connected to one of said pair

of conductor elements, electrically conductive saddle means adapted to rotatably secure said circuit breaker and having means whereby a second terminal of said circuit breaking means may be optionally connected to the second of said pair of conductor elements or to said continuously extending conductor, finger piece means rotatably mounted within said body, link means operatively associating said finger piece means and said circuit breaking means, means associated with said saddle means to retain said finger piece means within said body, cover means, lamp means mounted on said cover means, and means for optionally connecting said lamp means in series or in parallel relationship with said conductor means, said cover means maintaining the saddle means and the lamp connection means in operative position.

5. An electric switch comprising a body, a plurality of electricity conductors arranged therein in insulated relationship with respect to each other, an electric switch having one of its terminals in removable contact with one of said electricity conductors, spring contact means of the blade-receiving type on the remaining electricity conductors, integral saddle means of electrically conductive material in engagement with a second terminal of said switch and urging said switch into engagement with said first-named electricity conductor, said saddle means having severable electric contacts comprising blade-like extensions for electrically connecting the second terminal of said switch optionally to the spring contact means of one or another of said remaining electricity conductors, and means for moving said switch to open or closed circuit position.

6. An electric switch comprising a body portion, electricity conductor means arranged therein, one of said conductor means extending continuously from end to end of said body portion, another of said conductor means comprising a pair of conductor elements mutually spaced and electrically insulated one from the other, rotatable electric circuit breaking means having one terminal electrically connected to one of said pair of conductor elements, electrically conductive saddle means adapted to rotatably secure said circuit breaker and having means whereby a second terminal of said circuit breaking means may be optionally connected to the second of said pair of conductor elements or to said continuously extending conductor, finger piece means rotatably mounted within said body, link means operatively associating said finger piece means and said circuit breaking means, and cover means operatively associated with said saddle means to maintain the latter in operative position.

JOSEPH F. O'BRIEN.