

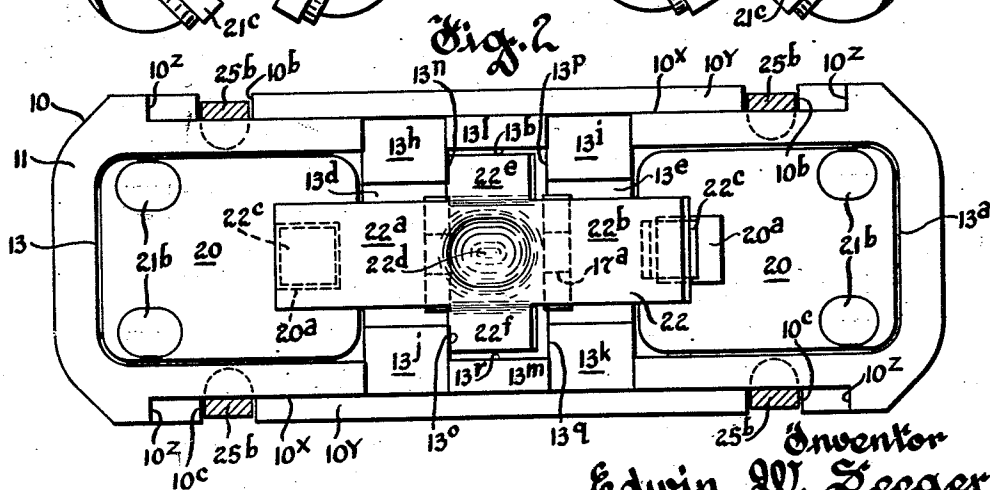
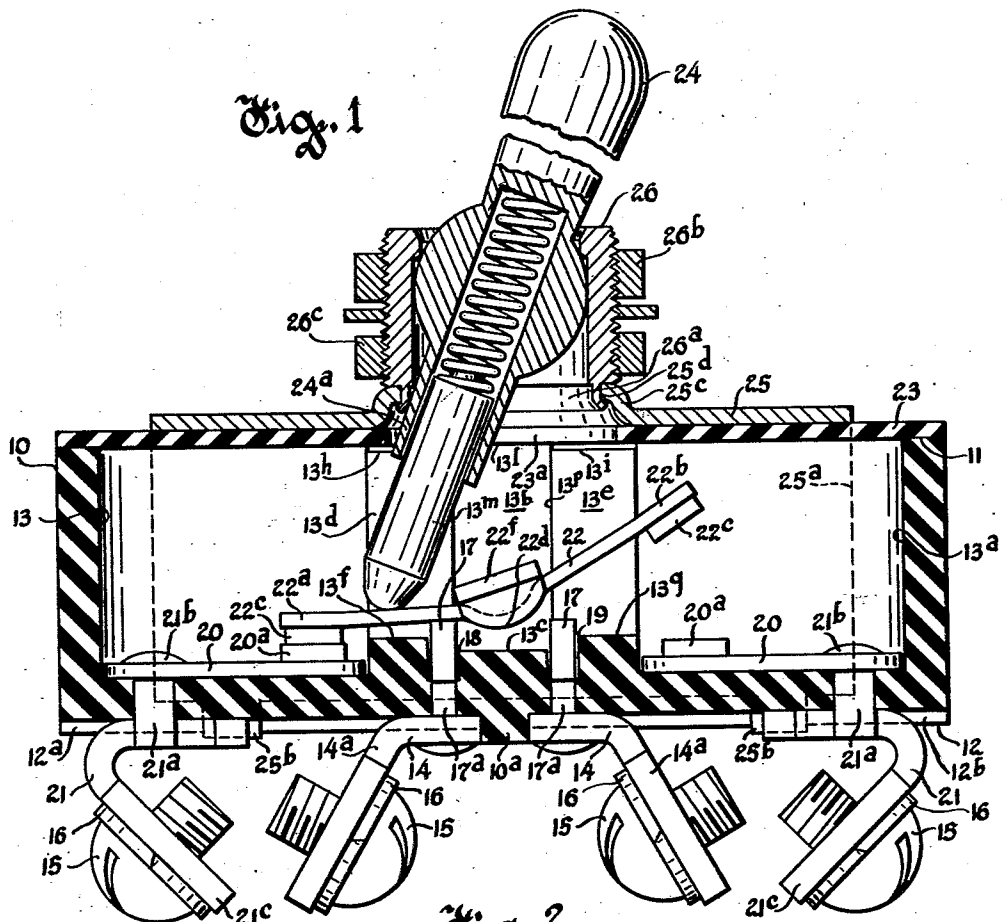
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ELECTRIC SWITCHES

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## ELECTRIC SWITCHES

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This invention relates to improvements in electric switches, and more particularly to a quick-acting, lever-operated switch for manually controlling selectively a multiplicity of electrical circuits.

A primary object of the invention is to provide a novel and simple form of manually operable switch of the quick-acting type wherein a single oscillatable contactor is adapted in an intermediate position thereof to provide for completion of an electric circuit, and said contactor being movable in each direction from said position to provide for interruption of said circuit and simultaneously selectively completing either of two of alternative electric circuits.

Another object is to provide a switch of the aforementioned character wherein a single manually operable contactor is movable, with a quick action, into and out of each of its three circuit-completing positions.

Another object is to provide a switch of the character herein contemplated wherein the recessed molded insulating base is so formed as to cooperate with the pair of intermediate stationary contacts for insuring proper pivotal movements of the contactor with a quick action into and out of its three respective circuit-closing positions, while also insuring proper engagement of the contactor with only one set of stationary contacts at a time.

Another object is to provide a switch of the aforementioned character wherein only four stationary contacts are required for cooperation with the contactor to afford closure of any one of three different electric circuits.

Another object is to provide a switch of the aforementioned character having means to provide for one-hole mounting thereof upon a panel or other suitable support.

Another and more specific object is to provide a manually operable switch of the aforementioned character of relatively small size with reference to its current controlling capacity.

Another object is to provide a novel form of oscillatable contactor for use in a switch of the character herein contemplated.

Another object is to provide novel forms of wiring terminal members for use with switches of the type herein disclosed.

Another object is to provide such a switch having a minimum number of different parts.

A further object is to provide a switch of the aforementioned character wherein by various modifications in the manner in which the circuit wires are connected to the wiring terminals, or by omitting circuit connections to one or two of the terminals, a variety of different circuit controlling characteristics can be provided by the switch mechanism.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate an embodiment of the invention in the form of a single pole switch; it being understood that the invention is susceptible of em-

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bodiment in the form of a multipole switch in any well known manner.

In the drawings, Figure 1 is an enlarged vertical sectional view of an electric switch as constructed in accordance with my invention, but with certain of the switch parts shown in side elevation; the movable parts being shown in the respective positions thereof affording bridging of the left-hand stationary end contact and the left-hand intermediate stationary contact of the switch; the manual operating means being shown as adapted for effecting movement of the contactor with a quick action into and out of its three respective contact-bridging positions; and

Fig. 2 is a top plan view of the switch shown in Fig. 1, but with the insulating cover and mounting members, and the manual operating means for the contactor, omitted.

Referring to Figs. 1 and 2, the numeral 10 designates the switch base, which is preferably molded to the form illustrated from any suitable insulating material, such as "Bakelite." Base 10 is preferably provided with a flat upper surface 11, and a substantially flat lower surface 12. Base 10 is provided with an upwardly opening recess of the form illustrated in Figs. 1 and 2; said recess comprising relatively large and relatively deep opposite end portions 13 and 13<sup>a</sup>; the midportion 13<sup>b</sup> of said recess being shown (Fig. 2) as of the same width as recess portions 13 and 13<sup>a</sup>, as best illustrated at 13<sup>c</sup> in Fig. 1. Base 10 is further provided with a pair of longitudinally spaced intermediate recess portions 13<sup>d</sup> and 13<sup>e</sup>, which are of substantially less width than portions 13 and 13<sup>a</sup>, as shown in Fig. 2; and said recess portions 13<sup>d</sup> and 13<sup>e</sup> are also preferably of substantially less depth than portions 13 and 13<sup>a</sup>, as shown at 13<sup>f</sup> and 13<sup>g</sup> in Fig. 1.

As shown at 13<sup>d</sup> and 13<sup>e</sup> in Figs. 1 and 2, and at 13<sup>f</sup> and 13<sup>g</sup> in Fig. 2, the flat upper ends of the portions of base 10 which form the intermediate recess portions 13<sup>d</sup> and 13<sup>e</sup> are offset downwardly to a slight extent from the upper surface 11 of base 10. The upper ends 13<sup>f</sup> and 13<sup>g</sup> of the walls forming the mid-portion 13<sup>b</sup> of said base recess are preferably coplanar with the upper surface 11 of base 10, as illustrated in Fig. 1.

The insulating base 10 is preferably provided in its lower surface 12 with upwardly extending relatively shallow grooves or recesses 12<sup>a</sup> and 12<sup>b</sup> (Fig. 1); which grooves terminate, in spaced relationship to each other, adjacent the longitudinal center of surface 12; and base 10 is provided at said area with an integral downward projection 10<sup>a</sup>, the outer vertical surfaces of which act as positioning and insulating abutments for the pair of intermediate wiring terminal members 14, 14 of like form. The downwardly and outwardly angled portions 14<sup>a</sup> of members 14 are each provided with a threaded opening (not shown) to accommodate the shank of a binding screw 15; and a lock-washer 16 is preferably interposed between each screw-head and terminal member.

The spaced pair of intermediate stationary contacts are initially in the form of flat punchings composed of metal of good electrical conductivity, such as copper, and are of approximately T-shape; the upper or head portions 17 thereof being adapted to seat within recesses 18 and 19 of suitable depth in the bottom wall of base 10; and the relatively narrow shank portions 17<sup>a</sup> thereof being adapted to pass downwardly through and beyond openings of corresponding form in said bottom wall and in the respective terminal members 14. While the head portions 17 are held in proper position and the terminal members 14 are held in proper relationship to the downwardly projecting shank portions 17<sup>a</sup> of said stationary contacts, the lower ends of said shank portions are spun or riveted over the lower surfaces of said terminal members 14, to rigidly

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and permanently secure said parts to each other and to base 10.

The like, flat punched end contact members 20 are adapted to seat flatwise against the respective bottom walls of the recess portions 13 and 13<sup>a</sup>, as shown in Figs. 1 and 2. Each member 20 preferably has rigidly attached thereto a contact tip 20<sup>a</sup> having high electrical conductivity and high arc-resisting characteristics. Each member 20 is provided adjacent its outer end with a pair of rectangular openings (not shown) to accommodate the upwardly projecting pairs of lugs 21<sup>a</sup>, which are formed integrally with and bent upwardly from the pair of opposite end terminal members 21. The portions of lugs 21<sup>a</sup> which project above the upper surface of the respective contact members 20 are upset thereover, as shown at 21<sup>b</sup> in Figs. 1 and 2, to rigidly and permanently unite contact members 20 with their respective terminal members 21, and with respect to base 10. The downwardly angled portions 21<sup>c</sup> of end terminal members 21 preferably extend inwardly toward the corresponding portions 14<sup>a</sup> of terminal members 14, as shown in Fig. 1.

The arrangement is such that terminals 14, 14 and 21, 21 are positively restrained against displacement transversely of the bottom surface of base 10 and contact members 17, 17 and 21, 21 are positively restrained against displacement transversely of the bottom walls of the respective end portions of the recess in base 10.

The bridging contactor 22 of the switch is preferably punched and stamped, to the form thereof illustrated in Figs. 1 and 2, from a strip or sheet of copper, or other metal of good electrical conductivity. Thus contactor 22 includes a pair of aligned upwardly angled arms 22<sup>a</sup> and 22<sup>b</sup>; and each arm preferably has rigidly attached to its lower surface, adjacent the outer end thereof, a contact tip 22<sup>c</sup>. Contact tips 22<sup>c</sup> are adapted to selectively engage the corresponding contact tips 20<sup>a</sup> on the respective stationary end contacts 20. As shown in Figs. 1 and 2, the contact tips 20<sup>a</sup> and 22<sup>c</sup> are preferably of square or rectangular contour; and the tips 20<sup>a</sup> are preferably of somewhat larger dimensions than tips 22<sup>c</sup>.

Contact 22 is provided, between the arms 22<sup>a</sup> and 22<sup>b</sup>, with an integral depressed portion 22<sup>d</sup> of somewhat elliptical contour (see Fig. 2). Extending upwardly and then outwardly from depressed portion 22<sup>d</sup> are the pair of integral lugs or arms 22<sup>e</sup> and 22<sup>f</sup>, preferably in coplanar relationship to each other. As shown in Figs. 1 and 2 the left-hand edges of arms 22<sup>e</sup> and 22<sup>f</sup> are adapted to abut the wall portions 13<sup>n</sup> and 13<sup>o</sup> of the intermediate recess portions 13<sup>b</sup> and 13<sup>r</sup> to insure proper engagement of the left-hand arm 22<sup>a</sup> of contactor 22 with left-hand intermediate stationary contact 17 and of the left-hand contact tip 22<sup>c</sup> with the left-hand stationary contact tip 20<sup>a</sup>. The laterally spaced end edges of arms 22<sup>e</sup> and 22<sup>f</sup> are similarly restrained against a substantial degree of displacement transversely of base 10 by the transversely spaced end walls of intermediate recesses 13<sup>b</sup> and 13<sup>r</sup>.

As will be understood, contactor 22 is adapted in its intermediate position to bridge the two intermediate stationary contacts 17, 17; whereas in its right-hand extreme position the arm 22<sup>b</sup> of contactor 22 will bridge the right-hand intermediate stationary contact 17, and the right-hand contact tip 22<sup>c</sup> will be engaged with the right-hand stationary contact tip 20<sup>a</sup>. In this position of contactor 22 the right-hand edges of arms 22<sup>e</sup> and 22<sup>f</sup> will abut the wall portions 13<sup>p</sup> and 13<sup>q</sup>, for the purpose aforementioned.

As shown in Fig. 1, base 10 is provided with a flat punched cover plate 23 of suitable insulating material, such as fiber board, preferably impregnated with a suitable resinous material. Plate 23 is shaped to cover the upper edges of the peripheral wall of the recessed portions of base 10 and the upper ends of said recess portions; the single elongated opening in said plate being

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designated by numeral 23<sup>a</sup> in Fig. 1. As indicated in Fig. 1 the opening 23<sup>a</sup> is provided with straight side walls and rounded or hemispherical end walls; thus to limit the cylindrical lower end portion 24<sup>a</sup> of manual operating lever 24 to oscillatory movement in a single plane, as hereinafter described.

Insulating cover plate 23 is shown as positively retained in assembled position by means of an inverted U-shaped sheet metal member or saddle comprising a substantially flat rectangular upper end wall portion 25 and a pair of depending rectangular side wall portions, of a length coextensive with portion 25, and of a width or depth to fit within the exterior recesses formed in the opposite side walls of base 10. Said external recesses on each side of base 10 include the relatively large rectangular side wall 10<sup>x</sup>, the relatively narrow bottom wall 10<sup>y</sup>, and the relatively narrow-opposite end walls 10<sup>z</sup>, 10<sup>z</sup>. The rectangular side wall portions of said saddle member, one of which portions is indicated in dotted lines at 25<sup>a</sup> in Fig. 1, are adapted to fit within the respective external recesses in base 10 and to be offset inwardly from the outer side surfaces of said base. The lower edges of each spaced side wall portion of the saddle member 25 are adapted to be located a slight distance above said bottom walls 10<sup>y</sup>, 10<sup>y</sup> of the external recesses of base 10, to facilitate assembly of said parts. Each side wall portion of saddle 25 is provided with a pair of integral downwardly projecting lugs or tongues 25<sup>b</sup>, 25<sup>b</sup>, and the opposite sides of base 10 are provided with pairs of like vertical notches or grooves 10<sup>b</sup>, 10<sup>b</sup> and 10<sup>c</sup>, 10<sup>c</sup> to accommodate the respective lugs 25<sup>b</sup>; the projecting lower ends of which lugs are bent inwardly over the lower surface of base 10 to secure said parts in assembled relationship to each other.

The upper end wall portion 25 of the saddle is provided with an upwardly bulged central portion 25<sup>c</sup>, which in turn is provided with a circular opening 25<sup>d</sup> to accommodate the reduced lower end 26<sup>a</sup> of an exteriorly threaded metal bushing 26; which reduced end is spun outwardly as shown to rigidly and permanently connect said parts. Bushing 26 is formed at its upper end with an inwardly projecting annular flange, which permits upward insertion of the bat-shaped handle portion of operating lever 24, while restraining and providing a bearing for oscillatory movement of said lever as guided and limited by the side and end walls of the opening 23<sup>a</sup> in cover plate 23. Bushing 26 is also provided with the usual clamping nuts 26<sup>b</sup>, 26<sup>c</sup> for adjustably attaching the switch to panels or other suitable supports of desired thickness.

I claim:

1. In a three-position electric switch of the quick-acting type, in combination, a longitudinal insulating base having integral therewith upstanding side and end portions, each side portion having a slot formed interiorly thereof, a group of four spaced stationary contacts carried by said base substantially in alignment longitudinally of said base, the two intermediate stationary contacts extending from said base upwardly above the level of the two end stationary contacts, a contactor comprising contact arms extending in substantially opposite directions at a small angle upwardly from the mid-portion of said contactor in overlying relation to said group of contacts and laterally extending supporting arms positioned in said slots for pivotal engagement with the latter, said contactor having a central operating position for bridging the two intermediate stationary contacts for completing a first electric circuit and opposite extreme pivotal operating positions for bridging each end stationary contact and the adjacent intermediate stationary contact for completing second and third electric circuits, respectively, the relative levels of said intermediate and end stationary contacts and the angle of said arms relative to the mid-portion of said contactor insuring against simultaneous com-

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pletion of more than one of said electric circuits, a manually operable lever comprising means including a spring for continuously biasing said contactor toward said stationary contacts and affording movement of said contactor from each bridging position thereof to another with a quick action upon predetermined degrees of movement of said lever, and supporting means for said lever comprising an annular bearing surrounding a mid-portion of said lever and a cover plate having a narrow longitudinal aperture accommodating the inner end of said lever and limiting the latter to oscillatory movement in a single plane.

2. The combination according to claim 1, wherein said manually operable lever comprises a spring-biased plunger slidably carried by said lever for continuously engaging said contactor, and each of said stationary contacts comprises a flat sheet metal contact member of good electrical conductivity positioned interiorly of said base and a sheet metal wiring terminal member electrically connected to said contact member through said base and exposed at the outer surface of the latter.

3. The combination according to claim 2, wherein certain of said contact members have integral portions thereof extending outwardly through said base and through their associated terminal members and upset over the outer surfaces of the latter and the other terminal members have integral portions extending inwardly through said base and through their associated contact members and upset over the inner surfaces of the latter for rigidly and permanently securing said contacts to said base.

4. The combination according to claim 3, wherein each contact arm has a contact tip rigidly attached to the lower surface thereof, and each stationary end contact has a

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contact tip rigidly attached to the upper surface thereof for engaging the contact tip on the associated contact arm.

5. In a three-position electric switch of the quick-acting type, in combination, an insulating base, a group of four spaced stationary contacts carried by said base substantially in alignment longitudinally of said base, the two intermediate stationary contacts extending from said base upwardly above the level of the two end stationary contacts, a contactor comprising contact arms extending in substantially opposite directions at a small angle upwardly from the mid-portion of said contactor in overlying relation to said group of contacts and lateral arms for pivotally supporting said contactor on said base, said contactor having a central operating position for bridging said two intermediate stationary contacts for completing a first electric circuit and opposite extreme pivotal operating positions for bridging each end stationary contact and the adjacent intermediate stationary contact for completing second and third electric circuits, respectively, the relative levels of said intermediate and end stationary contacts and the angle of said arms relative to the mid-portion of said contactor insuring against simultaneous completion of more than one of said electric circuits, and an operating lever for activating said contactor to bridge a selected pair of said stationary contacts.

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