July 8, 1941. A. W. KRIEGER 2,248,361

ELECTRIC SWITCH

Filed July 7, 1939 3 Sheets-Sheet 1

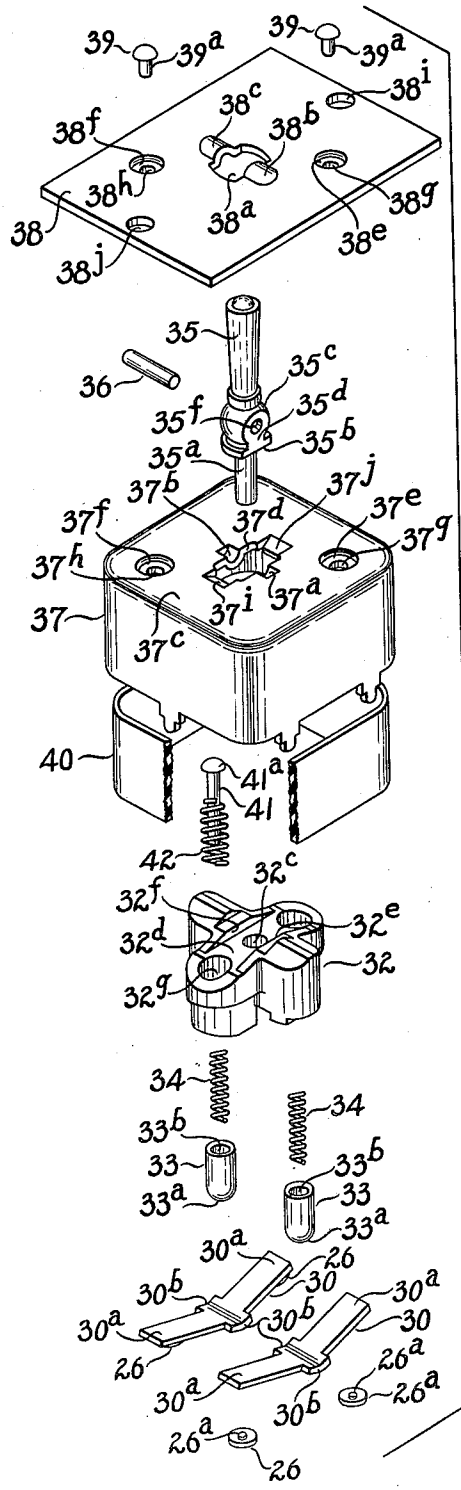


Fig. 1

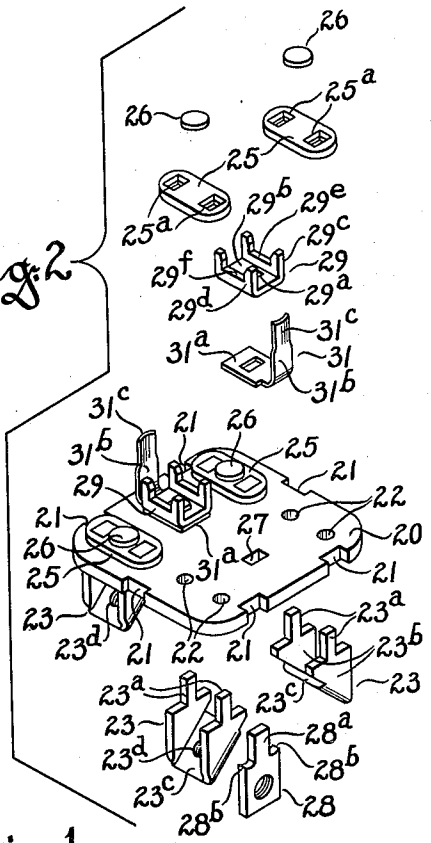
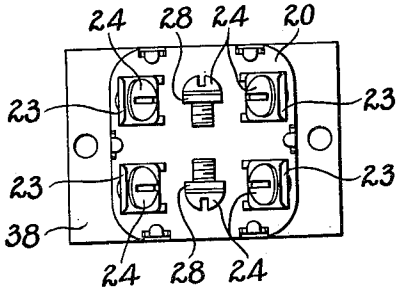


Fig. 2

Fig. 3



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ELECTRIC SWITCH

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Fig. 4

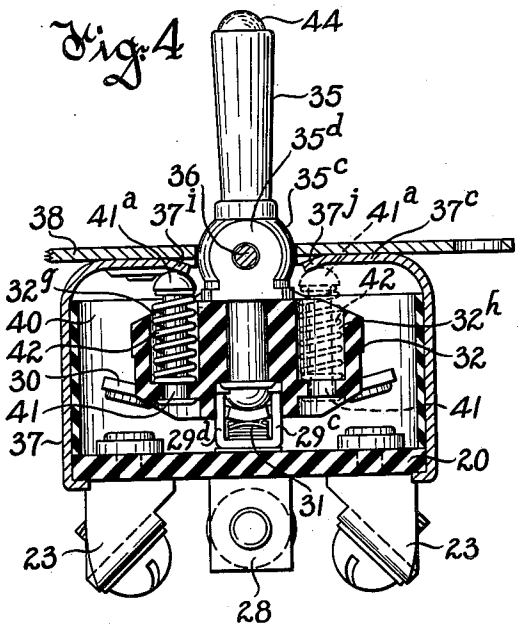


Fig. 5

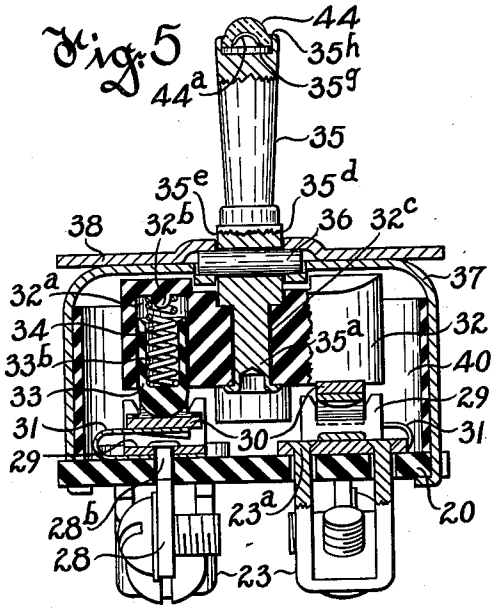


Fig. 6

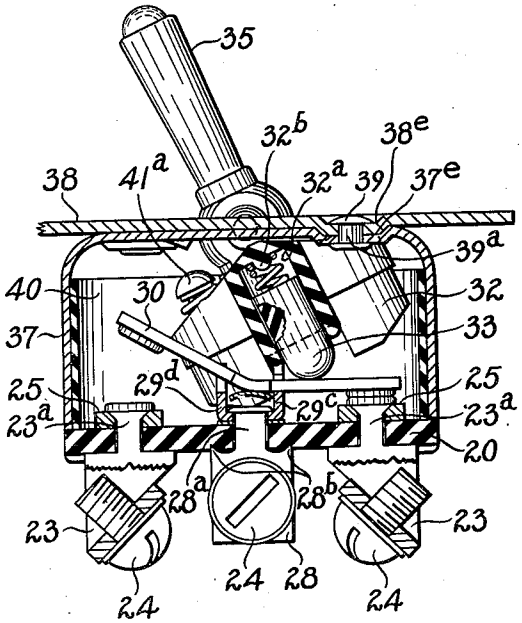


Fig. 7

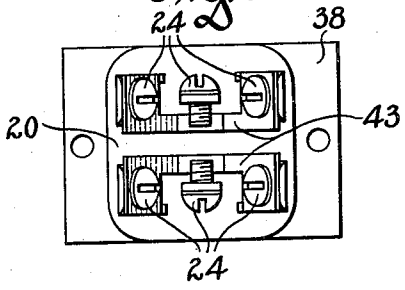
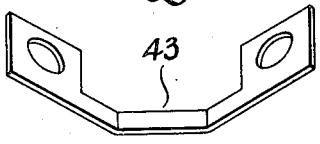


Fig. 8



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ELECTRIC SWITCH

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Fig. 9

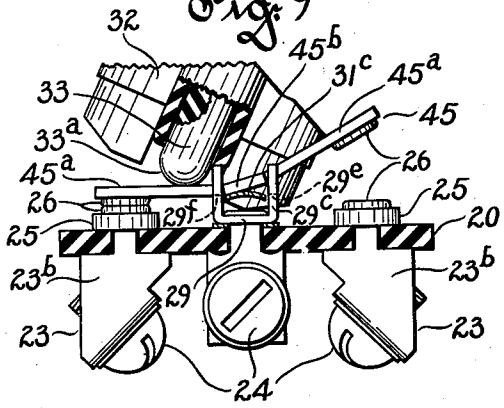


Fig. 10

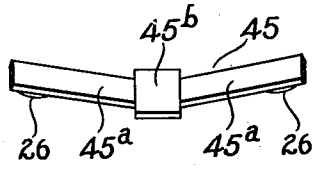


Fig. 11

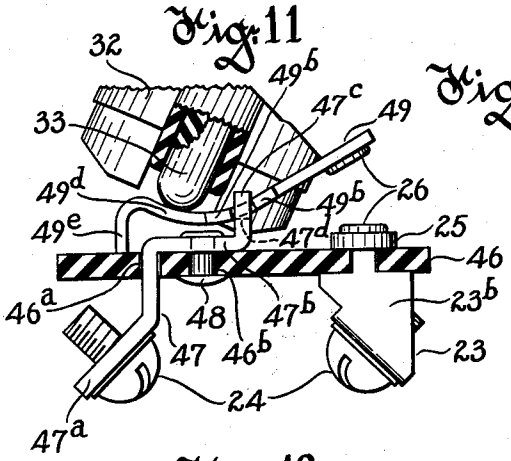


Fig. 12

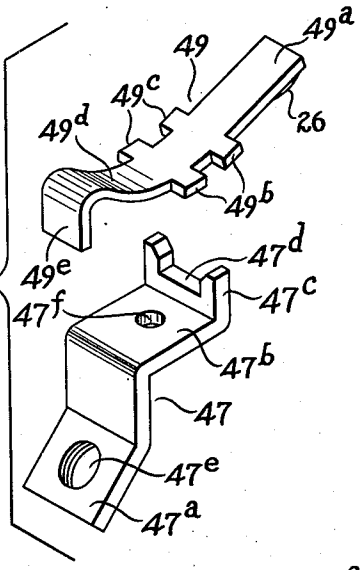


Fig. 13

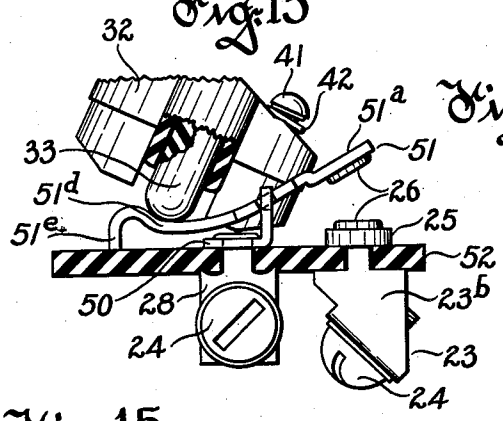


Fig. 14

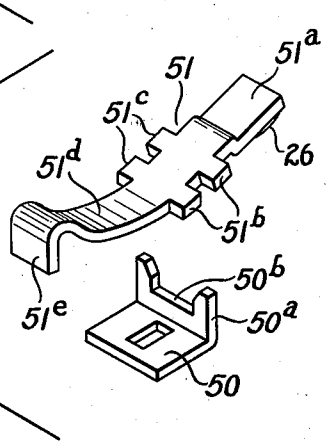
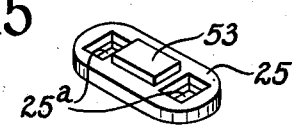


Fig. 15



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Patented July 8, 1941 2,248,361

UNITED STATES PATENT OFFICE

2,248,361

ELECTRIC SWITCH

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Application July 7, 1939, Serial No. 283,175

9 Claims. (Cl. 200—68)

This invention relates to improvements in electric switches. The invention relates more particularly to manually operable multi-pole switches for control of airplane signal lights and the like.

A primary object is to provide a switch of the aforementioned character which is extremely simple in construction and reliable in operation.

Another object is to provide a minimum number of switch parts, including like parts, which may be combined in selected groups to provide switches having substantially different electrical characteristics.

Another object is to provide novel forms of contacts, terminals and contactors, and novel actuating means for the latter.

Another object is to provide switches of the aforementioned character having a relatively high current controlling capacity.

Another object is to provide switches of the aforementioned character of the double-throw type.

Another object is to provide double-throw switches, having novel means for insuring good electrical connections between the tiltable contactors and the terminal elements which support the latter.

Another object is to provide improved means for pivotally supporting and guiding the operating lever of the switch.

Another object is to provide a switch having novel spring means associated therewith to normally bias the contactors thereof from one or the other of their extreme positions.

Another object is to provide a double-throw switch mechanism having such spring means to bias the contactors from both of their extreme "on" positions to an intermediate "off" position.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described; it being understood that the embodiments illustrated are susceptible of modification in respect of certain structural details thereof without departing from the scope of the appended claims.

In the drawings,

Figures 1 and 2 jointly illustrate the parts of a double-pole, double-throw (or three-position) switch as constructed in accordance with my invention,—most of the switch parts being shown in separated relation, and the usual binding screws being omitted.

Fig. 3 is a bottom plan view of the switch parts of Figs. 1 and 2 in assembled relation,—with the binding screws in assembled relation.

Fig. 4 is a central vertical section through the switch shown in Figs. 1 to 3, in the plane of oscillation of the operating lever, which is shown in elevation,—the movable switch parts being shown in their intermediate, or "off" position.

Fig. 5 is a partial central vertical section, in a plane at right angles to the section of Fig. 4,—portions of certain of the switch elements being shown in elevation.

Fig. 6 is a sectional view similar to but to one side of the section of Fig. 4, showing the movable switch parts in one of their extreme "on" positions.

Fig. 7 is a view similar to Fig. 3, but showing the addition of a pair of bus members for electrically connecting the end terminal members of each set, whereby (see Fig. 4) the movable switch parts will be biased out of one extreme position upon release of the operating lever, for momentary completion of a circuit, or will be permitted to remain in their other extreme position upon release of said lever for maintenance of the switch parts in circuit completing position.

Fig. 8 is a perspective view of one of the bus members shown in Fig. 7.

Fig. 9 is a fragmentary view, partly in side elevation and partly in vertical section, of a double-pole, double-throw switch without an intermediate "off" position,—the form of the contactors, which are slightly different from those shown in Figs. 1 to 6, insuring this characteristic.

Fig. 10 is a perspective view of the modified form of contactor shown in Fig. 9.

Fig. 11 is a fragmentary view similar to Fig. 9, but with stationary and movable contact parts adapted to provide a multi-pole switch of the single throw "on" and "off" type.

Fig. 12 is a perspective view of the contactor and supporting terminal therefor shown in Fig. 11.

Fig. 13 is a view similar to Fig. 11, but having a modified form of contactor and a modified form of pivotal support and wiring terminal for the latter.

Fig. 14 is a perspective view of the contactor and the pivotal support therefor shown in Fig. 13, and

Fig. 15 is a perspective view of a slightly modified form of stationary contact tip of oblong form which may be substituted for the circular contact tips shown in the other figures.

Referring first to the switch shown in Figs. 1

to 6, inclusive, the numeral 20 designates a supporting base preferably comprising a flat punched plate of insulating material. Base 20 is of approximately square form with rounded corners, the same being provided with rectangular notches 21 arranged in alined pairs at two of the parallel edges of the base and said notches being arranged singly, centrally and in alinement with each other at the other parallel edges of said base. Base 20 is provided with substantially circular small openings 22 arranged in four pairs in the manner best illustrated in Fig. 2. Said pairs of openings 22 are adapted to accommodate the reduced ends 23a of the parallel arms 23b of four like wiring terminal members 23,—the connecting portions 23c of which are angled upwardly, and said terminal members being assembled with respect to base 20 and with respect to each other as shown in Figs. 2 and 3 to facilitate attachment of circuit wires thereto while minimizing the over-all depth of the switch. Thus, as shown in Fig. 2, each connecting portion 23c is provided with a tapped opening 23d to accommodate the shank of a binding screw 24,—the heads of said screws being arranged in opposed pairs in downwardly divergent relationship to each other, as illustrated in Figs. 3, 4 and 6. The shoulders formed on arms 23b by the reduced ends 23a are adapted to abut the lower surface of base 20.

The four stationary contacts of the switch comprise flat punched metal plates 25 each having a pair of rectangular openings 25a through and upwardly beyond which the reduced ends 23a are adapted to extend,—said openings 25a having flared or enlarged upper ends, and the ends 23a being upset or swaged to fill said enlarged upper ends of the openings, to provide a rigid and permanent connection of members 23 and plates 25 to each other and to base 20. In practice the plates 25 are formed of brass or other good conducting metal, and to provide a good contacting area thereon I prefer to attach to each plate 25, as by welding, a relatively thin disk or button 26 of fine silver, or similar contact metal. To facilitate such welding of disks 26 I prefer to provide each of the latter with a small integral nib or stud 26a (see Fig. 1), which will act to localize the welding current, with resultant fusion of said stud without fusion of or damage to the main body of the disk.

Base 20 is further provided with a pair of rectangular openings 27, arranged as shown in Fig. 2, to accommodate the reduced upper ends 28a of a pair of flat punched sheet metal terminal members 28,—the shoulders formed by said ends 28a being curved outwardly and upwardly to provide a pair of sharp edges or teeth 28b which are pressed into the lower surface of base 20 to assist in retaining the respective members 28 in the planes thereof illustrated in Figs. 3 and 6. Each reduced end 28a extends upwardly through a correspondingly shaped opening 29a in the flat bottom portion 29b of a punched and stamped U-shaped sheet metal member 29. (Fig. 2), and said ends are upset or riveted as shown in Figs. 2 and 6 to retain members 28 and 29 in assembled relation to each other and to base 20.

Each member 29 is provided with a pair of upstanding parallel arms 29c and 29d which are provided with upwardly opening notches 29e and 29f, the bottom edges of which notches are respectively adapted to provide pivot bearings for the opposite upwardly angled arms 30a, 30a of tiltable contactors 30; and the side edges of which notches prevent lateral displacement of said contactors. The mid-portions of contactors 30 are provided with lateral extensions 30b, 30b which fit between the arms 29c, 29d of members 29 to prevent substantial displacement of said contactors in either direction with respect to the length of the latter, as best illustrated in Figs. 4 and 6.

I preferably interpose between the top surface of base 20 and the flat portion 29b of each member 29 the perforated flat portion 31a of a member 31 formed of phosphor bronze, or a similar resilient metal of good electrical conductivity. Each member 31 includes an integral arm 31b which is bent to provide for positioning thereof between the arms 29c and 29d of one of the members 29,—and the free end 31c of each arm is of upwardly convex form in transverse cross section (Figs. 4 and 6) and biased upwardly against the mid-portion of the contactor 30 associated therewith. By this means a good electrical connection between each contactor 30 and its support 29 and terminal 28 is insured at all times. As shown in Fig. 2, each terminal member 28 is provided with a tapped opening to accommodate the shank of a binding screw 24,—the shanks of said screws extending inwardly through members 28 toward each other, as shown in Fig. 3.

Positioned above contactors 30 is a molded member or block 32 of "Bakelite" or other suitable insulating material, said member being of substantially cruciform in horizontal cross section (see Fig. 1),—two of the arms of member 32 overlying the respective contactors 30, and each of said arms having a downwardly opening substantially cylindrical recess 32a which is adapted to accommodate with a free sliding fit a substantially cylindrical molded insulating plunger 33. Plungers 33 have lower ends 33a of rounded or hemispherical form adapted for continuous engagement with the respective contactors 30. Each plunger 33 is provided with an upwardly opening cylindrical recess 33b (Figs. 1 and 5) to accommodate and provide an abutment for the lower end of a coiled compression spring 34 the upper end of which abuts the end wall of one of the recesses 32a. The end wall of each recess 32a is provided with a projection or boss 32b (Fig. 5) to be surrounded by the upper end coils of spring 34 to retain the latter in centered relation, whereby fouling of the spring by its associated plunger 33 is prevented.

Member 32 is provided with a centrally located cylindrical opening or passage 32c which is adapted to provide for downward insertion of the reduced cylindrical lower end 35a of a metal lever 35 (preferably machined), said lower end having a hollow portion which is spun or upset over the lower surface of member 32 (Figs. 4 and 5) to rigidly secure said parts to each other. Member 32 is provided at its upper end with a flat surface 32d (Fig. 1) against which the flat surface 35b of the intermediate enlarged portion 35c of said lever is adapted to abut, said enlarged intermediate portion having parallel flat sides 35e and 35d. The lower portions of said flat sides 35e and 35d are adapted to fit rather closely between the parallel vertical walls 32e and 32f arranged on opposite sides of the flat surface 32d aforementioned, whereby relative rotation of member 32 and lever 35 is prevented.

The enlarged portion 35c of lever 35 is provided with a passage 35f of circular cross section

extending transversely therethrough in a plane at right angles to the flat sides 35d, 35e. Freely insertable through passage 35f and projecting from opposite sides of lever 35 is a pivot pin 36, the ends of which are adapted to seat within the upwardly opening bearings 37a, 37b formed in the flat upper surface 37c of a stamped sheet metal housing member 37 of substantially inverted cup shape, and of substantially rectangular contour to conform to the shape of base 20. Said upper surface 37c of the housing is provided between the bearings 37a, 37b with a substantially rectangular opening 37d (Fig. 1) which is adapted to rather closely accommodate the enlarged intermediate portion 35c of lever 35 to assist in restricting the latter to oscillatory movement in a single plane.

Superimposed upon the flat surface 37c of the housing is a substantially flat metal plate 38 of relatively larger dimensions than said flat surface. Plate 38 is provided centrally thereof with an approximately rectangular opening 38a to accommodate the intermediate enlarged portion 35c of lever 35, and with a pair of downwardly opening bearings 38b, 38c, complementary to the bearings 37a, 37b aforementioned to properly accommodate the opposite ends of pivot pin 36 (see Fig. 5). The top surface 37c of housing 37 is provided at diagonally opposite points with relatively large countersinks or recesses 37e and 37f,—the bottom walls of said recesses having openings 37g, 37h respectively formed therein. In like manner, plate 37 is provided with relatively smaller countersinks 38e and 38f having openings 38g and 38h formed in the respective bottom walls thereof. Said countersunk portions are telescoped or nested in the manner best illustrated at 37e, 38e in Fig. 6. Rivets 39 have their heads positioned within countersinks 38e, 38f—their shanks 39a penetrating the aforementioned openings and being upset over the inner side of the surface 37c of the casing (Fig. 6) to rigidly and permanently secure the casing and supporting plate to each other.

As illustrated in Fig. 1, disks or buttons 26, preferably composed of fine silver, are welded or otherwise rigidly attached to the lower surfaces of the arms 30a of each contactor 30, for cooperative engagement with the disks attached to the stationary contact plates 25.

In practice the side walls of casing 37 are lined or covered by an insulating strip, which is preferably in the form of a section 40 of wound paper tubing, rather closely conforming to the inside contour of said casing and insertable bodily into the latter. By this means grounding or jumping of any arcs to the casing from the sets of stationary contacts and contactors is effectually prevented. Plate 38 is preferably provided with a pair of openings 38i and 38j adjacent the respective ends thereof to provide for attachment of the switch as a whole, by screws or bolts (not shown), to a panel or other suitable support.

With respect to Figs. 1 to 6, and with particular reference to Fig. 4, it will be noted that due to the trough formation at the mid-point of each contactor 30, a definite intermediate "off" position is provided for the contactors,—the operating lever being retained in its intermediate or vertical position by the coaction or cooperation of the switch contactors and the operating elements therefor. As shown in full lines in Fig. 4 a bolt 41 is positioned within a recess 32g formed in block 32 and opening to the upper surface of the latter,—said recess being of sufficiently large diameter to freely accommodate a coiled compression spring 42 which surrounds the shank of bolt 41 and underlies the rounded or hemispherical head 41a thereof to bias said head against the inner side of the flat top surface 37c of the casing,—said surface 37c preferably having lugs 37i and 37j partially sheared therefrom and bent inwardly at an angle thereto for cooperation with a bolt head 41a at either or both sides of the pivotal center of the lever 35.

The bottom wall of recess 32g is provided with an opening to afford sliding clearance for bolt 41,—the lower end of the bolt shank being upset or riveted as shown to limit the degree of upward displacement of the bolt. Thus, assuming use of a single bolt 41 as shown in full lines in Fig. 4, it will be apparent that upon clockwise pivotal movement of lever 35 the contactors will engage the left hand stationary contacts only so long as lever 35 is manually held against the bias of the aforementioned spring 42,—whereas upon manual release of lever 35 the same and the other movable switch parts will assume the intermediate or "off" positions thereof illustrated.

In the absence of the bolt 41 and spring 42 shown in dotted lines in Fig. 4, it will be understood that upon counterclockwise operation of lever 35 the contactors will be engaged with the cooperating contacts at the right and will be maintained in such engagement by the action of the aforementioned plunger springs 34 pending manual operation of lever 35 in a clockwise direction. With such an arrangement, it is obvious that if the right hand and left hand contacts are provided with a common circuit connection—as by use of a pair of conductors or bus members 43 (Figs. 7 and 8), the circuit or circuits to be controlled may be completed temporarily (or only so long as lever 35 is manually held) upon clockwise movement of said lever from its intermediate position; whereas the circuit or circuits may be completed upon counterclockwise movement of said lever from its mid-position, and will remain completed upon manual release of the lever. Manifestly such function, or a similar function, may be obtained by omitting the bus members 43 and by providing different circuit connections for the left hand and right hand contacts of the respective sets.

As aforeindicated, block 32 is likewise provided at the right hand side of the pivotal center of lever 35 with a recess 32h which accommodates a bolt 41 and a spring 42 (dotted lines) like the corresponding parts aforedescribed, whereby the contactors will be automatically biased to their intermediate "off" position upon release of lever 35 after counterclockwise movement of the latter. Under the last mentioned conditions, if the left hand bolt 41 and spring 42 are omitted, the switch will function in the reverse manner from that aforedescribed. That is to say, upon counterclockwise movement of lever 35 from its mid-position the contactors will be biased out of engagement with the right hand contacts upon manual release of the lever; whereas upon manual clockwise movement of the lever from its mid-position the contactors will be permitted to remain in engagement with the left hand contacts (under the bias of plunger springs 34) pending manual operation of lever 35 in a counterclockwise direction.

In certain installations it may be desirable to provide for automatic return of the contactors to their intermediate "off" position upon release of lever 35 after operation thereof in either direc-

tion,—in which case it is of course only necessary to employ both of the bolts 41 and the springs 42 shown in full lines and in dotted lines in Fig. 4.

The lever 35 is preferably provided with a luminous tip 44 comprising an inverted hollow glass or lens the inner surface of which is provided with a coating or layer of luminous paint 44a or similar substance. Lens 44 is freely insertable into a recess 35c provided in the upper end of the lever,—a soft fiber or paper disk being interposed between the bottom wall of said recess and the open end of lens 44 to provide a seal for the latter and to provide a cushion therefor to accommodate the pressure thereon incident to inward spinning or upsetting of the upper edge of the peripheral wall 35b of said recess, whereby the lens is permanently attached to the lever.

In Fig. 9 all of the parts employed, except the contactors may be identical with those aforedescribed, and the same have been given corresponding numerals of reference,—it being understood that Fig. 9 is likewise intended to illustrate a switch of the double-pole, double-throw type, but without an "off" position. In Fig. 9 each contactor 45 is provided between its pair of arms 45a, 45a with a straight or horizontal portion 45b, which functions to insure against intermediate "off" positioning of the contactors. As will be apparent from Fig. 9, each contactor 45 is at all times fulcrumed upon one or the other of the edges 29e or 29f provided in the arms 29c and 29d of its supporting element 29. Moreover, the horizontal portion 45b of each contactor prevents engagement of the lower end 33a of its associated plunger 33 therewith in a manner to apply equal degrees of pressure to the fulcrum points thereof, as distinguished from the effect provided by the trough or groove formation provided at the midpoints of contactors 30 in Figs. 1 to 6.

In a device like that illustrated in Fig. 9, I may, if desired, utilize a single bolt 41 and spring 42 like those aforedescribed, and arranged at one side or the other of the pivotal center of the aforementioned lever 35, whereby the lever and the contactors are normally biased to one extreme position for completing a circuit or circuits controlled thereby. In such a device as that disclosed in Fig. 9, two of the spring-pressed bolts 41 would not be employed, because of the lack of an intermediate "off" position, as will be obvious. Thus Fig. 9 discloses a double-pole, double-throw switch having two alternative "on" positions,—as distinguished from the three-position switch (two alternative "on" positions and an intermediate "off" position) shown in Figs. 1 to 6.

Fig. 11 illustrates a modified form of switch of the double-pole, single-throw type. Most of the parts aforedescribed are employed in a switch like that illustrated in Fig. 11, and the like parts illustrated have been given corresponding numerals of reference. Inasmuch as the switch of Fig. 11 provides a single "on" position and a single "off" position for the contactors, it follows that one stationary contact (left hand) of each of the sets aforedescribed is omitted. The insulating base 46, although of the same size and contour as base 20 aforedescribed, is provided with a pair of rectangular openings, one of which is shown at 46a, to provide for downward insertion of the wiring terminal ends 47a of a pair of members 47 each having a flat portion 47b superimposed upon the upper surface of base 46, and a vertically extending arm 47c having an upwardly opening notch 47d which provides a single fulcrum for its associated contactor. The flat portion 47b of each member 47 is provided with an opening 47f alined with an opening 46b in base 46, a headed rivet 48 having its shank extending upwardly through said openings and being upset over the upper surface of the base.

Each contactor 49 in the switch of Fig. 11 consists of a punched and stamped sheet metal member provided at one end with an arm 49a, to the lower surface of which a fine silver contact disk or tip 26 is attached in the manner aforedescribed. Member 49 is provided at opposite sides thereof with sets of spaced lateral extensions 49b and 49c, (Fig. 12) which sets accommodate therebetween the respective portions of arm 47c at opposite sides of the notch 47d in the latter. The pivotal connection between each contactor 49 and its associated supporting and wiring terminal member is illustrated in Fig. 11,—it being understood that relative lateral and longitudinal movement of the contactor with respect to its support is substantially prevented. The rear end portion of each contactor 49 is curved upwardly from the pivot point, as shown at 49d, and the end thereof is bent downwardly, as shown at 49e, to form a stop or abutment for engagement with the upper surface of base 46 to limit the degree of opening movement of the contactor. The end 47a of each member is provided with a tapped opening 47e to accommodate the shank of a binding screw 24, as shown in Fig. 11. The single stationary contact and terminal unit 25, 23 of each set is identical with the corresponding units aforedescribed.

The switch illustrated in Figs. 13 and 14 is functionally identical with that shown in Figs. 11 and 12, and is structurally like the latter except for certain detail changes now to be pointed out. Thus in Fig. 13, I am able to employ wiring terminal elements 28 identical with those aforedescribed in connection with Figs. 1 to 6,—the supporting elements 50 for the respective contactors being quite similar to the elements 29 aforedescribed, except that elements 50 are provided with only one upstanding lug 50a which is notched as shown at 50b (Fig. 14) to accommodate a contactor such as that shown at 51. Thus each contactor 51 is provided with an end portion 51a slightly offset downwardly from the main body thereof, and to the lower surface of which the aforementioned silver contact tip 26 may be attached. Contactor 51 is provided with sets of spaced laterally extending lugs 51b, 51c for cooperation with the portions of lug 50a at opposite sides of notch 50b, whereby substantial lateral and longitudinal movement of contactor 51 is prevented.

Each contactor 51 is provided at the left hand side of its point of pivotal support with a relatively long curved portion 51d which terminates in a downwardly extending portion 51e which engages the upper surface of the insulating supporting base 52 to limit the degree of opening movement of the respective contactors. The stationary contact and terminal units 25, 23 of each set may be identical with the corresponding parts aforedescribed.

In Fig. 15 I have shown a contact plate 25 identical with the contact plates aforedescribed. Plate 25 has attached to the upper surface thereof, between the openings 25a, 25a, a rectangular plate or tip 53 of a suitable silver alloy. Tips 53 may be substituted for the disks or tips 26 on the stationary contact plates 25 of each of the switches aforedescribed,—the tips 26 of the

respective contactors of the switches remaining the same. The material of which the tips 53 are formed is available commercially, and tips formed therefrom are characterized by an increased resistance toward welding or "freezing," as compared with tips formed of fine silver as aforedescribed. Thus, with switches of the aforementioned character employing fine silver tips upon the stationary contacts, the same are rated at 20 amperes at 125 volts A. C., whereas like switches having stationary contact tips formed of said silver alloy material have a rating of 40 amperes at 125 volts A. C. If desired, of course, the contact tips for both the stationary contacts and the contactors may comprise the aforementioned silver alloy material,—whereby the current controlling capacity of the switch will be still further increased. Obviously, all of the contact tips may be made of rectangular shape if desired.

When a switch of 40 ampere capacity is constructed I prefer to increase the spacing of the respective sets of contacts and contactors and/or to provide suitable means (not shown) to assist in controlling any arcs formed during operation of the switch.

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

1. In a multi-pole electric switch, in combination, an insulating base, a plurality of sets of spaced stationary contacts carried by said base, a contactor loosely and tiltably supported by one of the stationary contacts of each set and having an end portion overlying another contact of such set, an oscillatable metal operating lever pivotally supported above said insulating base, a molded insulating block rigidly attached to and movable with the lower end of said lever, said insulating block having a plurality of downwardly opening recesses formed therein and respectively alined with said contactors, an insulating plunger slidably mounted in each of said recesses, said plungers being arranged in parallel relationship to each other, a coiled compression spring interposed between the inner wall of each recess and its associated plunger to bias the latter toward its associated contactor, said plungers cooperating with said contactors to effect tilting movements of the latter with a quick action into and out of engagement with the aforementioned other stationary contacts of said sets upon movements of said operating lever in opposite directions respectively, and each of said contacts having a wiring terminal element associated therewith and exposed at the lower surface of said base.

2. In a multi-pole electric switch, in combination, an insulating base, a plurality of sets of spaced stationary contacts carried by said base, a contactor loosely and tiltably supported by one of the stationary contacts of each set and having an end portion overlying another contact of such set, an oscillatable metal operating lever pivotally supported above said insulating base, a molded insulating block rigidly attached to and movable with the lower end of said lever, said insulating block having a plurality of downwardly opening recesses formed therein and respectively alined with said contactors, an insulating plunger slidably mounted in each of said recesses, said plungers being arranged in parallel relationship to each other, a coiled compression spring interposed between the inner wall of each recess and its associated plunger to bias the latter toward its associated contactor, said plungers cooperating with said contactors to effect tilting movement of the latter with a quick action into and out of engagement with the aforementioned other stationary contacts of said sets upon movements of said operating lever in opposite directions respectively, each of said contacts having a wiring terminal element associated therewith and exposed at the lower surface of said base, and said plungers cooperating with said lever and said contactors to normally retain the same in one or the other of their extreme positions.

3. In a manually operable multi-pole electric switch, in combination, an insulating base, a plurality of sets of spaced stationary contacts carried by said base, a contactor loosely and tiltably supported by one of the stationary contacts of each set and having an end portion overlying another contact of such set, an oscillatable metal operating lever pivotally supported above said insulating base, a molded insulating block rigidly attached to and movable with the lower end of said lever, said insulating block having a plurality of downwardly opening recesses formed therein and respectively alined with said contactors, an insulating plunger slidably mounted in each of said recesses, said plungers being arranged in parallel relationship to each other, a coiled compression spring interposed between the inner wall of each recess and its associated plunger to bias the latter toward its associated contactor, said plungers cooperating with said contactors to effect tilting movements of the latter with a quick action into and out of engagement with the aforementioned stationary contacts of said sets upon movements of said operating lever in opposite directions respectively, each of said contacts having a wiring terminal element associated therewith and exposed at the lower surface of said base, said plungers cooperating with said lever and said contactors and tending to normally retain the same in one or the other of their extreme positions, and means including a spring-pressed bolt associated with said insulating block and adapted to cooperate with a suitable abutment to bias said block, said lever and said contactors out of one of said extreme positions.

4. In a manually operable multi-pole electric switch, in combination, a metal housing member, an insulating base attached to said housing member for support thereby, a plurality of sets of spaced stationary contacts carried by said base, there being three contacts in each set, a contactor loosely and tiltably supported by the intermediate contact of each set, said contactors having opposite end portions overlying the end contacts of the respective sets, an oscillatable metal operating lever pivotally supported above said insulating base, a molded insulating block rigidly attached to and movable with the lower end of said lever, said insulating block having a plurality of downwardly opening substantially cylindrical recesses formed therein and respectively alined with said contactors, a substantially cylindrical insulating plunger slidably mounted in each of said recesses, said plungers being arranged in parallel relationship to each other, a coiled compression spring interposed between the inner wall of each recess and its associated plunger to bias the latter toward its associated contactor, said plungers cooperating with said contactors to effect tilting movements of the latter jointly in either direction with a quick action into and out of engagement with the opposite end contacts

respectively upon movements of said lever toward its respective extreme positions, each of said contacts having a wiring terminal element associated therewith and exposed at the lower surface of said base, said plungers cooperating with said lever and said contactors and tending to normally retain the same in any one of a number of given positions thereof, a pair of headed bolts slidably carried by said block at opposite sides of the center of oscillation of the latter, and a pair of coiled compression springs interposed between the respective bolt heads and said block, whereby said bolt heads cooperate with said housing member to bias said block, said lever and said contactors out of their respective extreme positions.

5. In an electric switch of the multi-pole type, in combination, a casing including an inverted cup-shaped sheet metal member, a metal lever supported for pivotal movement relatively to said sheet metal member, an insulating base member rigidly attached to said sheet metal member at the open end of the latter, a molded insulating block rigidly attached to said lever at the lower end of the latter for movement thereby, a plurality of separate insulating members carried in parallel relationship to each other by said block and spring-biased downwardly with respect thereto, a corresponding number of sets of stationary and movable contacts carried by said base, each movable contact being tiltably supported by one stationary contact of each set, and said movable contacts being continuously engaged by the respective spring-biased insulating members for tilting movements by the latter with a quick action into and out of bridging engagement with other of the stationary contacts of said sets upon corresponding movements of said lever.

6. In a manually operable multi-pole electric switch, in combination, an insulating base, a plurality of transversely spaced sets of stationary contacts carried by said base, a wiring terminal element associated with each of said contacts and exposed at the lower surface of said base, a plurality of contactors each loosely and tiltably supported by one stationary contact of each set and having an upwardly angled end portion overlying another contact of such set, a molded insulating block supported for oscillatory movement relatively to said insulating base, said insulating block having a plurality of downwardly opening recesses formed therein and respectively alined with said contactors, an insulating plunger slidably mounted in each of said recesses, said plungers being arranged in parallel relationship to each other, a coiled compression spring interposed between the inner wall of each recess and its associated plunger to bias the latter toward its associated contactor, said plungers cooperating with said contactors to effect tilting movements of the latter into and out of engagement with the aforementioned other stationary contacts of said sets upon oscillatory movements of said insulating block in opposite directions respectively, and manually operable means including a pivotally supported metal lever engaged with said block for effecting such movements of the latter.

7. In a manually operable multi-pole electric switch, in combination, an insulating base, a plurality of sets of spaced stationary contacts carried by said base, a wiring terminal element associated with each of said contacts, a plurality of contactors each tiltably supported by one stationary contact of each set and having an upwardly angled end portion overlying another contact of such set, a molded insulating block supported for oscillatory movement relatively to said insulating base, said insulating block having spring-pressed insulating means associated therewith and projecting downwardly therefrom in parallel relationship to each other, said means cooperating with said contactors to effect tilting movements of the latter into and out of engagement with the aforementioned other stationary contacts of said sets upon oscillatory movements of said insulating block in opposite directions respectively, and manually operable means including a pivotally supported metal lever for effecting such movements of said insulating block.

8. In a multi-pole electric switch, in combination, a sheet metal member, an insulating base attached to said sheet metal member for support by the latter, a plurality of sets of spaced stationary contacts carried by said base, a wiring terminal element associated with each of said contacts, a plurality of contactors each tiltably supported by one stationary contact of each set and having an upwardly angled end portion overlying another contact of such set, a molded insulating block supported for oscillatory movement relatively to said insulating base, said insulating block having spring-pressed insulating means associated therewith and projecting downwardly therefrom at a right angle to the axis of oscillation thereof, said means cooperating with said contactors to effect tilting movement of the latter into and out of engagement with the aforementioned other stationary contacts of said sets upon oscillatory movements of said insulating block in opposite directions respectively, and manually operable means including an oscillatable metal lever engaged with said block for effecting such movements of the latter.

9. In a multi-pole electric switch, in combination, a sheet metal member, an insulating base attached to said sheet metal member for support by the latter, a plurality of sets of spaced stationary contacts carried by said base, a contactor tiltably supported by one of the stationary contacts of each set and having an end portion overlying another contact of such set, an oscillatable metal operating lever pivotally supported relatively to said insulating base, a molded insulating block engaged with and movable by said lever, said block being recessed in its lower surface and having spring-pressed insulating plunger means associated therewith and projecting downwardly therefrom at a right angle to the axis of oscillation of said lever, said plunger means cooperating with said contactors to effect tilting movement of the latter into and out of engagement with the aforementioned other stationary contacts of said sets upon movements of said operating lever in opposite directions respectively, each of said contacts having a wiring terminal element associated therewith, said plunger means cooperating with said lever and said contactors to normally retain the same in any one of a number of given positions thereof, and additional means including a coiled spring associated with said block and said lever and cooperating with said metal member to bias said block, said lever and said contactors out of one of said given positions.

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