

Oct. 14, 1947.

M. F. KOENIG ET AL

2,428,848

ELECTRIC SWITCH

Filed March 21, 1945

2 Sheets-Sheet 1

Fig. 1

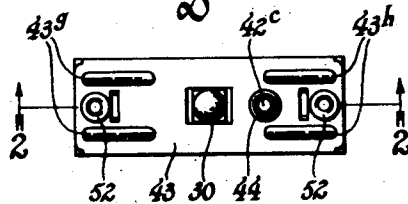


Fig. 2

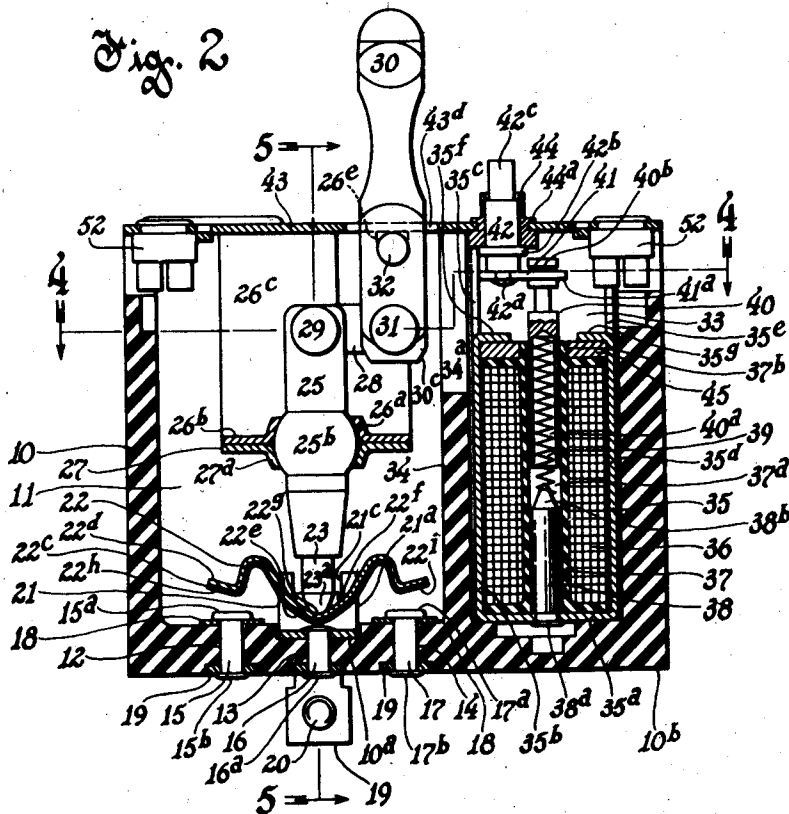
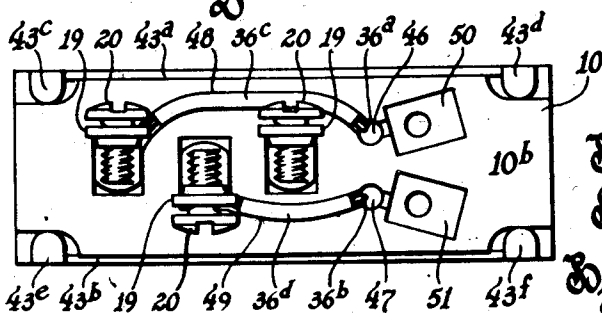


Fig. 3



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2 Sheets-Sheet 2

Fig. 4

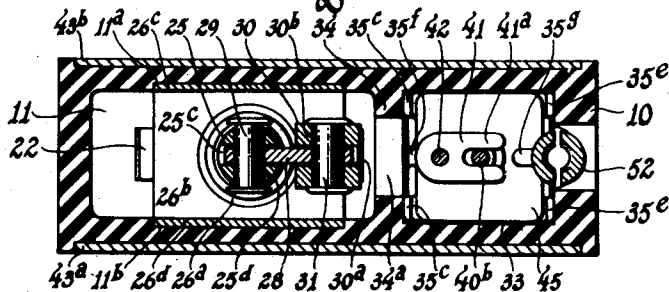


Fig. 5

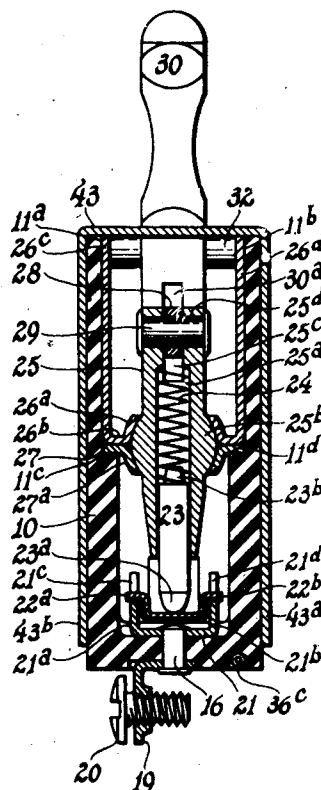


Fig. 6

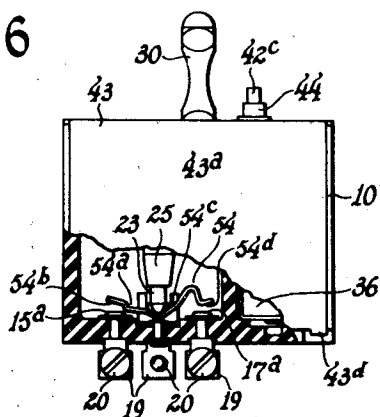


Fig. 7

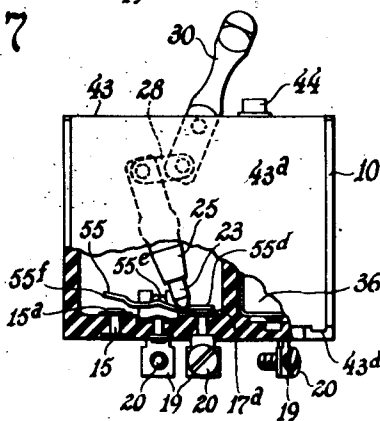
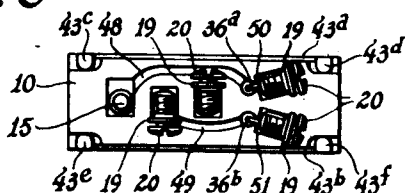


Fig. 8



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2,428,848

ELECTRIC SWITCH

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Application March 21, 1945, Serial No. 583,974

8 Claims. (Cl. 200—6)

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This invention relates to improvements in electric switches, and more particularly to a novel form of combined switch and electromagnetic indicator.

A primary object of the invention is to provide a novel form and arrangement of the switch parts and a novel form and arrangement of the electromagnetic indicating means to facilitate positioning thereof within a single housing.

Another object is to provide a novel form of housing adapted to support the switch mechanism at one end thereof and the indicating means at the other end thereof, while at the same time enabling location of the manually operable lever in a centered relationship to the upper end of the housing.

Another object is to provide an arrangement embodying switch parts and indicator parts of minimum size, to meet the space limitations of similar electrical devices to be attached to the control panel of an airplane or the like.

Another object is to provide alternative forms of contactors and contacts and terminals for the latter, to afford various different circuit controlling characteristics of the unit.

Another object is to provide a novel form of recessed insulating base into which most of the switch and indicator parts may be readily inserted and thereafter retained by merely attaching the cover member.

Another object is to provide means integral with the cover member to enable attachment thereof to the base and to afford an armored covering for the main sides of the latter.

Another object is to provide a switch of the aforementioned character of relatively small size with respect to its current controlling capacity.

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 with respect to the structural details thereof without departing from the scope of the appended claims.

In the drawings,

Figure 1 is a top plan view (actual size) of a combined electric switch and indicator constructed in accordance with my invention.

Fig. 2 is an enlarged longitudinal vertical section, on the line 2—2 of Fig. 1; certain of the switch parts and indicator parts being shown in elevation, and the contactor being of a type affording an intermediate "off" position, and a

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momentary "on" position when moved in each direction.

Fig. 3 is a bottom plan view of the device shown in Figs. 1 and 2, showing the bus connections between the coil leads and certain of the wiring terminals of the switch.

Fig. 4 is a horizontal sectional view, on the broken line 4—4 of Fig. 2;

Fig. 5 is a vertical section, on the line 5—5 of Fig. 2.

Fig. 6 is a view partly in side elevation, and partly in vertical section, of a device like that of Figs. 1 to 5, but with a modified form of contactor affording an intermediate "off" position, a momentary "on" position when moved in one direction, and a non-momentary "on" position when moved in the opposite direction.

Fig. 7 is a view similar to Fig. 6, but with a still further modified form of contactor to provide a non-momentary "on" and "off" switch; the left-hand contact acting as a "dummy" to afford this characteristic; and the coil of the indicator having separate terminal members associated therewith to provide for a different type of circuit connection, and

Fig. 8 is a bottom plan view of the device shown in Fig. 7.

Referring first to the device shown in Figs. 1 to 5, the numeral 10 designates a molded insulating base of substantially rectangular contour; said base being of relatively small width and of relatively greater length and depth. Base 10 is provided at the left-hand side thereof (Fig. 2) with a substantially rectangular recess 11, the bottom wall of which is provided with three equally spaced circular openings or passages 12, 13 and 14 to accommodate the shanks of a corresponding number of headed rivets 15, 16 and 17. The rivets 15 and 17 are composed of silver, or a composition or alloy including silver; whereby the heads 15^a and 17^a thereof are respectively adapted to act as stationary contacts of the switch. Said rivets 15 and 17 may, of course, be of identical form and the aforementioned heads 15^a and 17^a thereof have washers 18, 18 underlying the same as illustrated. The shank ends of said rivets penetrate openings provided in a pair of like wiring terminal members 19, 19, and said ends are upset over said terminal members, as shown at 15^b and 17^b in Fig. 2.

Said terminal members have portions bent downwardly at a right angle to the lower surface of base 10 and are tapped to accommodate the shanks of binding screws 20 of well known form.

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The head of rivet 16 overlies the intermediate or connecting portion of a contactor supporting bracket 21 which is positioned within a correspondingly shaped recess 10^a in said bottom wall to positively prevent rotation of said bracket; both rivet 16 and bracket 21 being preferably composed of brass, with a plating of silver. The shank of rivet 16 is adapted to penetrate an opening in a third terminal member 19, and is upset over the latter as shown at 16^a.

As shown in Figs. 2 and 3, the lower surface 10^b of base 10 is provided with depressions to accommodate the correspondingly shaped portions of the terminal members 19, to positively prevent relative rotation of the latter; the terminal member 19 associated with rivet 16 also having a binding screw 20 associated therewith. The vertical upstanding arms 21^a and 21^b of member 21 have upwardly opening rectangular notches 21^c and 21^d formed therein to accommodate the lateral projections 22^a and 22^b formed upon the contactor 22.

Contact 22 is preferably stamped to the form illustrated in Figs. 2 and 5 from a suitable blank punched from a bimetallic strip, the arrangement being such that the contactor has a lower layer of lamination 22^c of silver and an upper layer 22^d of the base metal such as copper. The intermediate portion of contactor 22 is bent to approximately V-shape, the inclined cam surfaces 22^e and 22^f of which meet or merge in a concave portion 22^g below the plane of the aforementioned lugs 22^a and 22^b; the manner in which the latter are upwardly offset being best illustrated in Fig. 5. Each end portion of contactor 22 is bent as shown to extend upwardly at a predetermined angle from the cam surfaces 22^e and 22^f, then downwardly at a predetermined angle, and then endwise at substantially a right angle to said downwardly extending portions respectively to provide the silver tip portions 22^h and 22ⁱ, whereby said tips are adapted to engage or abut flatwise against flat heads 15^a and 17^a of the silver rivets aforementioned.

Contact 22 is adapted to be continuously engaged by the rounded or hemispherical lower end 23^a of an insulating plunger 23 of circular form in transverse cross section. Plunger 23 is provided with a reduced upper end portion 23^b adapted to fit within the lower end of a coiled compression spring 24; the lower end coil of said spring seating against the shoulder formed by portion 23^b. The upper end of spring 24 seats against the upper end of a cylindrical recess 25^a formed in a metal lever 25; the arrangement being such that when the parts are assembled spring 24 will be placed under a predetermined degree of compression, whereby the same tends to eject plunger 23 outwardly from said recess. As shown in Figs. 2 and 5, plunger 23 normally projects a substantial distance beyond member 25.

Member 25 is provided intermediate its length with a partially spherical enlargement 25^b which merges into the upper and lower portions of said member. Enlargement 25^b fits a ball within the upper portion 26^a of a socket; said portion 26^a being formed integrally with and bent upwardly from the connecting portion 26^b of a substantially U-shaped bracket member whose upstanding parallel sides or arms are designated by numerals 26^c and 26^d (Figs. 2 and 5). The lower portion 27^a of the socket is formed integrally with and bent downwardly from a metal plate

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27 which is preferably coextensive with the area of the bracket portion 26^b, said plate 27 being spot-welded or otherwise rigidly attached at at least two diagonally opposed corners thereof with said portion 26^b to retain said socket portions in fixed relationship to each other. As best illustrated by comparison of Fig. 5 with Fig. 2, the openings provided in the respective socket portions 26^a and 27^a are of somewhat elliptical contour, whereby the same are adapted to afford clearance for the upper and lower end portions of member 25 during oscillatory movement of the latter while acting to limit the same to oscillatory movement in a single plane.

As best illustrated in Figs. 4 and 5, the opposite side walls of recess 11 are respectively provided with rectangular indentations or grooves 11^a and 11^b which open to the upper surface of base 10, said indentations being adapted to accommodate in a flush relationship the aforementioned bracket arms 26^c and 26^d. As shown in Fig. 5, the horizontal shoulders 11^c and 11^d formed by said indentations 11^a and 11^b, respectively, are adapted to serve as seats for the opposite side portions of plate 27, so that when the aforementioned bracket is inserted into recess 11 the upper ends of the arms 26^c and 26^d will be positioned flush with the upper surface of base 10.

As shown, lever 25 is provided with an upwardly opening kerf or cut 25^c, which is adapted to loosely receive one perforated end of a metal link 28; said lever having adjacent its upper end a circular passage or opening 25^d extending through said kerf at a right-angle to the plane of the latter. A headed pin 29 has its shank penetrating said last mentioned opening and the perforated end of link 28 to provide a pivotal connection between said parts, the shank end being upset as shown to secure said parts in assembled position. The other perforated end of link 28 fits loosely into a kerf 30^a (Figs. 4 and 5) in the lower end of a manually operable lever 30; said lower end having therein a circular passage or opening 30^b extending through said kerf at a right angle to the plane of the latter. A headed pin 31 has its shank penetrating said last mentioned opening and the perforated end of link 28 to provide a pivotal connection between said parts, the shank end being upset as shown to secure said parts in assembled position.

As shown at 30^c in Fig. 2, the lower end of lever 30 is partially rounded to insure proper clearance between the same and lever 25 during pivotal movement of the respective parts. Lever 30 is provided intermediate its length with a circular opening (not shown) to accommodate with a drive fit the intermediate enlarged portion of a pin 32 (Figs. 2 and 5); the oppositely extending ends of which pin are adapted to bear within open pivotal bearings formed in the upper edges of the side walls 26^c and 26^d of recess 26; one of said bearings being shown in dotted lines at 26^e in Fig. 2. The upwardly projecting portion of lever 30 is preferably shaped as illustrated to facilitate manipulation thereof by the thumb and/or the index finger of an operator's hand.

Base 10 is provided at its right-hand end (Fig. 2) with a recess 33 of substantially square form in transverse cross section, said recess 33 being separated from recess 11 by a vertical wall 34 which is provided at its upper end with a relatively wide rectangular notch 34^a to provide clearance for lever 30 upon oscillation of the latter. Recess 33 is adapted to accommodate a substan-

tially U-shaped sheet metal bracket member 35, the lower or connecting portion 35^a of which is adapted to seat upon the bottom wall of recess 33. One upstanding arm 35^b of said bracket is provided with a forked extension whose portions 35^c, 35^d (Figs. 2 and 4) are located flush with the upper surface of base 10. The other upstanding arm 35^d of said bracket is likewise provided with a forked extension, the portions 35^c, 35^e of which end short of the upper surface of base 10.

A wire of extremely small gauge is wound in the form of a coil 36 around a bobbin or spool 37 formed of a suitable insulating material, such as "Bakelite." The passage 37^a through said spool is adapted to accommodate a pin or supporting stud 38, the reduced lower end of which penetrates an opening of corresponding size in the connecting portion 35^a and is upset over the lower surface of the latter as shown at 38^a in Fig. 2. The upper end 38^b of said pin is preferably of cone shape to accommodate the lower end of a coiled compression spring 39, whose upper end engages the end wall of a downwardly opening recess 40^a formed in a metal plunger 40.

Plunger 40 is provided adjacent its upper end with a reduced or neck portion 40^b to accommodate the forked end 41^a of a flat, punched sheet metal member 41. Member 41 is provided with a perforation to accommodate the reduced or shank end of a metal member 42, said shank end being upset over the lower surface of member 41 as indicated at 42^a to secure said parts to each other. Member 42 is provided with an integral annular flange portion 42^b which is adapted to engage the lower surface of a metal bushing 44 attached to the cover member 43 of the device, said bushing having an integral portion 44^a thereof upset over the upper surface of cover member 43 for this purpose. Bushing 44 thus acts as a guide for member 42; the hollow upper end of the latter having cemented therein or otherwise rigidly attached thereto a cylindrical member 42^c of insulation or the like. The flat upper end of member 42^c is preferably of a dark color such as black; whereas the peripheral portion thereof projecting beyond member 42 is preferably provided with a coating of luminous paint.

Spool 37 is provided at its upper end with an annular extension 37^b, and a flat punched sheet metal plate 45 of square form has an opening to accommodate said extension. The opposite arms of bracket 35 are provided with integral lugs 35^f and 35^g which are bent inwardly over plate 45 to rigidly secure the latter and the coil assembly within said bracket.

Recess 33 is provided in its bottom wall with a pair of openings 46 and 47 to accommodate the opposite ends of the wire of which the coil 36 is formed (see Fig. 3). Said wire ends have terminal extensions of different lengths attached thereto, as indicated by numerals 36^a and 36^b, the portions 36^c and 36^d of said extensions being adapted to fit within grooves 48 and 49 in the lower surface of base 10, to provide for electrical connection of one end of the coil wire to the left-hand terminal member 19 (Fig. 3) and for connection of the other end of the coil wire to the intermediate terminal member 19. As shown in Fig. 8, however, said extensions 36^a and 36^b may be made of relatively shorter, substantially equal, lengths to provide for attachment thereof to a pair of wiring terminal members individual to the coil; as hereinafter more fully described.

As best illustrated in Fig. 3, the lower surface of base 10 is provided with rectangular recesses

50 and 51 to accommodate the auxiliary terminal members as shown at 19, 19 in Fig. 8; said recesses 50 and 51 respectively having countersunk portions providing relatively thin integral diaphragms which may be broached or otherwise removed to accommodate the shanks of securing rivets (not shown). In each case, the bared ends of the coil extension wires are preferably soldered, brazed or otherwise rigidly and permanently attached to the horizontal portions of the respective terminal members 19, thus leaving the respective binding screws 20 free for attachment of the circuit wires.

The aforementioned cover member 43 is provided with integral, downwardly extending arms 43^a and 43^b which fit into grooves of corresponding size formed in the respective main sides of base 10 (as best illustrated in Fig. 4). The respective arms 43^a and 43^b of cover member 43 are likewise provided with integral lugs 43^c, 43^d and 43^e 43^f which are bent inwardly over the downwardly facing walls of notches or countersinks in the lower surface of base 10 to rigidly secure said parts in assembled relation.

As best illustrated in Figs. 2 and 5, the cover member 43 overlies the opposite ends of pivot pin 32 to retain the same within the aforementioned bearings in the side walls of base 10, said cover member 43 having a rectangular opening 43^d (Fig. 2) formed therein to provide for assembly thereof over the projecting end of lever 30 and to provide oscillatory clearance for the latter.

Cover member 43 has attached thereto at opposite ends thereof a pair of interiorly threaded members 52, 52 (see Fig. 4) which act as lock nuts in a well known manner, to accommodate the shanks of bolts or screws (not shown) whereby the complete device may be attached to the inner surface of a suitable panel or similar support.

As best illustrated in Figs. 1, 2, 6 and 7, the aforescribed mechanical arrangement of the parts is such as to provide for proper positioning of lever 30 in a central or symmetrical location relatively to the cover member 43. Also as shown, the coil 36 when deenergized permits the indicating portion 42^c of member 42 to project outwardly beyond bushing 42 under the bias of spring 39. On the other hand, upon energization of coil 36, plunger 40 is drawn inwardly against the bias of spring 39, at the same time retracting member 42 and the indicating portion 42^c of the latter.

With the terminal wires 36^c and 36^d of the coil 36 connected as shown in Fig. 3, it may be assumed that the righthand terminal member 19 has attached thereto by means of its binding screw 20 a wire leading from a suitable source of current supply. The intermediate terminal member (which has one terminal wire 36^d of the coil 36 attached thereto) may be connected by its binding screw 20 to one terminal of the operating winding of an electromagnetic switch or contactor (not shown), the other terminal of which winding is connected to ground. Similarly the left-hand terminal member 19 in Fig. 3, in addition to the illustrated connection thereof with the other terminal wire 36^c of coil 36, may be connected to ground, through the medium of a suitable conductor (not shown) attached by binding screw 20. Accordingly, with the parts in the respective positions thereof illustrated in Fig. 2, upon clockwise oscillation of lever 30 the lever 25 will be oscillated in a counterclockwise direction to effect engagement of the contactor tip 22ⁱ with stationary contact tip 17^a, thus completing a circuit from the right-hand terminal member 19

through the contactor 22 and the intermediate terminal member 19 to and through the operating coil (not shown) of an electromagnetically operable switch, and thence to ground. At the same time a circuit will extend from the right-hand terminal 19 through contactor 22 and the intermediate terminal 19, thence by the terminal wire 36^d of coil 36 through the latter, and by the other terminal wire 36^e of said coil to the left-hand terminal member 19, thence to ground; thus providing for energization of coil 36 and retraction of the indicating element 44 associated therewith.

In practice the circuit arrangement (not shown) is preferably such that the energizing circuit of the aforementioned electromagnetically operable switch is maintained independently of the contactor 22, after initial completion of such energizing circuit, so that upon manual release of lever 30 the switch parts will again assume the respective positions thereof illustrated in Fig. 2, but the coil 36 will remain energized and the indicating element 44 will remain in its retracted position.

Under the conditions last mentioned, upon counterclockwise movement of lever 30 the lever 25 will be moved in a clockwise direction to effect engagement of contactor tip 22^b with the left-hand stationary contact tip 15^a; the circuit arrangement preferably being such that both the operating coil of said electromagnetically operable switch and the coil 36 aforementioned will be short-circuited to effect deenergization thereof.

A circuit of the character aforescribed is disclosed in the copending application of A. P. Charbonneau, F. J. Russell and E. W. Seeger, Serial No. 444,304, filed May 25, 1942, for Electric circuit controller.

In the modified form of our invention illustrated in Fig. 6, all of the parts except the contactor 54 may be identical with the corresponding parts aforescribed. The contactor 54 differs from the contactor 22 in that the left-hand end 54^a of the former is adapted upon clockwise movement of lever 25 (as an incident to counterclockwise movement of lever 30) to provide for non-momentary engagement of contactor tip 54^b with stationary contact tip 15^a; lever 25 being also adapted for manual movement to provide momentary engagement of contactor tip 54^d with stationary contact tip 17^a; and lever 25 being further adapted for manual movement to and automatic retention in its intermediate "off" position illustrated.

Upon movement of lever 25 in a counterclockwise direction from the position thereof illustrated, the right-hand portion 54^c of contactor 54 cooperates with the spring pressed plunger 23 to provide for momentary engagement of contactor tip 54^d with the stationary contact tip 17^a; disengagement of said tips being effected automatically upon manual release of lever 30, with return of contactor 54 to the intermediate "off" position thereof illustrated. The three wiring terminal members 19 and their associated binding screws 20 may be the same as those employed in the device of Figs. 1 to 5; the operating coil 36 preferably having its terminal wires (not shown) respectively connected to the left-hand and center terminal members 19, 19, as shown in Fig. 3.

In the device of Figs. 7 and 8 the contactor 55 is shaped to provide for non-momentary engagement of contactor tip 55^d with stationary contact tip 17^a upon counterclockwise movement of lever 25 from its left-hand position, so that the lower end of plunger 23 rides over the interme-

mediate or central hump 55^e of said contactor. Upon clockwise movement of lever 25 from the right-hand extreme position thereof illustrated to its left-hand extreme position, so that plunger 23 rides over hump 55^e in the reverse direction, contactor tip 55^d will be non-momentarily engaged with the stationary contact tip 15^a. In this instance, however, there is no terminal member connected with the shank of rivet 15, so that the tip 15^a merely acts as a "dummy" to provide an "off" position for the switch. In Figs. 7 and 8, the wire ends 36^a and 36^b of coil 36 are relatively shorter than those aforescribed, said ends (see Fig. 8) being soldered, brazed, or otherwise rigidly connected to the horizontal portions of a pair of auxiliary terminal members 19, 19 whose binding screws 20, 20 provide for attachment of suitable circuit wires. The switch itself in Figs. 7 and 8 is provided only with a right-hand terminal member 19 and a so-called intermediate terminal 19, each being provided with a binding screw 20; the end wires of the coil 36 being un-connected with said last mentioned terminals in the device of Figs. 7 and 8. In this arrangement it may be assumed that contactor 55 will provide for completion or interruption of the energizing circuit of an electromagnetically operable switch, and that the latter will in turn control the energizing circuit of coil 36.

As aforesaid, the combination device herein disclosed was designed to meet the space limitations of similar electrical devices to be attached to the control panel of an airplane or the like. For example, the present combination device may be applied to a panel prepared to accommodate a circuit breaker of the character disclosed in Patent No. 2,342,945, granted February 29, 1944, to A. W. Krieger.

As best illustrated in Fig. 1, cover member 43 is provided with two pairs of parallel ribs or bosses 43^a and 43^b to insure proper seating thereof against the inner surface of a supporting panel, and to avoid interference with such seating by the upset or riveted portions upon the upper surface of said cover member.

We claim:

1. In combination, a molded insulating base having a relatively large recess and a relatively small recess formed therein in side by side relationship and opening to one end of said base, a manually operable switch mechanism positioned within said large recess and an electromagnetically operable indicating device positioned within said small recess, a cover member secured to said base and overlying both of said recesses, said cover member acting to retain all parts of said indicating device and the movable parts of said switch mechanism in assembled relationship to said base, said cover member having therein an opening to afford clearance for a reciprocating part of said indicating device and a second opening to afford clearance for an oscillatable operating part of said switch, and means including a plurality of wiring terminal members exposed at the lower surface of said base to provide for connection of said switch and said indicating device to a suitable source of current supply and to provide for control of said indicating device by said switch.

2. In combination, a molded insulating base having a relatively large recess and a relatively small recess formed therein in side by side relationship and opening to one end of said base, a manually operable switch mechanism positioned within said large recess and an electromagneti-

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cally operable indicating device positioned within
said small recess, a cover member secured to said
base and overlying both of said recesses, said
cover member acting to retain all parts of said
indicating device and the movable parts of said
switch mechanism in assembled relationship to
said base, said cover member having therein an
opening to afford clearance for a reciprocating
part of said indicating device and a second open-
ing to afford clearance for an oscillatable oper-
ating part of said switch, means including a plu-
rality of wiring terminal members exposed at the
lower surface of said base to provide for con-
nection of said switch and said indicating device
to a suitable source of current supply and to pro-
vide for control of said indicating device by said
switch, and certain of said wiring terminal mem-
bers being common to said switch and said indi-
cating device.

3. In combination, a molded insulating base
having a relatively large recess and a relatively
small recess formed therein in side by side rela-
tionship and opening to one end of said base, a
manually operable switch mechanism positioned
within said large recess and an electromagneti-
cally operable indicating device positioned within
said small recess, a cover member secured to said
base and overlying both of said recesses, said
cover member acting to retain all parts of said
indicating device and the movable parts of said
switch mechanism in assembled relationship to
said base, said cover member having therein an
opening to afford clearance for a reciprocating
part of said indicating device and a second open-
ing to afford clearance for an oscillatable oper-
ating part of said switch, means including a plu-
rality of wiring terminal members exposed at the
lower surface of said base to provide for connec-
tion of said switch and said indicating device to
a suitable source of current supply and to provide
for control of said indicating device by said
switch, said cover member having integral paral-
lel arms overlying the opposite sides of said base,
and said arms each having a plurality of integral
lugs bendable inwardly over said base adjacent
the lower end of the latter.

4. In combination, a molded insulating base
having a relatively large recess and a relatively
small recess formed therein in side by side rela-
tionship and opening to one end of said base, a
manually operable switch mechanism positioned
within said large recess and an electromagneti-
cally operable indicating device positioned within
said small recess, a cover member secured to said
base and overlying both of said recesses, said
cover member acting to retain all parts of said
indicating device and the movable parts of said
switch mechanism in assembled relationship to
said base, said cover member having therein an
opening to afford clearance for a reciprocating
part of said indicating device and a second open-
ing to afford clearance for an oscillatable oper-
ating part of said switch, means including a plu-
rality of wiring terminal members exposed at the
lower surface of said base to provide for connec-
tion of said switch and said indicating device
to a suitable source of current supply and to
provide for control of said indicating device by
said switch, said cover member having integral
parallel arms overlying the opposite sides of said
base, said arms each having a plurality of in-
tegral lugs bendable inwardly over said base ad-
jacent the lower end of the latter, said oscillatable
operating part of said switch being positioned
centrally of said cover member, and the same

having a link pivotally connected thereto and to
another oscillatable part of the switch.

5. In an electric switch, in combination, a
molded insulating base having a recess formed
therein and opening to the upper end thereof, a
pair of stationary contacts secured to the bot-
tom wall of said recess, a fulcrum member also
secured to said wall between said contacts, a
punched and stamped laminated sheet metal con-
tactor oscillatably supported by said fulcrum
member, said contactor having a pair of oppo-
sately extending arms bent to provide a pair of
oppositely inclined cam surfaces meeting below
the point of support thereof, the lower lamination
of said contactor comprising silver and said arms
being shaped to provide for engagement of por-
tions of said lamination with the stationary con-
tacts selectively, an actuating lever pivotally
supported at an intermediate point in the depth
of said recess, said lever having an associated
spring-biased member continuously engaged with
said contactor, whereby the latter is normally
biased to its intermediate "off" position, a second
lever pivotally supported by the side walls of said
recess at the upper end of the latter, said levers
being normally positioned in vertical planes off-
set from each other, said first lever having a kerf
in its upper end and said second lever having a
kerf in its lower end, a link having its ends posi-
tioned within the respective kerfs and pivotally
connected with the respective levers, and a cover
member overlying said recess to retain both of
said levers in assembled relationship to said base.

6. In combination, a base having recesses
formed therein in side by side relationship and
opening to one end of said base, a manually op-
erable switch mechanism positioned within one
of said recesses and an electromagnetically op-
erable indicating device positioned within an-
other of said recesses, a cover member overlying
both of said recesses, said cover member having
therein an opening to afford clearance for a part
of said indicating device and a second opening to
afford clearance for an operating part of said
switch, means including a plurality of wiring
terminal members to provide for connection of
said switch and said indicating device to a suit-
able source of current supply and to provide for
control of said indicating device by said switch,
and certain of said wiring terminal members be-
ing common to said switch and said indicating
device.

7. In combination, an insulating base having
recesses formed therein and opening to one end
thereof, a switch mechanism positioned within
one of said recesses, said switch including a piv-
otally supported lever, the support for said lever
comprising a bracket positioned within said first
mentioned recess above the bottom wall of the
latter, said bracket and lever being formed to
provide a ball and socket connection therebe-
tween, a second lever having a pivotal connection
with the side walls of said first mentioned recess
at the upper end of the latter and in a plane off-
set from the plane of pivotal support of said first
lever, a link having a pivotal connection with the
upper end of said first lever and the lower end of
said second lever, said second lever having a man-
ually engageable portion projecting upwardly be-
yond said base, a substantially U-shaped metal
bracket positioned within the other recess and
having at least one arm thereof extending up-
wardly into substantially flush relationship to
the upper end of said base, a metal core member
upstanding from the connecting portion of said

last mentioned bracket and rigidly attached thereto, an insulating spool slidable onto said core and seated upon said connecting portion, a wire coil wound upon said spool, a plurality of lugs formed integrally with said last mentioned bracket and bent inwardly over said spool to hold the same in assembled position, a metal plunger slidable within said spool and having a downwardly opening recess, a spring interposed between the end wall of said plunger recess and said core to bias said plunger toward the upper end of said base, an indicating member having a loose interlocking connection with said plunger at the upper end of the latter, a cover member secured to said base and having an opening therein to guide said indicating member and limit the degree of outward movement thereof, said cover member also acting to retain said brackets and the pivot of said second lever in assembled relationship to said base, and associated means to provide for energization and deenergization of said coil in accordance with the operation of said switch.

8. In combination, an insulating base having a recess formed therein and opening to the upper end thereof, a switch mechanism within said recess, said mechanism including stationary contacts and a contactor pivotally movable into and out of engagement with said contacts selectively, an actuating lever for said contactor, said lever being pivotally supported at an intermediate point in the depth of said recess, a second lever pivotally supported by the side walls of said recess at the upper end of the latter, said levers being normally positioned in vertical planes offset

from each other, a link pivotally connected with the respective levers, a cover member overlying said recess to retain both of said levers in assembled relationship to said base, the supporting means for said first mentioned lever comprising a substantially U-shaped metal bracket adapted to seat within said recess in a substantially flush relationship to the upper end of said base, said first lever having a partially spherical enlargement intermediate its ends, the connecting portion of said bracket having a downwardly facing socket adapted to accommodate the upper portion of said enlargement, a punched and stamped sheet metal plate rigidly secured to the lower surface of said connecting portion, said plate having an upwardly facing socket adapted to accommodate the other portion of said enlargement, and said connecting portion and said plate having slots formed therein for cooperation with portions of said lever above and below said enlargement to limit said first lever to oscillatory movement in substantially a single plane.

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