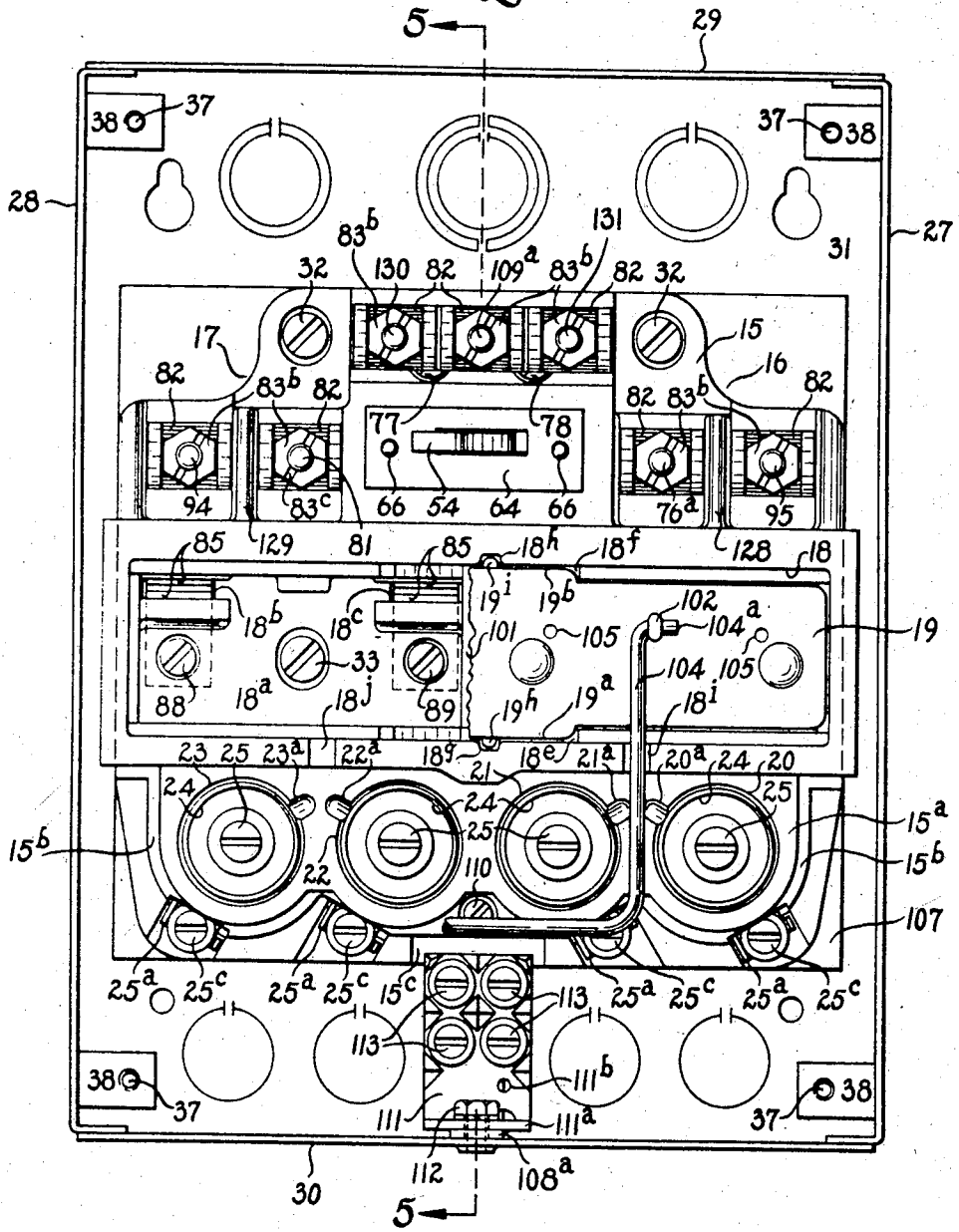
Oct. 8, 1940. R. A. MILLERMASTER ET AL 2,217,024

ELECTRIC SWITCH

Original Filed June 6, 1938 4 Sheets-Sheet 1

Fig. 1



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Fig. 2

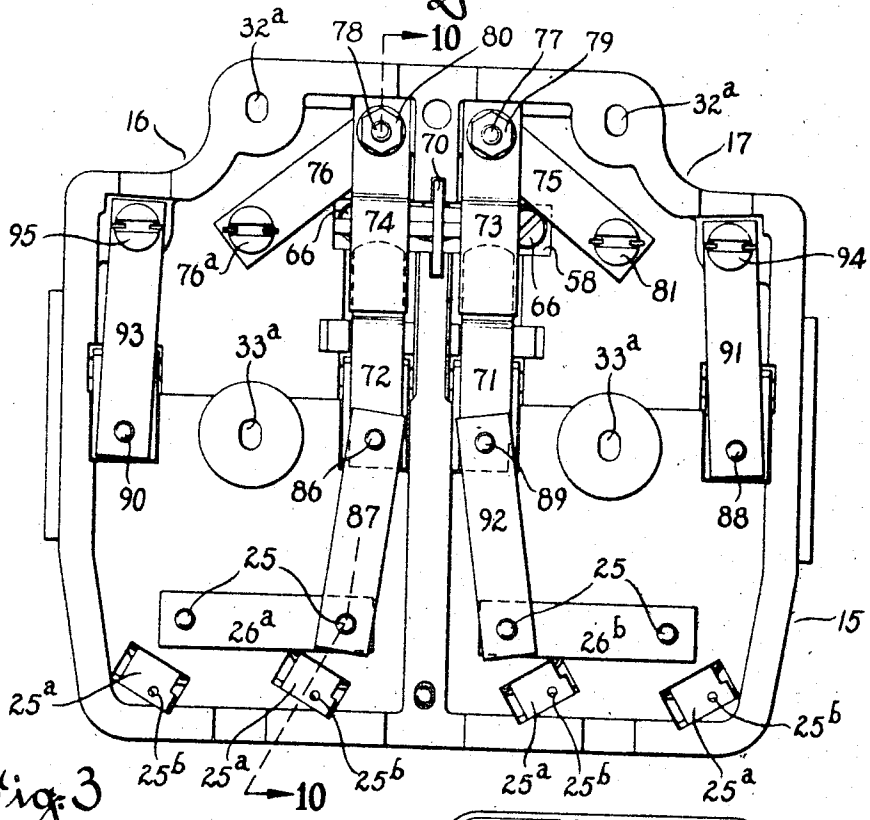


Fig. 3

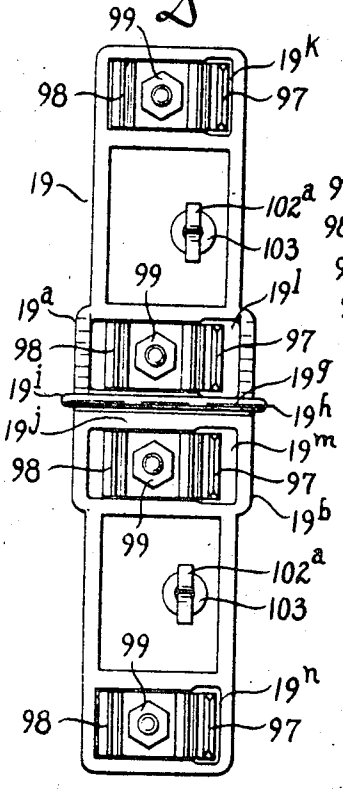
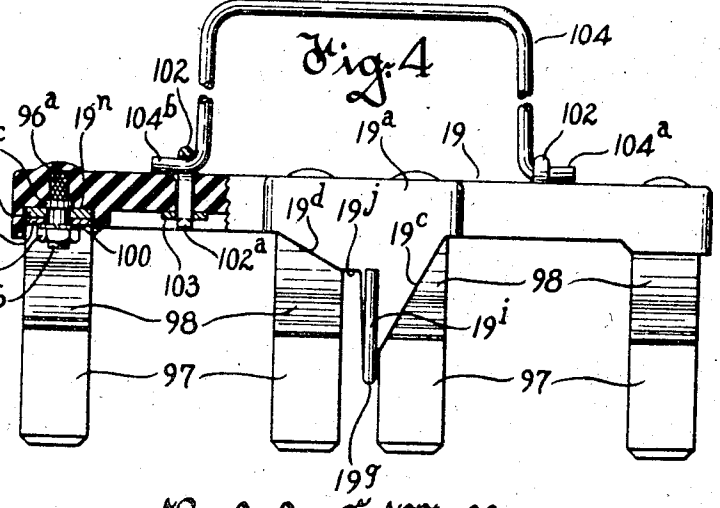


Fig. 4



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Fig. 5

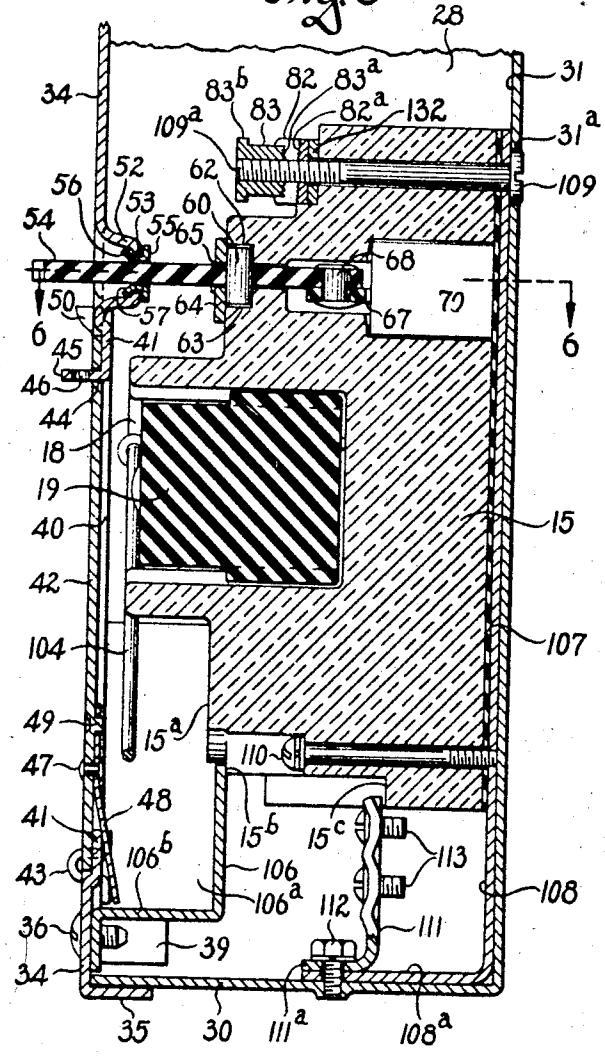


Fig. 6

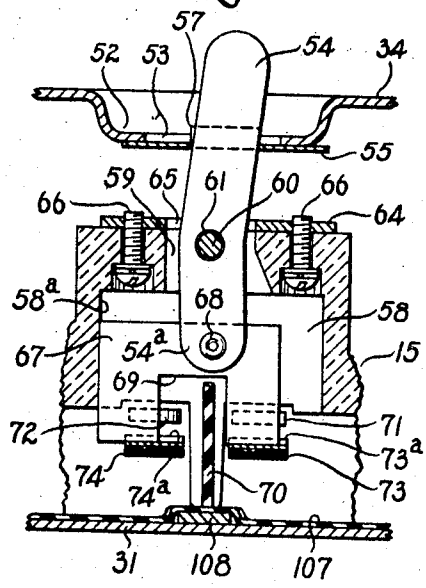


Fig. 7

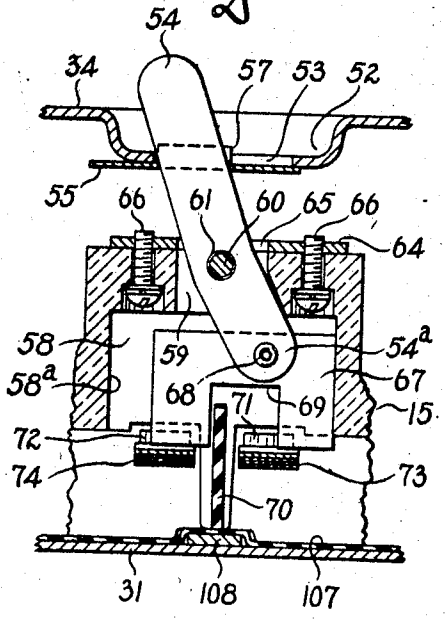


Fig. 8

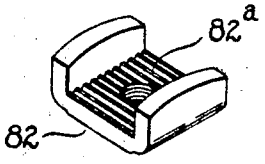
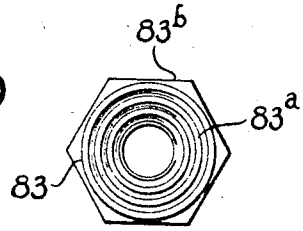


Fig. 9



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Fig. 10

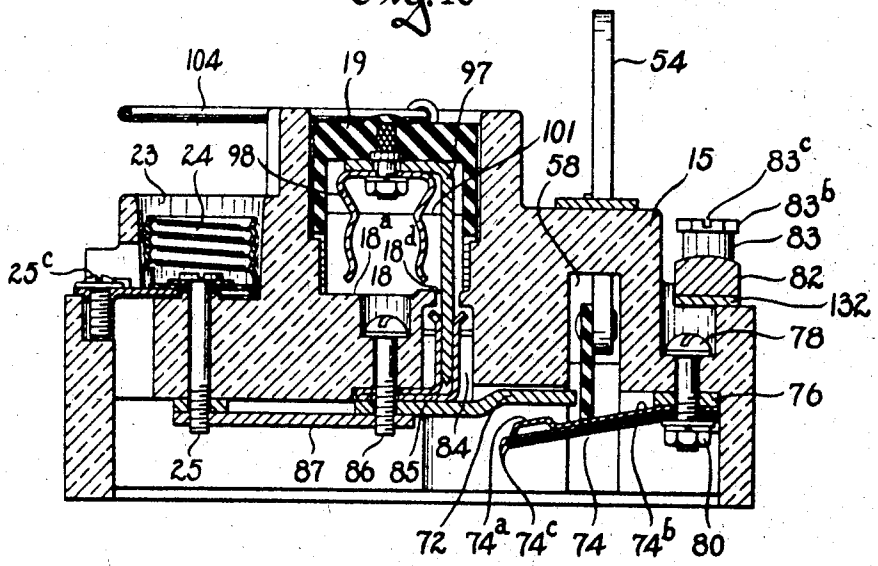


Fig. 11

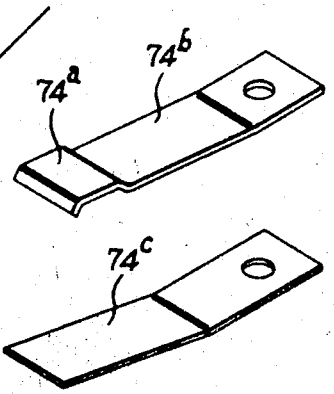


Fig. 12

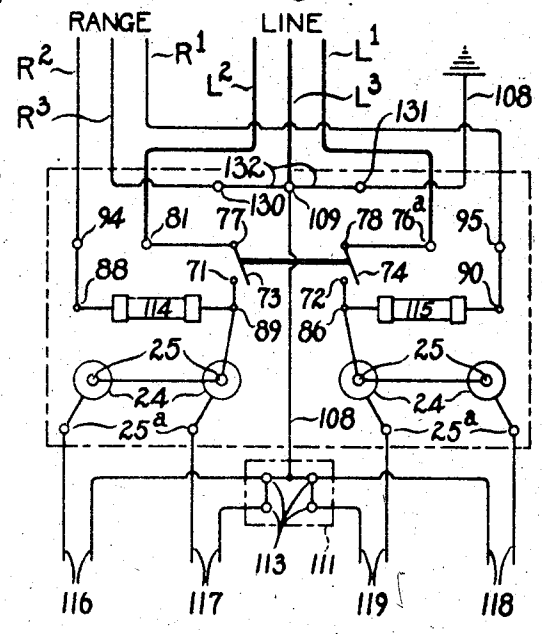


Fig. 13

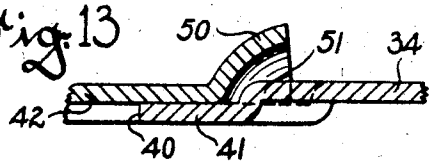
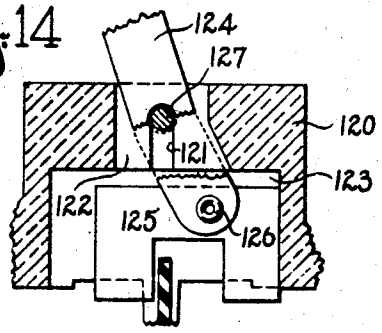


Fig. 14



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Patented Oct. 8, 1940

2,217,024

UNITED STATES PATENT OFFICE

2,217,024

ELECTRIC SWITCH

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Original application June 6, 1938, Serial No. 212,152. Divided and this application May 4, 1939, Serial No. 271,678

10 Claims. (Cl. 200—163)

This invention relates to improvements in electric switches. The invention relates more particularly to fuseless main switches adapted for use in conjunction with service control equipment.

A primary object of the invention is to provide a fuseless main switch of simple and rugged construction, which is easy to operate and trustworthy in operation.

Another object is to provide such a switch of the lever operated type.

Another object is to improve and simplify the details of construction and the manner of assembling the parts of fuseless main switches of the aforementioned character.

Another object is to provide a switch of the aforementioned character having solderless wiring terminals of improved form associated therewith.

Other objects and advantages of the invention will hereinafter appear.

This application is a division of our application Serial No. 212,152, filed June 6, 1938, for Service control equipment.

The accompanying drawings illustrate a preferred embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification in respect of certain structural details thereof without departing from the spirit and scope of our invention as defined by the appended claims.

In the drawings,

Figure 1 is a top plan view of a service control device embodying our improved switch mechanism and solderless wiring terminals, the main and auxiliary cover members of the control device being removed.

Fig. 2 is a bottom plan view of the one-piece molded insulating base showing parts of the switch mechanism and the bus connections between the several parts of the complete device.

Fig. 3 is a bottom plan view of our novel form of range fuse pull-out plug, whereby the range fuses may be mounted in tandem, or end to end, relation.

Fig. 4 is a side elevation of the plug shown in Fig. 3, with parts broken away and in section to illustrate the manner of attaching the various metal parts to the insulating base of the plug.

Fig. 5 is a fragmentary sectional view, on the line 5—5 of Fig. 1, the main and auxiliary cover members being shown in assembled relation.

Fig. 6 is a fragmentary sectional view, on the line 6—6 of Fig. 5, showing the parts of the fuseless main switch in circuit interrupting position.

Fig. 7 is a view substantially like that of Fig. 6, but showing the switch parts in circuit completing position.

Fig. 8 is a detail perspective view (substantially full size) of a stationary part of our improved form of solderless wiring terminal.

Fig. 9 is a bottom plan view (double scale) of the clamping nut for cooperation with the part shown in Fig. 8.

Fig. 10 is a sectional view, on the broken line 10—10 of Fig. 2.

Fig. 11 is a detail perspective view, in separated relation, of certain parts of one of the resilient contacts of the switch.

Fig. 12 is a diagram showing the circuit connections for the various parts of the complete device.

Fig. 13 is a fragmentary sectional view of a portion of the main cover member and a portion of the auxiliary cover member, showing the form and arrangement of one of the integral finger lugs formed on the free end of the latter, and

Fig. 14 is a fragmentary sectional view, similar to Fig. 7, but illustrating a slightly modified form of insulating base to provide therein a downwardly opening bearing slot to receive the pivot pin of the operating lever.

Referring to the drawings, the numeral 15 designates a single molded insulating base adapted to be produced by a straight-line molding operation from a suitable material, such as gray porcelain. Base 15 as shown is of approximately rectangular contour, except that the corners have been omitted at 16 and 17 to avoid an unnecessary weight or mass of material. Extending transversely of base 15 intermediate the ends thereof (Fig. 1) is a relatively long, outwardly opening, substantially rectangular recess 18, which is adapted to accommodate in a substantially flush relation a correspondingly shaped pull-out plug the molded insulating base of which is designated by the numeral 19. Base 19 is provided with parts, hereinafter described, to receive and retain a pair of cartridge type range fuses in tandem, or end to end, relationship to each other.

Arranged in a line at one side of recess 18, and in a plane offset downwardly from the outer end of the latter (see Fig. 1), is a series of four substantially cylindrical recesses 20, 21, 22 and 23, each of which is respectively adapted to accommodate a screw shell contact 24 and a center contact 25 for cooperation with the screw shell and center contacts of branch circuit fuses of well known form.

Arranged at the other side of recess 18, and in a plane offset downwardly slightly below the plane of the upper ends of recesses 20 to 23 (see Fig. 10) is a main switch mechanism, the insulating operating lever 54 of which projects upwardly a substantial distance beyond the upper end of recess 18. Base 15 is housed within a casing, preferably formed of sheet metal, comprising side walls 27 and 28, end walls 29 and 30, and a bottom wall 31, to which base 15 is rigidly secured, as by means of a pair of relatively short screws 32, and a pair of relatively long screws, one of which is shown at 33 in Fig. 1. Said pairs of screws 32 and 33 are preferably arranged in the form of a rectangle, as best illustrated in Fig. 2 by the pairs of openings 32a and 33a adapted to accommodate the same.

The open front of said casing is provided with a main cover member 34, formed of stamped sheet metal, said cover member having a peripheral flange which exteriorly overlaps the upper ends of the aforementioned side and end walls, as shown at 35 in Fig. 5. Main cover member 34 is secured to the casing as by means of four screws, one of which is shown at 36 in Fig. 5, which penetrate openings provided at the respective corners of said cover member and take into tapped openings 37 provided in the horizontal arms 38 of brackets, the vertical arms 39 (Fig. 5) of which are welded or otherwise rigidly secured to the opposite ends of side walls 27 and 28.

Main cover member 34 is provided with a relatively large rectangular opening 40 (Fig. 5) which is adapted to provide free access to the recess 18 and to the relatively small cylindrical recesses 20 to 23, inclusive. Surrounding opening 40 is a flange 41 which is offset inwardly from the outer surface of said main cover member, said flange being adapted to accommodate the auxiliary cover member 42 in a relation substantially flush with said outer surface of said main cover member. Auxiliary cover member 42 is attached to the main cover member as by means of a pair of hinge members of well known form, one of which is shown at 43 in Fig. 5. Auxiliary cover member 42 is provided near its upper end with an opening 44 to accommodate the perforated upstanding lug 45 formed integrally with the aforementioned flange 41. The perforation 46 in said lug is adapted to receive the loop portion of a wire whose ends may be sealed together in the usual manner, to provide for sealing of said auxiliary cover member to said main cover member.

Secured to the inner surface of auxiliary cover member 42 (Fig. 5) at the hinged end of the latter, as by means of a rivet 47, is a resilient plate or spring 48; the fixed end of which is provided with a circular opening to accommodate with a close fit the cylindrical boss or extrusion 49, formed on said auxiliary cover member, whereby turning of plate 48 relatively to rivet 47 is prevented. The free end of plate 48 underlies the adjacent portion of the aforementioned flange 41 and cooperatively engages the inner edge of the latter to yieldably retain the auxiliary cover member 42 in the closed position thereof illustrated. Assuming vertical mounting of the complete device in the manner illustrated in Fig. 5, it is to be understood that plate 48 will cooperate with the edge of flange 41 to yieldably resist a portion of the opening movement of auxiliary cover member 42, whereupon the latter will tend to move by gravity to a fully opened position substantially 180 degrees removed from the closed position illustrated.

On the other hand, if the complete device of Fig. 5 is mounted in a vertical position reversed, or upside down, with respect to the position illustrated, plate 48 will cooperate with flange 41 to resist a portion of the opening movement of said auxiliary cover member, and thereafter plate 48 will cooperate with the inner edge of flange 41 to hold said auxiliary cover member in a horizontal position affording free access to the aforementioned recesses 18 and 20 to 23. To facilitate opening of the auxiliary cover member 42 we prefer to provide the same, at the end therefore opposite to the hinges, with a pair of integral lugs bent outwardly to arcuate form in cross section, one of said lugs being shown in elevation at 50 in Fig. 5, and in section in Fig. 13. Also as shown in Fig. 13 the main cover member 34 is provided with non-offset portions 51 of arcuate form which underlie portions of the lugs 50 to minimize the apparent degree of projection of the latter when viewed from the front. A commercial form of our combined main and auxiliary cover members is illustrated in our Design Patent No. 108,212, dated Feb. 1, 1938.

As shown in Figs. 5 to 7 the main cover member 34 is provided with a narrow, elongated depression or offset 52 having formed therein a slot 53 which acts to guide and limit oscillatory movement of the operating lever 54 of the main switch. Underlying the slot 53 is a flat sheet metal plate 55 having an opening formed therein to accommodate lever 54, a pair of lugs 56 and 57 being formed integrally with and upstanding from opposite parallel sides of said opening, the upper ends of said lugs being bent laterally over the bottom wall of depression 52, as shown in Fig. 5, whereby plate 55 is supported by but slidable with respect to said main cover member 34. As shown in Figs. 6 and 7, plate 55 acts to substantially close the aforementioned opening 53 in all positions of the lever 54. Cover member 34 is provided adjacent to the right-hand end of depression 52 with the legend "Off" and at the left-hand end thereof with the legend "On," to indicate the "off" and "on" positions of the main switch (Figs. 6 and 7).

The main switch comprises a relatively narrow substantially rectangular cavity 58 which opens to the lower surface of base 15, a passage 59 communicating with recess 58 and opening to the upper surface of said base. In assembling the switch mechanism lever 54 is inserted upwardly through passage 59 to an extent sufficient to permit insertion of pin 60 through the pivot opening 61 provided in said lever, said lever being then lowered to effect seating of pin 60 in the open pivotal bearings 62 and 63 (Fig. 5) provided in the upper surface of base 15. A metal plate 64 overlies the opposite ends of pin 60 to restrain the latter from upward displacement relatively formed therein to provide clearance for lever 54. Plate 64 is secured to base 15 as by means of a pair of bolts 66 the heads of which are located in countersinks provided in the end wall of recess 58 (Figs. 6 and 7).

Lever 54 preferably consists of a flat punched plate of fiber impregnated with a suitable insulating binder material. Any other suitable tough and relatively rigid, fiber reinforced, insulating material may be employed if desired. As best illustrated in Figs. 6 and 7, the lower end portion 54a of lever 54 extends from the point of pivotal support at an obtuse angle to the upper end portion of said lever, the arrangement being such that in the "off" position of the switch parts

(Fig. 6) said lower end portion 54ª of the lever is in a substantially vertical position with respect to pivot pin 60.

The lower end portion 54ª of said lever is pivotally attached to a substantially rectangular insulating plate 67, at one side of the horizontal and vertical center lines through the latter, as by means of a hollow rivet or eyelet 68. The lower edge of plate 67 is mounted or cut away, as indicated at 69, to provide clearance between the same and an insulating barrier plate 70, which is interposed between the sets of cooperating stationary and movable contacts of the switch. As shown in Figs. 6 and 7 the plate 67 is of substantially inverted U-shape, with the arms thereof projecting to a slight extent below recess 58 in the "on" position of the switch (Fig. 7), while the same project to a greater extent below said recess in the "off" position of the switch (Fig. 6).

Secured to the lower surface of base 15 (Fig. 2) are a pair of substantially rigid stationary contacts 71 and 72 of like form, the free ends of which underlie, to a very slight extent, the recess 58 (see Fig. 10). Secured to the lower surface of base 15 at the opposite side of recess 58, and adapted to underlie the latter and portions of contacts 71 and 72, is a pair of resilient contacts 73 and 74 of like form. Contacts 73 and 74 preferably consist of laminations or superimposed strips of resilient conducting material, such as phosphor bronze, the inner laminations of the respective contacts 73 and 74 having hollow bosses or projections 73ª, 74ª formed thereon (see 74ª in Fig. 10), which bosses are normally biased into engagement with the respective contacts 71, 72. In Fig. 11 we have shown in perspective the inner lamination 74ᵇ having said boss 74ª formed thereon, together with one of the three other laminations 74ᶜ which we prefer to employ. The initial upward angle provided for the free ends of the laminations like 74ᶜ affords the normal bias of the boss (like 74ª) into engagement with its cooperating stationary contact.

Contacts 73 and 74 are clamped in position against the respective bus members 75 and 76 as by means of bolts 77, 78 and nuts 79, 80, the heads of said bolts being located in countersinks provided in the upper surface of base 15 (see bolt 78 in Fig. 10). Associated with bus member 75 is a bolt 81 (Fig. 2) the shank of which extends upwardly through base 15 and takes into a tapped opening provided in the bottom wall of a channel-shaped wiring terminal element 82 (Fig. 1) to clamp the latter in position. The exposed surface of said bottom wall is provided with a series of alternate grooves and ridges which extend in parallel relation between the side walls of said channel-shaped element, as shown in detail at 82ª in Fig. 8.

The threaded shank of bolt 81 preferably extends a substantial distance above the side walls of the channel-shaped element 82 for cooperative engagement by a wire-clamping nut of novel form. As shown in Fig. 9 said nut comprises a lower cylindrical portion 83, the flat lower end of which is provided with a series of concentrically arranged alternate grooves and ridges 83ª. By reason of the formation of elements 82 and 83 as described we are able to properly clamp a stranded conductor of a size which could not ordinarily be accommodated by known forms of solderless wiring terminals of similar size. A bolt 76ª (Figs. 1 and 2) associated with bus member 76 likewise takes into a tapped opening in the bottom wall of its associated channel-shaped terminal member 82 to clamp the latter in position.

In practice the strands of the wire will be divided, for positioning thereof on opposite sides of the bolt, whereupon the cylindrical portion 83 of the nut will be screwed home, the slight degree of clearance between portion 83 and the side walls of element 82 being insufficient to permit escape of any of the wire strands, and the surfaces 82ª and 83ª cooperating with the wire strands to insure a proper and efficient electrical engagement. As shown in Figs. 5, 9 and 10 said nut is provided with an upper end portion 83ᵇ of hexagonal or other polygonal contour, to provide for tightening or loosening thereof by means of a suitable wrench, it being noted (Figs. 5 and 10) that the upper end or head portion 83ᵇ of the nut will always clear the side walls of element 82. Also as shown in Figs. 1 and 10, head portion 83ᵇ is provided with a kerf 83ᶜ to enable adjustment of the nut by means of a screw driver. The screw driver to be employed will preferably have a forked blade, to provide clearance for the shank of a bolt, such as 81 in Fig. 1. We have disclosed use herein of seven solderless wiring terminal units of the character just described, as indicated by the like reference characters applied thereto.

Referring again to Figs. 6 and 7, it will be noted that in the "off" position of the switch the plate 67 abuts at one edge against the left-hand vertical end wall 58ª of recess 58 to insure substantially identical spacing of contacts 73 and 74 from the respective stationary contacts 71 and 72. Upon a slight degree of counterclockwise movement of lever 54 the resilient contacts 73 and 74 act upon the arms of plate 67 to bias the same upwardly and laterally with a quick action, toward the extreme position thereof shown in Fig. 7, with consequent normal and automatic acceleration of the counterclockwise movement of lever 54.

Referring to Figs. 1 and 10, recess 18 is provided in its bottom wall 18ª along one longitudinal side thereof with four constricted openings, one pair of which is shown at 18ᵇ and 18ᶜ in Fig. 1, and one opening of the other pair is shown at 18ᵈ in Fig. 10. Located within suitable recesses (such as recess 84 in Fig. 10) beneath the respective openings are jack receiving contacts of the form illustrated in cross section at 85 in Fig. 10. Each of said contacts preferably consists of a resilient strip of metal, such as phosphor bronze, bent to provide a pair of spaced, upwardly extending parallel arms with outwardly flared ends, and a reflexed connection portion bent laterally to underlie a portion of base 15.

As shown in Fig. 10 the connecting portion of one of said contacts is interposed between the terminal end of stationary contact 72 and base 15, a bolt 86 having its head located in a countersink in the bottom wall of recess 18 and its threaded shank freely penetrating openings provided in the connecting portion of contact 85 and in the terminal portion of contact 72 and taking into a tapped opening in bus member 87 to clamp said parts in assembled relation. The three other jack receiving contacts, like 85, are secured in position by bolts 88, 89 and 90 (Figs. 1 and 2). Bolt 88 takes into a tapped opening in bus member 91; bolt 89 takes into a tapped opening in bus member 92; and bolt 90 takes into a tapped opening in bus member 93 (Fig. 2). As shown, bus member 92 overlies the terminal end

of contact 71 to provide for clamping the latter in position.

The other end of bus member 91 is engaged by the head of bolt 94, the shank of which takes into a tapped opening in the bottom wall of one of the channel-shaped wiring terminal members 82 (Fig. 1). Similarly, the other end of bus member 93 is engaged by the head of bolt 95, the shank of which takes into a tapped opening in the bottom wall of another of the channel-shaped wiring terminal members.

The cartridge type fuse carrying plug comprises the aforementioned insulating base portion 19 having four relatively shallow, substantially rectangular recesses 19^k, 19^l, 19^m and 19^n formed in the inner surface thereof. Each of said recesses is provided substantially centrally thereof with a metal insert in the form of a bolt having a roughened inner end portion 96^a embedded in base 19 for non-rotatable anchorage thereof, the exposed threaded shank 96^b of each bolt being adapted to penetrate alined openings provided in the base portions 97^a, 98^a of the jack blade members 97 and the fuse clips 98, respectively. Nuts 99 cooperate with shanks 96^b to clamp members 97 and 98 in assembled position against the bottom wall of a recess (such as 19^n) and against the integral annular extension 96^c formed on each bolt, spring lock washers 100 (Fig. 4) of suitable form being employed to prevent accidental turning or loosening of said nuts.

As shown, the jacks 97 are arranged adjacent to one longitudinal side of base 19 whereby the same are adapted to register with the aforementioned constricted openings 18^b, 18^c, etc., in the bottom wall 18^a of recess 18 in only one relative position of the parts.

Base 19 is preferably provided at its mid-length on opposite sides thereof with slight lateral projections 19^a and 19^b, and the opposite longitudinal walls of recess 18 are formed as shown at 18^e and 18^f (Fig. 1) to accommodate said projections, it being noted that the lower ends (Fig. 4) of projections 19^a, 19^b are of irregular angular contour, as indicated at 19^c, 19^d, and the lateral recesses 18^e, 18^f are correspondingly shaped to insure against insertion of plug 19 into recess 18 in more than one relative position of said parts.

Base 19 is also preferably provided, at a point offset from the mid-length thereof, with an integral barrier member 19^g, which extends downwardly throughout the major portion of the length of jacks 97. The opposite edges 19^h, 19^i of said barrier member extend laterally beyond the projections 19^a, 19^b throughout a portion of the lower ends of the latter, recess 18 being provided in its longitudinal walls with recesses 18^g, 18^h (Fig. 1) to accommodate said extensions, to additionally limit plug base 19 to insertion in recess 18 in only one relation of said parts. The two longitudinally alined pairs of clips 98 are adapted to receive and retain a pair of cartridge type fuses for range service.

As shown in Figs. 1 and 10, recess 18 is provided with a barrier 101 formed integrally with the side and bottom walls thereof and extending upwardly from the latter to the degree indicated in Fig. 10, and to provide a seat for the ledge or surface 19^j formed on base 19 (Figs. 3 and 4). By reason of the overlapping relationship of barriers 101 and 19^g, the recess 18 is divided into two compartments effectively sealed electrically with respect to each other prior to engagement of the jack blades 97 with contacts 85. The depth of the peripheral wall of plug base 19 is also preferably such that the upper end of recess 18 is completely sealed off thereby, or made "dead-front" prior to engagement of jack blades 97 with contacts 85.

Plug base 19 is provided with a pair of spaced openings to accommodate the shanks 102^a of a pair of cotter pins whose loops or eyes 102 are exposed at the outer surface of said base, said shanks having their ends spread or bent over washers 103 to retain said cotter pins in position. The handle comprises a length of relatively heavy resilient wire 104, preferably steel, bent to substantially U-shape with laterally extending ends 104^a, 104^b, either of which may be freely inserted into one of the eyes 102, whereupon the other end of said handle may be forcibly inserted into the other eye by a slight degree of bending or distortion of the wire. The arrangement is preferably such that the handle may not be inserted or removed when in upright position, as shown in Fig. 4; but may be readily inserted or removed manually when it is in the inoperative position thereof shown in Fig. 1. This has the advantage of insuring against inadvertent dislocation of the handle in the event of excessive resistance to removal of the fuse carrying plug 19 from recess 18, due to an improper direction of pull upon the handle.

Base 19 is provided with four openings or passages 105, two of which are shown in Fig. 1, which permit access to the base portions of the respective jack blades, as by means of test jacks or wire ends, to permit testing of the range fuses while in position. The branch circuit fuses (not shown) when positioned in the respective recesses 20 to 23, inclusive, may likewise be tested without removal thereof from normal position, by reason of the provision of angularly extending ways or slots 20^a, 21^a, 22^a and 23^a, which provide access to the respective shell contacts 24, as by means of a test jack, the wiring terminals 25^a, associated with the center contact screws or bolts 25, being exposed and readily accessible for engagement by the other jack of a fuse testing device of known form, when the main cover member 34 is removed.

As shown in Figs. 1 and 5, the portion 15^a of base 15 in which cylindrical recesses 20 to 23 are formed is preferably offset inwardly from the forward face of the base, as represented by the forward end of the surrounding walls of recess 18. Portion 15^a of base 15 is further provided with an inwardly offset ledge 15^b, which may be interrupted at a number of points to facilitate proper molding of said base, as shown in Fig. 1. Cover member 34 has attached to the inner surface thereof, as by means of rivets or spot welds, or both (not shown) a sheet metal guard member, the flat inwardly offset portion 106 (Fig. 5) is shaped to closely surround the contour of the forward end of portion 15^a of base 15, said flat portion being adapted to seat upon or rest adjacent to the aforementioned ledge 15^b. Guard member 106 is provided with parallel side wall portions, one of which is shown at 106^a, said side wall portions extending closely adjacent to the surrounding wall of recess 18. The rear end wall 106^b associated with guard member 106 completes the enclosure to prevent access to the wiring terminal members of the branch circuit fuses, so long as cover member 34 remains in position.

With the complete device mounted as shown in Figs. 1 and 5, the handle 104 will fall by gravity to the position thereof illustrated, after

insertion of plug 19 into recess 18, the front edge of the lower wall of recess 18 having grooves or notches 18[1], 18[2] formed therein to accommodate handle 104 in a plane substantially flush with the forward end of the walls of said recess. Handle 104 in such position provides proper clearance for insertion or removal of the branch circuit fuses (see Fig. 1). When the device is mounted in a position 180 degrees reversed from that shown in Figs. 1 and 5, handle 104 may be manually moved to and will remain in the position thereof shown in said figures, whereby the auxiliary cover member 42 may be closed in the manner aforedescribed.

Also as shown in Figs. 1 and 5 a fiber insulating plate 107 of rectangular contour underlies base 15 to insure proper electrical clearance between the conducting parts shown in Fig. 2 and the bottom wall 31 of the metal casing. A grounded neutral bus member 108 is interposed between insulating plate 107 and said bottom wall 31, the latter having an opening 31[a] (Fig. 5) to accommodate the flat cylindrical head 109 of a bolt the threaded shank 109[a] of which extends forwardly between the shanks 130 and 131 of a pair of bolts providing additional grounding terminals (Figs. 1 and 2). Said shanks 109[a], 130 and 131 take into tapped openings in the three channel-shaped terminal members 82 (Fig. 1) for cooperation with their associated wire clamping nuts 83[b]. Said shanks are electrically connected with each other, as by means of a metal strap or bus member 132 (Figs. 5 and 10).

A second bolt 110 (Figs. 1 and 5) extends rearwardly through base 15 and takes into a tapped opening in bus member 108 to assist in rigidly attaching the latter to said base. Bus member 108 is provided at the lower end thereof (Figs. 1 and 5) with a portion 108[a] extending forwardly at a right angle. A neutral terminal member 111 has a right-angled portion 111[a] arranged parallel to portion 108[a], and a bolt 112 has a threaded shank which penetrates portions 111[a] and 108[a] and takes into a tapped opening in end wall 30 to provide electrical and mechanical connection of said parts to each other and to the metal casing. One end of terminal member 111 overlies a ledge 15[c] formed on base 15 to provide against bending or displacement of said member upon tightening of the four binding screws 113 associated therewith. Member 111 may be provided with an opening 111[b] to accommodate the bared wire ends to provide a snubbing connection therefor prior to winding or looping the same around the shanks of binding screws 113. As shown in Fig. 2, the branch circuit fuse terminals 25[a] are preferably provided with similar openings 25[b] to provide snubbing connections for bared wire ends prior to winding or looping the same around the shanks of binding screws 25[c].

In Fig. 12 we have shown diagrammatically the circuit connections for the complete device, the various parts being designated by numerals corresponding to those employed in the other figures. Thus current is supplied from lines L^1, L^2 and L^3, the latter being the neutral wire, which is grounded through bus member 108. Upon closure of switch contacts 73 and 74 circuit will be pre-set for completion to the range upon closure of one or more of the usual range switches (not shown), line L^2 being thus connected through range fuse 114 with range lead R^2; line L^1 being connected through range fuse 115 with range lead R^1; and the grounded neutral L^3 being permanently connected with the neutral range lead R^3. Closure of contacts 73 and 74 likewise pre-sets the respective pairs of branch circuits 116, 117 and 118, 119 for completion to suitable translating devices (not shown) upon operation of suitable switches or plugs associated with the latter, it being noted that each branch circuit includes therein a grounded neutral connection.

In Fig. 14 we have shown an insulating base 120, which is slightly modified with respect to base 15 aforedescribed; base 120 being provided with a downwardly opening pair of opposed grooves (one of which is shown at 121) in a passage 122 which opens at one end to the outer surface of base 120 and at its other end communicates with recess 123. A handle member or operating lever 124, having plate 125 pivotally attached thereto at 126, is inserted upwardly through passage 122, with the pivot pin 127 in position in said lever, pin 127 being adapted to enter the opposed grooves, such as 121, to pivotally bear against the closed upper ends of the latter. When the contacts 73 and 74 are in assembled position they will normally act through engagement thereof with plate 125 to retain pin 127 against displacement from said slots 121. By the arrangement just described, we facilitate assembly of the switch parts, while at the same time obviating the necessity for use of the metal plate 64 and screws 66 shown in Figs. 6 and 7.

The advantages of our invention will be apparent to those skilled in the art. By our novel arrangement the necessity for use of main fuses is obviated, thus avoiding the principal source of injurious heat in devices of this character. In practice the stationary contacts 71, 72, the part 74[a], 74[b] of contact 74, and the corresponding part of contact 73, are provided with a silver electroplate of suitable thickness to insure high current-carrying efficiency of the switch, despite infrequent operation of the latter.

The main switch is operated from the exterior of the casing, with an operating lever like the toggle levers ordinarily employed on switches for home lighting circuits. The familiarity of the ordinary householder with this type of operating means, makes the complete device acceptable and easily understood by the user, thus resulting in a great reduction in the number of service calls required.

The aforedescribed arrangement provides for installation of the complete device in normal position (Figs. 1 and 5) or in an inverted position. In either event the auxiliary cover member 42 stays opened or closed, as desired; and the "on" and "off" indications read correctly. Solid porcelain barriers 128, 129 (Fig. 1) are provided between the solderless terminals associated with the aforementioned sets of bolts 76[a], 95 and 81, 94, thus preventing the possibility of short circuits.

The jack blades 97 of the range fuse pullout are preferably silver plated, and the same as shown are separate from the respective fuse clips 98, thus reducing contact temperature to a minimum.

As shown in Fig. 2, the left-hand pair of center contact screws 25, 25 are electrically connected with each other through the medium of bus member 26[a], which is likewise electrically connected with bus member 87. Similarly, the right-hand pair of center contact screws 25, 25 are electrically connected with each other through

the medium of bus member 26b, which is electrically connected with bus member 92.

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

1. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an operating lever having pivotal engagement with said base within said passage, the lower end portion of said lever being located within said recess, a flat insulating member of substantially rectangular contour positioned edgewise within said recess, said lever being pivotally connected with said insulating member, a pair of substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a second pair of contacts secured to the lower surface of said base at the opposite side of said recess, said second pair of contacts having portions underlying said recess and portions of said first pair of contacts and resiliently biased into engagement with the latter, and said second pair of contacts being engageable by said insulating member to effect disengagement of the former from said first pair of contacts against said bias upon movement of said lever toward one extreme position.

2. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an operating lever having pivotal engagement with said base within said passage, the lower end portion of said lever being located within said recess, a flat insulating member of substantially rectangular contour positioned edgewise within said recess, said lever being pivotally connected with said insulating member at one side of the vertical median line of the latter, a pair of substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a second pair of contacts secured to the lower surface of said base at the opposite side of said recess, said second pair of contacts having portions underlying said recess and portions of said first pair of contacts and resiliently biased into engagement with the latter, and said second pair of contacts being engageable by said insulating member to effect disengagement of the former from said first pair of contacts against said bias upon movement of said lever toward one extreme position, said second pair of contacts coacting with said insulating member and said lever to yieldably resist movement of the latter from each extreme position thereof.

3. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an operating lever having pivotal engagement with said base within said passage, the lower end portion of said lever being located within said recess, a flat insulating member of substantially rectangular contour positioned edgewise within said recess, said lever being pivotally connected with said insulating member at one side of the vertical median line of the latter, a pair of of substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a second pair of contacts secured to the lower surface of said base at the opposite side of said recess, said second pair of contacts having portions underlying said recess and portions of said first pair of contacts and resiliently biased into engagement with the latter, said second pair of contacts being engageable by said insulating member to effect disengagement of the former from said first pair of contacts against said bias upon movement of said lever toward one extreme position, an insulating barrier interposed between the cooperating contacts of said pairs, and said insulating member having a notch formed in the lower edge thereof to provide clearance between the same and said barrier.

4. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, a flat punched insulating operating lever having a pin extending transversely therethrough for pivotal engagement with said base, the lower end portion of said lever extending at an obtuse angle to the center line of the upper end portion thereof, whereby in one extreme position of said lever the lower end portion is vertically disposed with respect to said pivot pin, a flat punched insulating plate of substantially rectangular inverted U-shape to which the lower end portion of said lever is pivotally connected at a point offset from the vertical and horizontal center lines of the former, said recess having opposed vertical walls with which the vertical edges of said plate are respectively engaged in the opposite extreme positions of the latter, two stationary contacts underlying said base adjacent to said recess, two resilient contacts of laminated form underlying said recess and portions of said contacts first mentioned and normally biased into engagement with the latter, said plate being movable downwardly upon operation of said lever in one direction to depress said resilient contacts against said bias thereof to disengage the same from the respective contacts first mentioned, a barrier formed integrally with said base and interposed between the respective sets of cooperating contacts, said barrier being interrupted within the area defined by said recess, a flat insulating barrier plate positioned edgewise within the interrupted area of said barrier and extending upwardly between the arms of said U-shaped plate, and a grounding neutral bus member underlying said insulating barrier plate to retain the latter in proper position.

5. In an electric switch of the slow-break type, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an insulating operating lever having a pivotal connection with said base within said passage, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending at an obtuse angle to said upper end portion, at least a part of said lower end portion being located within said recess, a flat punched insulating plate of substantially inverted U-shape also located within said recess and having a pivotal connection with said lever, a pair of laterally spaced substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a pair of laterally spaced resilient stationary contacts secured to the lower surface of said base at the other side of said recess, the free end of said

resilient contacts underlying said recess and being normally biased by the resiliency thereof into cooperative engagement with said stationary contacts first mentioned, the arms of said U-shaped insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, and said lever in one extreme position thereof cooperating with said insulating plate and the latter cooperating with an end wall of said recess to retain said resilient contacts in disengaged relation to the contacts first mentioned.

6. In an electric switch of the slow-break type, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an insulating operating lever having a pivotal connection with said base within said passage, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending at an obtuse angle to said upper end portion, at least a part of said lower end portion being located within said recess, a flat punched insulating plate of substantially inverted U-shape also located within said recess and having a pivotal connection with said lever, a pair of laterally spaced substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a pair of laterally spaced resilient stationary contacts secured to the lower surface of said base at the other side of said recess, the free ends of said resilient contacts underlying said recess and being normally biased by the resiliency thereof into cooperative engagement with said stationary contacts first mentioned, the arms of said U-shaped insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, said lever in one extreme position thereof cooperating with said insulating plate and the latter cooperating with an end wall of said recess to retain said resilient contacts in disengaged relation to the contacts first mentioned, a sheet metal casing having bottom, side and end walls and an open front, said base being rigidly attached to said bottom wall, said base having a pair of spaced grooves formed therein and opening to the lower surface thereof, and a flat insulating plate positioned within said grooves in a plane at substantially right angles to said bottom wall of the casing, said last mentioned plate extending above the respective sets of cooperating contacts to provide an insulating barrier therebetween.

7. In an electric switch of the slow-break type, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an insulating operating lever having a pivotal connection with said base within said passage, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending at an obtuse angle to said said upper end portion, at least a part of said lower end portion being located within said recess, a flat punched insulating plate of substantially inverted U-shape also located within said recess and having a pivotal connection with said lever, a pair of laterally spaced substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a pair of laterally spaced resilient stationary contacts secured to the lower surface of said base at the other side of said recess, the free ends of said resilient contacts underlying said recess and being normally biased by the resiliency thereof into cooperative engagement with said stationary contacts first mentioned, the arms of said U-shaped insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, said lever in one extreme position thereof cooperating with said insulating plate and the latter cooperating with an end wall of said recess to retain said resilient contacts in disengaged relation to the contacts first mentioned, a sheet metal casing having bottom, side and end walls and an open front, said base being rigidly attached to said bottom wall, said base having a pair of spaced grooves formed therein and opening to the lower surface thereof, a flat insulating plate positioned within said grooves in a plane at substantially right angles to said bottom wall of the casing, said last mentioned plate extending above the respective sets of cooperating contacts to provide an insulating barrier therebetween, a sheet metal cover member normally immovably attached to said casing at the open front of the latter, and said cover member having a slot formed therein to provide clearance for said lever upon oscillatory movement of the latter.

8. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage opening to the upper surface thereof and communicating with said recess, an operating lever having a pivotal connection with said base within said passage, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending into said recess at an angle to said upper end portion, a flat insulating plate also located within said recess and having a pivotal connection with said lever, a pair of laterally spaced substantially rigid stationary contacts secured to the lower surface of said base at one side of said recess, a pair of laterally spaced resilient contacts secured to the lower surface of said base at the other side of said recess, the free ends of said resilient contacts underlying said recess and being normally biased by the resiliency thereof into cooperative engagement with said contacts first mentioned, said insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, and said lever in one extreme position thereof cooperating with said insulating plate and the latter cooperating with an end wall of said recess to retain said resilient contacts in disengaged relation to the contacts first mentioned.

9. In an electric switch, in combination, an insulating base, an operating lever having a pivotal connection with said base, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending at an angle to said upper end portion, a flat insulating plate having a pivotal connection with said lever, a plurality of laterally spaced substantially rigid stationary contacts secured to the lower surface of said base, a plurality of similarly spaced resilient contacts secured to the lower surface of said base, the free ends of said resilient

contacts being normally biased by the resiliency thereof into cooperative engagement with said first mentioned contacts, said insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, a sheet metal cover member overlying said base, said cover member having a portion of substantially channel-shape offset inwardly from the outer surface thereof, the bottom wall of said channel-shaped portion having a relatively long substantially rectangular slot formed therein to accommodate the upper end of said lever and to provide clearance therefor during oscillatory movement thereof, a flat sheet metal plate underlying the bottom wall of said channel-shaped portion, said metal plate having an opening only slightly larger than the cross sectional dimensions of said lever, and said metal plate also having lugs formed integrally therewith and overlying the upper surface of said last-mentioned bottom wall to restrain the former against downward displacement while permitting transverse sliding movement thereof relatively to said cover member, said metal plate acting to insure substantial closure of said slot in all positions of said lever.

10. In an electric switch, in combination, an insulating base, said base having a recess formed in the lower surface thereof and a passage opening to the upper surface thereof and communicating with said recess, an operating lever having a pivot pin penetrating the same and projecting a substantial distance from each side thereof, the opposed walls of said passage having downwardly opening grooves formed therein the side and end walls of which provide bearings for said pivot pin, said lever having an upper end portion extending a substantial distance above said base and a lower end portion extending at a predetermined angle to said upper end portion, a flat insulating plate located within said recess and having a pivotal connection with said lever, a pair of laterally spaced substantially rigid stationary contacts secured to the lower face of said base at one side of said recess, a pair of laterally spaced resilient contacts secured to the lower face of said base at the other side of said recess, each of said resilient contacts comprising an upper lamination having a boss formed thereon adjacent to the free end thereof and a multiplicity of lower laminations, said lower laminations being initially bent to normally bias said upper lamination into cooperative engagement with one of the contacts first mentioned, said insulating plate being adapted to cooperatively engage the respective resilient contacts to yieldably resist movement of said lever toward each of its extreme positions, and said insulating plate cooperating with an end wall of said recess and with said lever in one extreme position of said parts to retain said resilient contacts in disengaged relation to the contacts first mentioned.

RALPH A. MILLERMASTER.
ALEX A. WRITZMANN.

CERTIFICATE OF CORRECTION.

Patent No. 2,217,024. October 8, 1940.

RALPH A. MILLERMASTER, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 12, for the word "therefore" read --thereof--; line 60, after "relatively" insert --to bearings 62, 63; plate 64 having an opening 65--; page 3, first column, line 9, for "mounted" read --notched--; page 6, first column, line 72, claim 3, strike out "of" before "substantially"; page 6, second column, line 75, claim 5, for "end" read --ends--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of September, A. D. 1941.

Henry Van Arsdale,

(Seal) Acting Commissioner of Patents.