Sept. 15, 1942. A. W. KRIEGER 2,295,668

ELECTRIC SWITCH

Filed March 27, 1941 3 Sheets-Sheet 1

Fig. 1

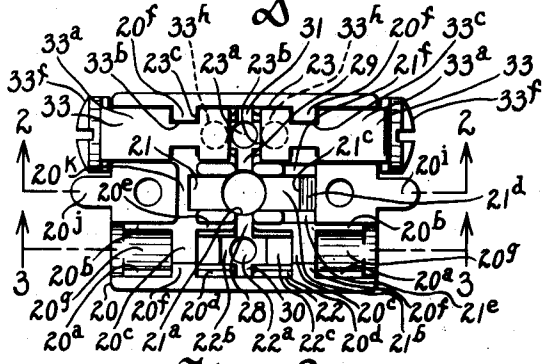


Fig. 2

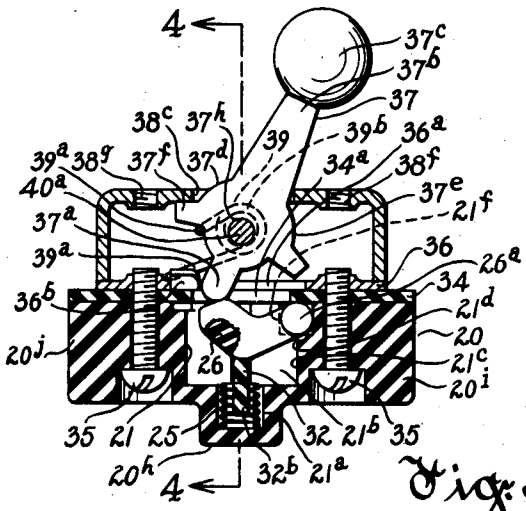


Fig. 3

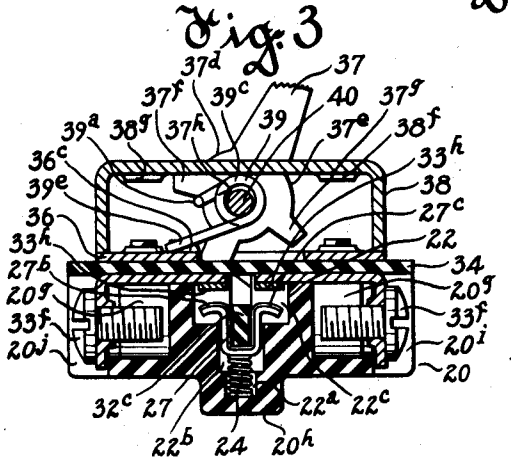


Fig. 4

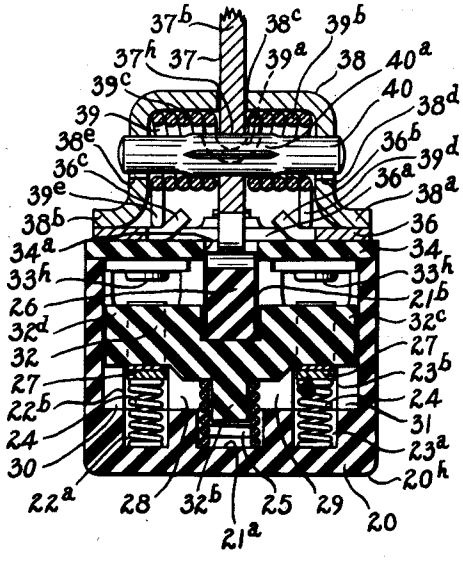
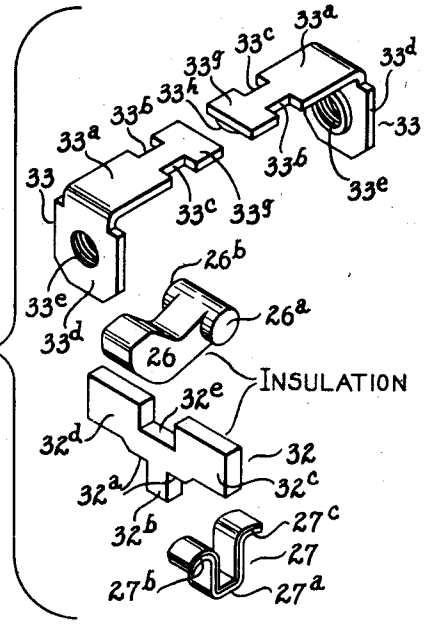


Fig. 5



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Fig. 6

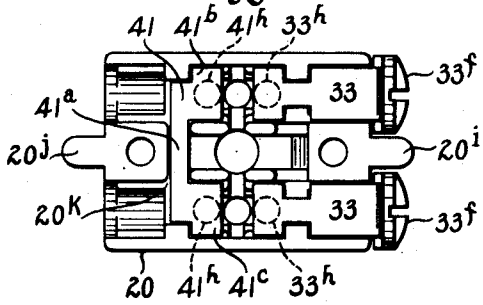


Fig. 7

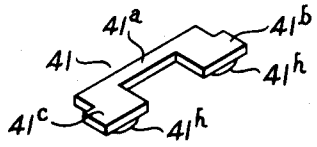


Fig. 8

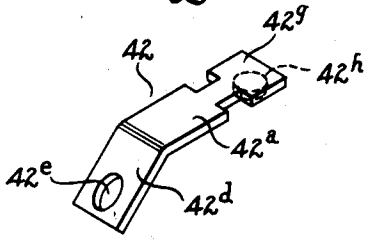


Fig. 9

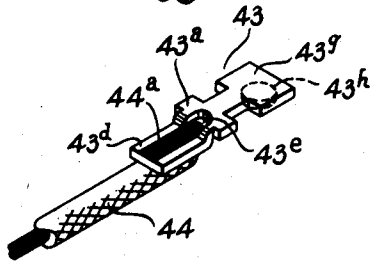


Fig. 10

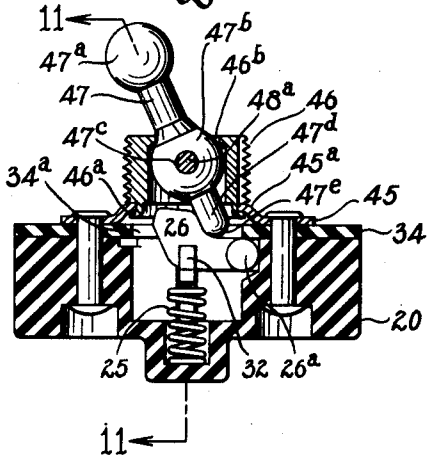
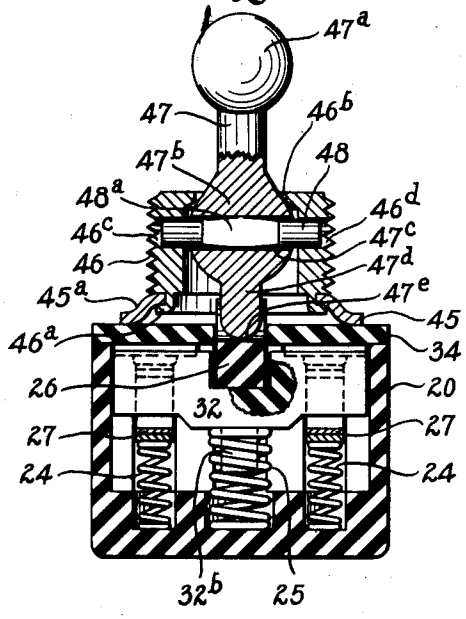


Fig. 11



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Fig. 12

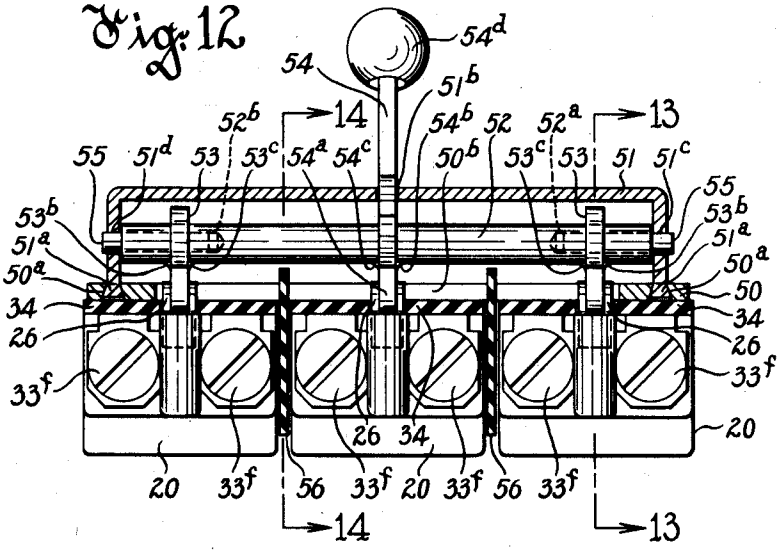


Fig. 13

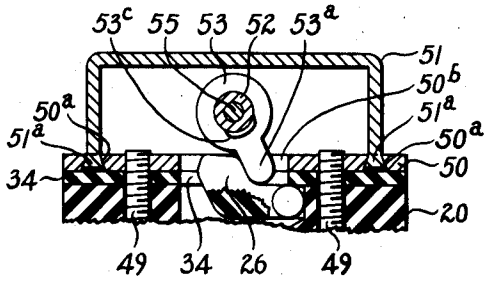


Fig. 14

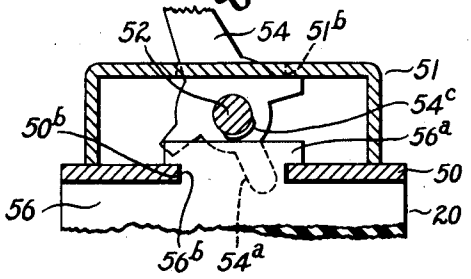


Fig. 15

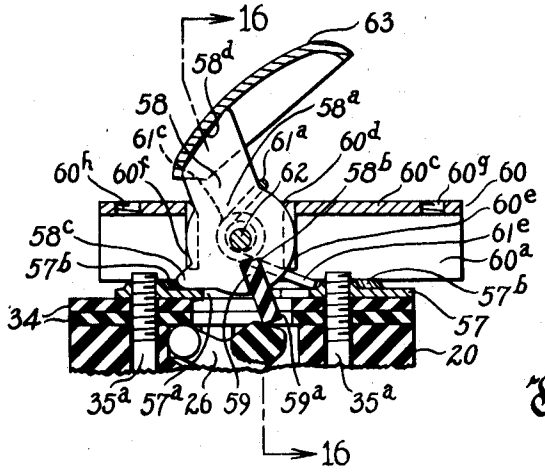
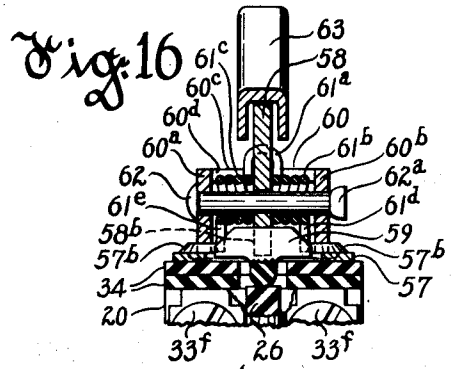


Fig. 16



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Patented Sept. 15, 1942 2,295,668

UNITED STATES PATENT OFFICE

2,295,668

ELECTRIC SWITCH

Alvin W. Krieger, Milwaukee, Wis., assignor to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

Application March 27, 1941, Serial No. 385,398

23 Claims. (Cl. 200—16)

This invention relates to improvements in electric switches, and the invention relates more particularly to improvements in switches adapted to control alternating current circuits.

A primary object of the invention is to improve and simplify the details of construction and assembly of the parts and the operation of switches of the aforementioned character.

Another object is to provide for utilization of a minimum number of different switch parts in the construction of switches having different operative characteristics, different types of wiring terminal elements, and different types of mounting and operating elements for the switches as a whole.

Another and more specific object is to provide an arrangement wherein the recessed insulating base, the insulating cover member therefore, the spring biased contactors, and the insulating actuating elements associated with the latter, are common to all of the various forms of switches herein contemplated.

Another object is to provide a novel form of single-pole, four-break switch adapted for control of an alternating current circuit.

Another object is to provide novel units of superstructure, including manual operating levers, to be alternatively and selectively associated with the insulating base and the parts carried by the latter.

Another object is to provide a novel ganging arrangement of a plurality of double-pole, alternating current controlling, switches of the aforementioned character—to function as a single switch for the control of four, six, or more, poles of an alternating current circuit.

Another object is to provide novel forms of combined contact and wiring terminal members and contactors for switches of the aforementioned character.

Other objects and advantages of the invention will hereinafter appear.

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

In the drawings,

Figure 1 is a top plan view (slightly over twice normal scale) of the recessed molded insulating base, which is common to all of the various switches herein disclosed—one longitudinally alined pair of combined contact and terminal members being shown in position—it being understood that in practice the bridging contactors and their biasing springs will first be positioned in the base recess.

Fig. 2 is a sectional view, on the line 2—2 of Fig. 1, showing the completely assembled parts of a double pole, single throw, momentary contact, binding screw terminal type of switch, the same having a superstructure adapted to provide for two-screw mounting of the complete switch within a tool handle or other suitable support (not shown)—the switch parts being shown in "off" position.

Fig. 3 is a sectional view, on the line 3—3 of Fig. 1, of a complete switch having a supporting and operating superstructure like that of Fig. 2, with the switch parts in "off" position.

Fig. 4 is an enlarged sectional view taken transversely, on the line 4—4, of Fig. 2—the switch parts being in "off" position.

Fig. 5 is a perspective view, in separated relation of certain of the switch parts shown in Figs. 1 to 4.

Fig. 6 is a view similar to Fig. 1, but illustrating a modified arrangement of stationary contacts to provide a single-pole switch of the four-break type—the bridging contactors and their biasing springs being omitted for clarity of illustration.

Fig. 7 is a perspective view of the connector which forms two of the stationary contacts in the switch of Fig. 6.

Fig. 8 is a perspective view of a solder-lug type of combined wiring terminal and contact member which may be substituted for the corresponding elements of Figs. 1 to 6.

Fig. 9 is a perspective view of a wire-lead type of combined stationary contact and terminal member which may be substituted for any of the corresponding elements of the other figures.

Fig. 10 is a sectional view of a double pole, single throw, switch similar to Fig. 2, but showing a one-hole mounting type of superstructure and operating lever, with the switch parts in "on" position; certain of the parts being shown in elevation.

Fig. 11 is a sectional view, on the line 11—11 of Fig. 10—the switch parts being in "on" position.

Fig. 12 is a view, partly in end elevation and partly in vertical section, of a six pole, single throw switch—the same comprising unitary supporting and operating means for three double pole switches of the character illustrated in Figs. 1 to 5.

Fig. 13 is a fragmentary sectional view, on the line 13—13 of Fig. 12.

Fig. 14 is a fragmentary sectional view, on the line 14—14 of Fig. 12.

Fig. 15 is a fragmentary vertical sectional view of a momentary contact type of switch similar to that of Figs. 2 to 4, but having a modified form of supporting superstructure and operating lever.

Fig. 16 is a fragmentary sectional view, on the line 16—16 of Fig. 15.

Referring to the switch shown in Figs. 1 to 5, the numeral 20 designates an insulating base of substantially rectangular contour molded from any suitable insulating material—preferably "Bakelite." Base 20 is provided with a group of three transversely alined, longitudinally parallel recesses 21, 22 and 23. The opposite end recesses 22 and 23 are of like form, and as best illustrated in Fig. 3 each is of substantially inverted, stepped, pyramidal form in vertical cross section. The lower end portions 22^a and 23^a of said end recesses are of substantially cylindrical form, against the bottom walls of which a pair of like springs 24, 24 (Figs. 3 and 4) are adapted to seat. The relatively larger intermediate portions 22^b and 23^b of said recesses are of substantially rectangular contour (Figs. 1, 3 and 4); and the largest or upper end portions 22^c and 23^c are likewise of rectangular contour, but of greater dimensions, longitudinally of base 20, than the portions 22^b and 23^b.

The central recess 21 includes a lower end portion 21^a of substantially cylindrical form—the portion 21^a being of the same height as but of greater diameter than the portions 22^a and 23^a aforedescribed—see Fig. 4. A coiled compression spring 25 of greater size and strength than the springs 24, 24, is adapted to seat against the bottom wall of portion 21^a. The upper end portion 21^b of recess 21 is of substantially rectangular contour and of greater size, longitudinally of base 20, than the end recesses 22 and 23. The end wall 21^c of portion 21^b is cut away, as shown at 21^d in Figs. 1 and 2, to accommodate one end of a molded insulating cam member 26—said end of the cam member having alined cylindrical pivot lugs 26^a and 26^b formed integrally therewith and extending from opposite sides thereof (Fig. 5); the side walls of portion 21^b of recess 21 being respectively provided with upwardly opening substantially rectangular recesses 21^e and 21^f to respectively accommodate lugs 26^a and 26^b in a position only slightly below the upper surface of base 20—thus providing for oscillatable support of said cam member.

A pair of like substantially U-shaped bridging contactors 27, 27 are loosely positioned within the portions 22^b and 23^b—the form of said contactors being best illustrated in Figs. 3 and 5. The substantially flat connecting portions 27^a of said contactors are respectively adapted to seat against the upper ends of springs 24, 24—the latter acting at all times to move said contactors toward the upper extreme position thereof. As indicated in Figs. 1 and 3, the lower ends and arm portions of contactors 27 are adapted for a free sliding fit within the portions 22^b and 23^b of the recesses—the side and end walls of said portions of the recesses assisting in restricting the contactors to straight-line reciprocating movements.

The upper ends of the arms of said contactors 27 are bent to extend outwardly and downwardly in arcuate form, as shown at 27^b and 27^c in Figs. 3 and 5—the purpose of the curved tips of the contactor arms being to reduce the likelihood of deposition of dust particles or other foreign substance upon said tips, and to overcome the disadvantageous effect of the presence of such foreign particles if deposited thereon—it being noted (see Fig. 3) that said contactors are self-adjusting to a limited extent to compensate for any possible irregularities in the surfaces of said tips.

The walls between the central recess 21 and end recesses 22 and 23 are provided with notches 28 and 29 and the outer side walls of recesses 22 and 23 are respectively provided with vertical grooves 30 and 31—said notches and grooves being alined with each other and with the center lines of recess portions 21^a, 22^a and 23^a (Fig. 1) and preferably extending to the plane of the bottom walls of recess portions 21^b, 22^b and 23^b, as shown in Fig. 4. A flat, punched insulating plate 32 is positioned edgewise for vertical reciprocation within said notches and grooves, as shown in Fig. 4. A lower edge portion 32^a of plate 32 is adapted to seat against the upper end of spring 25—spring 25 being at all times under compression, whereby plate 32 is normally biased toward its upper extreme position.

Plate 32 is preferably provided at the center of its lower edge with an integral extension or lug 32^b which fits into the upper end of spring 25 to assist in retaining said parts in proper relationship to each other. The opposite end portions 32^c and 32^d of plate 32 are respectively positioned between the arms of contactors 27, 27—the lower edges of said plate portions overlying the connecting portions of said contactors, whereby upon depression of plate 32 to its lower extreme position the contactors 27, 27 will be depressed to their lower extreme positions against the bias of springs 24, 24 (see Figs. 3 and 4) for interruption of the controlled circuit. Plate 32 is preferably provided in its upper edge with a notch 32^e which is adapted to accommodate the free end portion of cam member 26 to assist in restricting said plate to reciprocating movement in a straight line.

As shown at the lower end of Fig. 1, base 20 is provided with sets of ledge portions—the ledge portions of each set being respectively designated by the numerals 20^a, 20^b, 20^c, 20^d and 20^e. Said ledges are located in a common plane offset downwardly from the upper surface of base 20 to an extent substantially corresponding to the thickness of the horizontal flat portions 33^a of four like combined contact and wiring terminal members 33 formed of sheet metal. Portions 33^a are provided on opposite sides thereof with alined rectangular notches 33^b and 33^c (Fig. 5), either of which notches is adapted to accommodate one of the four portions 20^f formed integrally with the upper surface of the base—depending upon right-hand or left-hand mounting of said members at the respective ends of the base.

The wiring terminal portion 33^d of each member 33 is formed integrally with and bent downwardly at substantially a right angle to the flat portion 33^a thereof—said terminal portion having an inwardly extruded and tapped opening 33^e formed therein to accommodate the shank of a binding screw 33^f of usual form. As best illustrated in Figs. 1 and 3, base 20 is provided with four recesses 20^g to accommodate the shanks of screws 33^f—each of said recesses opening to the upper surface and to one of the end surfaces of said base. The head 33^g of each flat portion

33a preferably has rigidly attached to its lower surface a substantially circular disk or plate 33h of silver or a silver alloy. In this connection attention is called to the fact that the contactors 27 are preferably formed of bimetallic strips composed of an inner layer of a noble metal, such as silver or a silver alloy, and an outer layer of a base metal, such as brass; said strips when bent to form the contactors 27 providing for exposure of the layer of silver or silver alloy at the upper surfaces of the respective tips 27b and 27c of the contactors. By providing tips composed of such material upon the contacts and contactors the current controlling capacity and the life of the switches is greatly increased—as compared with similar switches having tips formed of a base metal.

In order to minimize the amount of molding material required for production of base 20—while providing the required depth of the recess portions 21a, 22a and 23a, I prefer to provide upon the lower surface of the base a transversely extending substantially rectangular downward extension 20h. I prefer to provide at opposite ends of the base the relatively thin extensions 20i and 20j (Figs. 1 to 3) which act as insulating barriers between the end pairs of binding screws 33f and the circuit wire ends to be clamped thereby.

As best illustrated in Fig. 1, the combined contact and terminal members have their flat portions 33a positioned in a substantially flush relationship to the upper surface of the base and in a relation to prevent transverse displacement of the former with respect to the latter in any direction. All of the aforedescribed parts are held in properly assembled relationship to base 20 by a flat, punched insulating plate 34 of rectangular contour,—the width of said plate preferably corresponding with that of the base, and the length of said plate being coextensive with the outer ends of barriers 20i and 20j, as shown in Figs. 2 and 3. Plate 34 is rigidly secured to the upper surface of base 20 as by means of a pair of screws 35, 35 (Fig. 3), the shank ends of which take into tapped openings in a metal plate 36, hereinafter more fully described. Plate 34 is provided with a centrally located rectangular slot 34a of a length and width to afford oscillatory clearance for cam member 26 and for the lower end extension 37a of a pivoted manual operating lever 37 (see Figs. 2 and 4; and Figs. 10 and 11 wherein a different type of lever is employed). As will be noted in Fig. 2, plate 34 overlies the cam lugs 26a and 26b whereby the latter are positively retained within the aforementioned bearing recesses. Plate 34 is also provided with clearance openings for the shanks of screws 35.

Metal plate 36 is provided with a centrally located substantially rectangular opening 36a which is relatively wider and longer than the opening 34a aforedescribed. Plate 36 is provided at opposite sides of one end of opening 36a with a pair of lugs partially sheared therefrom and bent upwardly at a predetermined angle thereto as shown at 36b and 36c in Fig. 4, for a purpose to be described. Positioned upon the upper surface of plate 36 is a drawn or stamped sheet metal housing member 38 of substantially rectangular contour. The length of the hollow portion of member 38 substantially corresponds with the length of plate 36—and member 38 is provided on opposite sides thereof with longitudinally extending horizontal flanges 38a and 38b, each of which flanges is rigidly attached to plate 36 at two or more longitudinally spaced points, as by spot welding.

Prior to thus rigidly and permanently uniting housing 38 to plate 36, the reduced upper end portion 37b of lever 37 (prior to attachment of knob 37c thereto with a drive fit) is passed upwardly through the slot 38c in the upper end of housing 38—said slot providing oscillatory clearance for the lever and being at all times substantially closed by one or the other of the arcuate enlargements 37d or 37e of the lever. Projecting beyond the respective enlargements 37d and 37e at predetermined angles thereto are lugs 37f and 37g the upper edges of which are adapted to engage the inner surface of the upper end wall of housing 38 to limit the throw of lever 37 to insure a like angular extreme position thereof in each direction.

In order to effect automatic return of lever 37 to its right-hand extreme position (Fig. 2 and 3) upon manual release thereof, I provide a coiled torsion spring 39 having a connecting portion 39a which is engaged with the lower edge of lug 38f; portions 39b and 39c coiled in a like direction outwardly from said connecting portion, and parallel straight end portions 39d and 39e which are adapted for engagement, with a predetermined degree of pressure, against the upper surface of metal plate 36. End portions 39d and 39e are restrained by the respective lugs 36b and 36c against inward displacement relatively to each other.

Lever 37 is provided with an opening 37h to accommodate a drive fit the intermediate enlarged portion 40a of a pin 40—the side walls of housing 38 having relatively larger alined openings 38d and 38e (Fig. 4) to freely receive the pin 40 inclusive of its enlarged portion 40a when inserted from either side of said housing. Lever 37, spring 39 and pin 40 will thus be retained in assembled relation to housing 38,—the metal plate 36 when welded to the housing engaging the spring ends 39d and 39e to apply a predeterminad degree of torsion strain to the spring. The knob 37c is applied with a drive fit to the reduced end 37b of the lever after upward insertion of the latter through said slot 38c. Housing 38 is provided with a pair of spaced tapped openings 38f and 38g to accommodate the shanks of screws (not shown) for attaching the switch to a tool handle or other suitable housing or support. The switch of Figs. 1 to 5 has a rated capacity of 10 amperes at 250 volts, alternating current.

In the modified form of switch illustrated in Figs. 6 and 7 it is to be understood that the various parts thereof may be identical with those illustrated in Figs. 1 to 5, except that the two combined contact and wiring terminal elements at the left hand end of the switch (Figs. 1 to 3) will be omitted; and in their stead a punched sheet metal bus member 41 will be employed—base 20 being provided with a transverse groove or recess 20k (Figs. 1 and 6) to accommodate the mid-portion 41a of said bus member, whereby the latter is seated in a substantially flush relation to the upper surface of said base. Bus member 41 is so shaped with respect to the recesses and shoulders formed in the upper surface of base 20 as to prevent substantial lateral displacement of the former with respect to the latter. The stationary contact portions 41b and 41c of the bus member have spot welded to the under surfaces thereof the silver or silver alloy contact tips 41h corresponding to the tips 33h aforemen-

tioned. With an arrangement like that shown in Fig. 6 the circuit to be controlled by the switch will be made or broken at four points, as will be obvious. As will be understood, the contactors and their associated elements, as well as the operating superstructure, are omitted for clarity of illustration,—it being understood that the other switch parts not shown may be identical in size and shape with those of Figs. 1 to 5. The form of the bus member 41, with its attached contact tips 41h is shown in perspective in Fig. 7.

Fig. 8 shows in perspective a modified form of combined stationary contact and terminal member 42 which may be substituted for the members 33 in any of the switches herein disclosed. The flat portion 42a of member 42 corresponds in shape with the flat portion 33a of member 33 aforedescribed,—the contact head portion 42g having the silver or silver alloy tip 42h spot welded to its lower surface, as aforedescribed. The wiring terminal portion 42d is bent downwardly at a predetermined angle to flat portion 42a—said portion 42d having a punched opening 42e therein to provide for insertion or looping of a wire end therethrough and soldering of the same thereto.

The alternative form of combined contact and wiring terminal member 43 shown in perspective in Fig. 9 is adapted to provide for concealed wiring of the switch—a desired length of wire 44 having its bared end 44a inserted upwardly through an opening 43e and then bent flatwise against the flat terminal portion 43d, to which it is attached, as by spot welding. Portion 43d is offset downwardly from and in a plane parallel to the relatively short flat portion 43a of member 43—the contact head portion 43g of the latter having a silver or silver alloy tip 43h spot welded to its lower surface. The wire end 44a is thus attached to member 43 prior to assembly of the switch parts, and the point of attachment is concealed within the body of the switch, leaving exposed a length of the wire 44 (such as five or six inches) whose bared outer end may be attached to a circuit wire by soldering or in any other usual manner.

The switch illustrated in Figs. 10 and 11 may be identical with that of Figs. 1 to 5 in respect of the insulating plate 34 and all of the parts positioned therebelow. The switch of Figs. 10 and 11 is of the one-hole mounting type, and accordingly I provide a punched and stamped sheet metal top plate 45, the centrally located bulged portion 45a of which is provided with an opening to receive the reduced lower end 46a of an externally threaded hollow metal bushing 46, said end 46a being upset over the lower surface of portion 45a to rigidly and permanently secure said parts to each other. Bushing 46 is provided with an upper end opening 46b of reduced diameter—the opening 46b being sufficiently large to provide for upward passage therethrough of the substantially spherical knob 47a forming an integral part of the machined lever 47. The intermediate enlarged portion 47b of said lever is adapted to substantially close said opening 46b, in the assembled relation of the parts, while providing for oscillatory movement of the lever with respect thereto.

The enlarged portion 47b of said lever is provided, by drilling, with a transverse passage 47c which is adapted to accommodate with a drive fit the flattened or otherwise enlarged intermediate portion 48a of an otherwise substantially cylindrical pin 48; bushing 46 being provided with alined drilled openings 46c and 46d to provide for insertion of said pin transversely in either direction to the position thereof shown in Fig. 11—said openings acting as bearings for the opposite ends of said pin. Lever 47 is provided at its lower end with an integral cylindrical stud or projection 47d of reduced diameter—said projection preferably having a substantially hemispherical end 47e for cooperative engagement with the cam member 26 aforedescribed. As will be understood, a pair of nuts (not shown) are preferably associated with bushing 46 to provide for adjustable support of the switch within a hollow tool handle or other suitable support having a single circular opening to accommodate said bushing.

In the six-pole, single throw switch of Figs. 12, 13 and 14 I employ three double-pole, single throw switches which are identical, up to the insulating plates 34, with the switches of Figs. 1 to 5, 10 and 11—as indicated by the corresponding numerals of reference. In Figs. 12 to 14, however, the three switch bases 20 with their associated parts are each attached by a pair of screws 49 (Fig. 13) to a metal top plate 50 forming a part of the supporting and operating superstructure. Superimposed upon plate 50 is an inverted shallow, cup-shaped housing member 51 of substantially rectangular contour. Housing 51 is preferably provided at at least one point along each end wall (Fig. 12) and at at least two points along each side wall (see Fig. 13) with vertical lugs or extensions 51a which are freely insertable into correspondingly positioned downwardly flared openings 50a (Figs. 12 and 13)—said lugs after insertion being upset as illustrated to rigidly and permanently secure said parts in assembled relation.

Prior to such assembly there is positioned within housing member 51 a metal rod 52, shown as of circular cross section, onto which rod are slidably fitted a pair of levers 53, 53 having downward projections 53a, 53a for cooperative engagement with the cam members 26 of the respective end switch parts, and an intermediate lever 54 having a downward projection 54a for cooperation with the cam member of the intermediate switch parts. Levers 53, 53 and lever 54 are secured to rod 52, with their projections 53a, 53a and 54a arranged in a like angular position, as by spot welding or brazing at points 53b, 53c and 54b, 54c, respectively, to positively restrain said levers against endwise or rotary displacement with respect to said rod.

Housing 51 is provided in its upper end wall with a slot 51b (Figs. 12 and 14) to provide for upward insertion of lever 54 (Fig. 12) prior to attachment of knob 54d with a drive fit to the reduced upper end of said lever—said slot affording oscillatory clearance for lever 54, as indicated by the dotted lines in Fig. 14. Rod 52 is provided in its opposite ends with drilled recesses 52a and 52b (Fig. 12) to receive with a drive fit the pins 55, 55—which are inserted thereinto through openings 51c and 51d in the respective end walls of the housing—said openings providing bearings for said pins to provide for oscillatory movement of said rod and the levers attached thereto. Housing 51 may be provided in its upper end wall with a pair of suitably spaced tapped openings (not shown) to provide for attachment of the switch unit to a panel or other suitable support.

Although I have shown a six-pole switch mech-

anism, it is to be understood that the number of poles to be operated may be increased or decreased by increasing or decreasing the number of switch bases **20** employed, with corresponding changes in the length and arrangement of the parts of the superstructure.

As will be noted, the metal plate **50** is provided with a centrally located elongated rectangular opening **50b** of a width substantially corresponding to the width of the slots **34a** in insulating plates **34**. Two insulating plates **56** having head portions **56a** of greater width than slot **50b** and neck portions **56b** of a width only slightly less than said slot **50b** are assembled by insertion of the plate heads upwardly through slot **50b** longitudinally of the latter—said plates being then turned to the positions thereof illustrated to restrain the same against downward or upward displacement. As shown in Fig. 14 plates **56** are of a length corresponding to the length of bases **20**—whereby said plates when positioned between the adjacent bases **20** act to properly insulate from each other the adjacent wiring terminal screws **33f** and the circuit wire ends to be attached thereto.

The trigger-lever operated form of momentary-contact type of switch illustrated in Figs. 15 and 16 is generally quite similar to that of Figs. 1 to 5, and differs therefrom primarily in respect to the elements of the supporting and operating superstructure. In the switch of Figs. 15 and 16 I prefer to employ two insulating top plates **34**, **34**, with corresponding longer screws **35a**, **35a** which take into tapped openings in the metal top plate **57**. Plate **57** is of substantially rectangular contour—the same having an opening **57a** formed therein to provide clearance for the substantially circular lower end portion **58a** of a lever **58** and for the lower end portion **59a** of a flat, punched insulating plate **59** whose upper edge portion fits within a rectangualr radial notch **58b** formed at a predetermined point in the periphery of portion **58a**.

Plate **57** is provided with four perforated upwardly projecting bosses **57b**—the openings in said bosses being adapted to receive downwardly extending lugs formed integrally with the lower edges of the side walls **60a** and **60b** of an inverted, channel-shaped sheet metal member **60**—the lower ends of said lugs being upset against the lower surfaces of the bosses, as indicated in dotted lines in Fig. 16. Member **60** is provided in its upper end wall **60c** with a substantially rectangular opening **60d**, extending throughout the width of said wall, to provide oscillating clearance for the portion **53a** of lever **58**. Two pairs of lugs are formed integrally with said wall **60c** and are bent downwardly through opening **60d** for positioning of the lugs of each pair on opposite sides of portion **58a**—one lug of each pair being shown at **60e** and **60f** in Fig. 15. The purpose of said lugs is to restrict lever **58** to oscillatory movement in a single plane.

A return spring of the torsion type has its connecting portion **61a** engaged with lever **58** as illustrated to bias the same to move in a counterclockwise direction (Fig. 15), the portions **61b** and **61c** of said spring being coiled in a like direction for location thereof on opposite sides of lever **58**, and the straight end portions **61d** and **61e** of said spring being adapted to engage the upper surface of plate **57** with a predetermined normal degree of pressure, which is increased upon clockwise rotation of the lever **58**. A headed pin **62** penetrates alined openings in the side walls **60a** and **60b** of member **60** and in the center of lever portion **58a**—the shank end **62a** (Fig. 16) of said pin being upset or flattened as shown to retain the same in assembled position.

Portion **58a** of lever **58** is provided at a predetermined point in its periphery with an integral lug or extension **58c** which is engageable with the upper surface of plate **57** and with the lower surface of the aforementioned wall **60c** to limit the rotary movement of lever **58** in each direction. The upper end of lever **58** has an angled edge portion **58d**, to which the inverted, channel-shaped trigger or finger grip **63** is rigidly attached at the two points of contact of said parts, as by spot welding—it being noted that the upper surface of member **63** is preferably of curved form, as illustrated. The end wall **60c** of member **60** is provided with a pair of spaced tapped openings **60g** and **60h** to provide for concealed mounting of the switch unit within a tool handle or the like, as by means of a pair of securing screws.

With reference to the switch of Figs. 1 to 5, it will be apparent to those skilled in the art that spring **39** may be omitted, if desired; thus providing a switch which is functionally and operatively similar to that illustrated in Figs. 10 and 11.

I claim:

1. In an electric switch of the slow break type, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, substantially U-shaped contactors positioned within said recess, coiled compression springs interposed between the bottom wall of said recess and the connecting portions of the contactors respectively positioned therewithin whereby said contactors are normally biased toward their upper extreme positions, a flat plate of insulating material reciprocable vertically within said recess, said plate being positioned between the arms of said contactors and adapted to seat against the connecting portions of the latter, a cam member loosely pivoted within said recess and having a lower edge portion engaged with the upper edge portion of said plate, said cam member being pivotally movable downwardly within said recess to provide for depression of said plate and said contactors against the bias of said springs, stationary contacts positioned within said recess for engagement by the respective contactors in the upper extreme positions of the latter, said contacts having portions loosely seated upon the upper surface of said base in a relation to prevent lateral displacement with respect thereto, and an insulating member engaging the upper surface of said base to retain all of the aforementioned parts in assembled relation.

2. In an electric switch of the slow break type, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, substantially U-shaped contactors positioned within said recess, coiled compression springs interposed between the bottom wall of said recess and the connecting portions of the contactors respectively positioned therewithin, whereby said contactors are normally biased toward their upper extreme positions, a flat plate of insulating material reciprocable vertically within said recess, said plate being positioned between the arms of said contactors and adapted to seat against the connecting portions of the latter, a cam member loosely pivoted within said recess and having a lower edge por-

tion engaged with the upper edge portion of said plate, said cam member being pivotally movable downwardly within said recess to provide for depression of said plate and said contactors against the bias of said springs, stationary contacts positioned within said recess for engagement by the respective contactors in the upper extreme positions of the latter, said contacts having portions loosely seated upon the upper surface of said base in a relation to prevent lateral displacement with respect thereto, an insulating member engaging the upper surface of said base to retain all of the aforementioned parts in assembled relation, said insulating member having an opening formed therein to provide oscillatable clearance for said cam member, and a manually operable member supported above said base and movable between opposite extreme positions to effect corresponding movements of said cam member, said manually operable member having a portion extending downwardly into said last mentioned opening in all positions of the former.

3. In an electric switch of the slow break type, in combination, an insulating base having a recess opening to the upper surface thereof, said base having downwardly offset ledges formed thereon, a pair of stationary contact members having flat portions thereof seated upon said ledges in a substantially flush relationship to the upper surface of said base, said flat portions having notches and said base having integral lugs cooperating therewith to prevent substantial lateral displacement of said members relatively to said base, said members respectively having tips overlying the upper end of said recess in spaced relationship to each other longitudinally of said base, a substantially U-shaped contactor positioned within said recess, a coiled compression spring interposed between the bottom wall of said recess and said contactor to normally bias the latter into bridging engagement with said contact tips, a flat, punched insulating plate positioned edgewise within said recess and having a portion overlying the connecting portion of said U, and an insulating cam member oscillatably supported by said base and overlying the upper edge of said plate, said cam member being oscillatable at will to effect depression of said plate and said contactor against the bias of said spring.

4. In an electric switch of the slow break type, in combination, an insulating base having a recess opening to the upper surface thereof, said base having downwardly offset ledges formed thereon, a pair of stationary contact members having flat portions thereof seated upon said ledges in a substantially flush relationship to the upper surface of said base, said flat portions having notches and said base having integral lugs cooperating therewith to prevent substantial lateral displacement of said members relatively to said base, said members respectively having tips overlying the upper end of said recess in spaced relationship to each other longitudinally of said base, a substantially U-shaped contactor positioned within said recess, a coiled compression spring interposed between the bottom wall of said recess and said contactor to normally bias the latter into bridging engagement with said contact tips, a flat, punched insulating plate positioned edgewise within said recess and having a portion overlying the connecting portion of said U, spring means normally acting to bias said plate upwardly out of engagement with the connecting portion of said U whereby said first mentioned spring is relieved of the weight of said plate, an insulating cam member oscillatably supported by said base and overlying the upper edge of said plate, and a lever pivotally supported above said base, said lever having a lower end portion adapted for continuous cooperative engagement with said cam.

5. As an article of manufacture, a molded insulating base for an electric switch of the slow break type, said base having a group of three substantially rectangular recesses formed therein and opening to the upper surface thereof, said recesses being of substantially greater length than width and the same being arranged in transversely alined parallelism between the longitudinal sides of said base, the central portions of the barriers formed between said recesses being interrupted to provide clearance for a reciprocating actuating element of suitable form, the central recess of said group having a pair of open bearings formed therein for pivotal support of a cam member to be associated therewith, each of said recesses having a substantially cylindrical cavity formed in its bottom wall to accommodate and to center a coiled compression spring, the end recesses of said group being adapted to accommodate reciprocating contactors of suitable form and the central recess being adapted to afford clearance for oscillatory movement of said cam member, and said base having in the upper surface thereof a plurality of grooves leading to each of said end recesses to provide for positioning of a group of stationary contact members in a substantially flush relationship to said upper surface of the base.

6. As an article of manufacture, a supporting and operating superstructure for an electric switch of the slow break type, said superstructure comprising a substantially rectangular punched sheet metal top plate of greater length than width having a pair of tapped openings formed therein for cooperation with the respective shanks of securing screws whereby an insulating base of suitable form may be rigidly attached thereto, said top plate having a relatively large opening formed therein between said pair of openings aforementioned, a punched and stamped sheet metal member having an area substantially coextensive with the area of said plate, said member being of hollow substantially rectangular form in longitudinal and transverse cross section and having longitudinal edge flanges to each of which said plate is spot welded at a plurality of spaced points, said member having a pair of tapped openings and a longitudinally extending slot formed in the otherwise closed upper end thereof, said tapped openings being adapted for cooperation with the shanks of screws whereby said member may be attached to a suitable support, said member having a pair of alined bearing openings formed in the opposite side walls thereof, a flat, punched sheet metal lever having a relatively large lower end, the reduced upper end of said lever being freely insertable upwardly through said plate opening and said slot whereupon a substantially spherical knob may be attached thereto with a drive fit, said enlarged lower end of said lever having an opening to be alined with said bearing openings, a pivot pin having an enlarged intermediate portion, said pin being freely insertable through said bearing openings and the intermediate portion thereof having a drive fit within said lever opening, whereby said lever and said pin are retained in assembled relation to said member, said

lever having a portion extending downwardly at all times through said plate opening, said plate having a pair of lugs formed integrally therewith and extending upwardly therefrom at opposite sides of one end of said plate opening, and a torsion spring having a connecting portion continuously engaged with the enlarged portion of said lever at one side of said pivot pin, said spring having coiled portions wound in a like direction outwardly from said connecting portion and surrounding said pin on opposite sides of said lever, and said spring having straight free end portions continuously engaged under a predetermined degree of pressure with the upper surface of said plate, said free ends of the spring being respectively engaged with said lugs to insure retention of said spring in properly assembled relation.

7. A slow break switch adapted for control of alternating current circuits, comprising a molded insulating base having at least three substantially rectangular recesses formed therein and opening to the upper surface thereof, the adjacent walls of said recesses having notches formed therein and extending throughout the major portion of the depth thereof, a relatively strong coiled compression spring positioned within an intermediate recess and a relatively weak coiled compression spring positioned within each of the other recesses, a bridging contactor positioned within each of the last mentioned recesses and guided by the walls of the latter for reciprocating movement in a substantially straight line, each of said contactors comprising a sheet metal strip bent to substantially U-shape, the free ends of the arms of said contactors being bent outwardly at a predetermined angle thereto, a flat punched insulating plate positioned edgewise within said notches and having portions thereof positioned between the arms of the respective contactors, a molded insulating cam oscillatably supported within said intermediate recess, said cam having a lower edge portion engageable with said plate to effect downward movement of the latter and said contactors against the bias of said springs upon oscillatory movement of said cam in a downward direction, said springs acting to normally move said contactors, said plate and said cam toward their upper extreme positions, a plurality of pairs of contacts overlying the recesses containing said contactors, and a flat punched insulating cover plate rigidly secured to the upper surface of said base and adapted to retain all of the aforementioned parts in assembled relation.

8. A slow break switch adapted for control of alternating current circuits, comprising a molded insulating base having at least three substantially rectangular recesses formed therein and opening to the upper surface thereof, the adjacent walls of said recesses having notches formed therein and extending throughout the major portion of the depth thereof, a relatively strong coiled compression spring positioned within an intermediate recess and a relatively weak coiled compression spring positioned within each of the other recesses, a bridging contactor positioned within each of the last mentioned recesses and guided by the walls of the latter for reciprocating movement in a substantially straight line, each of said contactors comprising a sheet metal strip bent to substantially U-shape, the free ends of the arms of said contactors being bent outwardly at a predetermined angle thereto, a flat punched insulating plate positioned edgewise within said notches and having portions thereof positioned between the arms of the respective contactors, a molded insulating cam oscillatably supported within said intermediate recess, said cam having a lower edge portion engageable with said plate to effect downward movement of the latter and said contactors against the bias of said springs upon oscillatory movement of said cam in a downward direction, said springs acting to normally move said contactors, said plate and said cam toward their upper extreme positions, a plurality of pairs of contacts overlying the recesses containing said contactors, a flat punched insulating cover plate rigidly secured to the upper surface of said base and adapted to retain all of the aforementioned parts in assembled relation, switch supporting means also rigidly secured to said base, and movable means carried by said last mentioned means for controlling the operation of said cam.

9. A switch adapted for control of alternating current circuits, comprising a molded insulating base having three parallel substantially rectangular recesses formed therein and opening to the upper surface thereof, the adjacent walls of said recesses having notches formed therein and extending throughout the major portion of the depth thereof, a coiled compression spring positioned within each end recess and adapted to seat upon the bottom wall thereof, a pair of substantially U-shaped contactors respectively positioned within said end recesses and adapted to seat against the upper ends of the springs within the latter, a flat insulating plate slidably positioned edgewise within said notches and extending transversely of all of said recesses, the end portions of said plate being adapted to overlie the connecting portions of the respective U-shaped contactors, a pair of open pivotal bearings formed in the middle recess adjacent one end of the latter, an oscillatable insulating cam member adapted to overlie the upper edge of said plate at the mid-portion of the latter, said cam member having laterally extending lugs positioned within said bearings, two pairs of longitudinally alined contacts respectively overlying said end recesses for cooperation with the respective contactors, a flat insulating cover plate overlying the upper end of said base and acting to secure said contacts and said cam member in assembled position, and a movable operating member supported above said insulating cover plate and cooperable with said cam member to effect downward movement of the latter against the bias of said springs and to permit upward movement of said cam member under the bias of said springs.

10. A switch adapted for control of alternating current circuits, comprising a molded insulating base having three parallel substantially rectangular recesses formed therein and opening to the upper surface thereof, the adjacent walls of said recesses having notches formed therein and extending throughout the major portion of the depth thereof, a coiled compression spring positioned within each recess and adapted to seat upon the bottom wall thereof, a pair of contactors respectively positioned within the end recesses and adapted to seat against the upper ends of the springs within the latter, each of said contactors comprising a sheet metal strip bent flatwise to substantially U-shape with the free ends of the arms thereof bent laterally with respect thereto, a flat insulating plate slidably positioned edgewise within said notches and extending transversely of all of said recesses, the

lower edge of said plate being adapted to seat at its mid-point against the upper end of the middle spring and the end portions of said plate being adapted to overlie the connecting portions of the respective U-shaped contactors, a pair of open pivotal bearings formed in the middle recess adjacent one end of the latter, an oscillatable insulating cam member adapted to overlie the upper edge of said plate at the mid-portion of the latter, said cam member having laterally extending lugs positioned within said bearings, two pairs of longitudinally alined contacts respectively overlying said end recesses for cooperation with the respective contactors, a flat insulating cover plate overlying the upper end of said base and acting to secure said contacts and said cam member in assembled position, and a movable operating member supported above said insulating cover plate and cooperable with said cam member to effect downward movement of the latter against the bias of said springs and to permit upward movement of said cam member under the bias of said springs.

11. A slow break switch adapted for control of alternating current circuits, comprising a molded insulating base having at least three substantially rectangular recesses formed therein and opening to the upper surface thereof, the adjacent walls of said recesses having notches formed therein and extending throughout the major portion of the depth thereof, a relatively strong coiled compression spring positioned within an intermediate recess and a relatively weak coiled compression spring positioned within each of the other recesses, a bridging contactor positioned within each of the last mentioned recesses and guided by the walls of the latter for reciprocating movement in a substantially straight line, each of said contactors comprising a bimetallic strip bent to substantially U-shape, the inner surface of said U being composed of metal containing silver and the outer surface thereof being composed of metal containing copper, the free ends of the arms of said U being bent outwardly and downwardly to substantially arcuate form to provide upwardly exposed contactor tips of said metal first mentioned, a flat insulating plate positioned edgewise within said notches and having portions thereof positioned between the arms of the respective contactors, an insulating cam member oscillatably supported within said intermediate recess, said plate having a notch in its upper edge and said cam member being positioned between the side walls of said notch and engageable with the bottom wall thereof to effect downward movement of said plate and said contactors upon downward oscillatory movement of said cam member, a plurality of pairs of contact members overlying the recesses containing said contactors, each of said contact members having a tip composed of metal containing silver attached thereto for cooperation with its associated contactor, and means comprising an insulating cover member attached to said base and adapted to retain all of said parts in assembled position.

12. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, the side walls of said intermediate recess having notches formed therein and extending throughout the major portion of the depth thereof, a flat insulating member slidably positioned within said notches, the opposite end portions of said insulating member being adapted to fit rather loosely between the arms of the respective contactors, said springs acting to bias said contactors and said insulating member toward their upper extreme positions, two pairs of stationary contacts having portions thereof seated upon said base in a substantially flush relation to the upper surface of the latter, the tips of each pair of contacts overlying the bent ends of the arms of one of said contactors, and an insulating cover member secured to the upper surface of said base and adapted to retain all of the aforementioned parts in assembled relation.

13. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, a coiled compression spring positioned within said intermediate recess, the side walls of said intermediate recess having notches formed therein and extending throughout the major portion of the depth thereof, a flat insulating member slidably positioned within said notches and seated against the upper end of said last mentioned spring, the opposite end portions of said insulating member being adapted to fit rather loosely between the arms of the respective contactors, said springs acting to bias said contactors and said insulating member toward their upper extreme positions, two pairs of stationary contacts having portions thereof seated upon said base in a substantially flush relation to the upper surface of the latter, the tips of each pair of contacts overlying the bent ends of the arms of one of said contactors, an insulating cover member secured to the upper surface of said base and adapted to retain all of the aforementioned parts in assembled relation, and manually operable means for effecting downward movement of said insulating member and said contactors against the bias of said springs.

14. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substan-

tially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, the side walls of said intermediate recess having notches formed therein and extending throughout the major portion of the depth thereof, a flat insulating member slidably positioned within said notches, the opposite end portions of said insulating member being adapted to fit rather loosely between the arms of the respective contactors, said springs acting to bias said contactors and said insulating member toward their upper extreme positions, two pairs of stationary contacts having portions thereof seated upon said base in a substantially flush relation to the upper surface of the latter, the tips of each pair of contacts overlying the bent ends of the arms of one of said contactors, an insulating cover member secured to the upper surface of said base and adapted to retain all of the aforementioned parts in assembled relation, and manually operable means for effecting downward movement of said insulating member and said contactors against the bias of said springs, said last mentioned means comprising an insulating cam member pivotally supported within said intermediate recess and also retained in assembled relation by said insulating cover member.

15. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, each of said contactors comprising a bimetallic strip bent flatwise to the form defined, said strip having a layer of metal containing copper and a layer of metal containing silver, the arrangement being such that said last mentioned layer of metal is exposed at the upper surfaces of said bent ends of the contactor arms, a relatively stronger coiled compression spring being positioned within said intermediate recess, a flat insulating member seated against said last mentioned spring and having end portions reciprocable with the respective side recesses, said end portions being adapted to respectively fit between the arms of said contactors to assist in guiding the latter for movement in a straight line, two sets of sheet metal contact members having portions thereof seated flatwise upon said base in a substantially flush relation to the upper surface of the latter, each of said contact members having a tip portion of metal containing silver attached to the lower surface thereof for cooperation with its associated contactor, and a flat, punched insulating plate rigidly secured to the upper surface of said base and adapted to positively retain all of said parts in assembled relation.

16. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, each of said contactors comprising a bimetallic strip bent flatwise to the form defined, said strip having a layer of metal containing copper, and a layer of metal containing silver, the arrangement being such that said last mentioned layer of metal is exposed at the upper surfaces of said bent ends of the contactor arms, a relatively stronger coiled compression spring being positioned within said intermediate recess, a flat insulating member seated against said last mentioned spring and having end portions reciprocable with the respective side recesses, said end portions being adapted to respectively fit between the arms of said contactors to assist in guiding the latter for movement in a straight line, two sets of sheet metal contact members having portions thereof seated flatwise upon said base in a substantially flush relation to the upper surface of the latter, each of said contact members having a tip portion of metal containing silver attached to the lower surface thereof for cooperation with its associated contactor, and a flat, punched insulating plate rigidly secured to the upper surface of said base and adapted to positively retain all of said parts in assembled relation, and means comprising a movable member operable at will to effect downward movement of said insulating member and said contactors against the bias of said springs.

17. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, each of said contactors comprising a bimetallic strip bent flatwise to the form defined, said strip having a layer of metal containing copper and a layer of metal containing silver, the arrangement being such that said

last mentioned layer of metal is exposed at the upper surfaces of said bent ends of the contactor arms, a flat insulating member having end portions reciprocable with the respective side recesses, said end portions being adapted to respectively fit between the arms of said contactors to assist in guiding the latter for movement in a straight line, two sets of sheet metal contact members having portions thereof seated flatwise upon said base in a substantially flush relation to the upper surface of the latter, each of said contact members having a tip portion of metal containing silver attached to the lower surface thereof for cooperation with its associated contactor, a flat, punched insulating plate rigidly secured to the upper surface of said base and adapted to positively retain all of said parts in assembled relation, and means comprising a movable member operable at will to effect downward movement of said insulating member and said contactors against the bias of said springs, said last mentioned means including an insulating cam member pivotally supported within said intermediate recess and also positively retained in assembled relation by said insulating plate.

18. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other tranversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, each of said contactors comprising a bimetallic strip bent flatwise to the form defined, said strip having a layer of metal containing copper and a layer of metal containing silver, the arrangement being such that said last mentioned layer of metal is exposed at the upper surfaces of said bent ends of the contactor arms, a relatively stronger coiled compression spring positioned within said intermediate recess, a flat insulating member seated against said last mentioned spring and having end portions reciprocable with the respective side recesses, said end portions being adapted to respectively fit between the arms of said contactors to assist in guiding the latter for movement in a straight line, two sets of sheet metal contact members having portions thereof seating flatwise upon said base in a substantially flush relation to the upper surface of the latter, each of said contact members having a tip portion of metal containing silver attached to the lower surface thereof for cooperation with its associated contactor, a flat, punched insulating plate rigidly secured to the upper surface of said base and adapted to positively retain all of said parts in assembled relation, means comprising a movable member operable at will to effect downward movement of said insulating member and said contactors against the bias of said springs, said last mentioned means including an insulating cam member pivotally supported within said intermediate recess and also positively retained in assembled relation by said insulating plate, and said last mentioned means also including means cooperable with said cam member to releasably retain the latter, said insulating member and said contactors in their lower extreme positions upon the aforementioned downward movement thereof.

19. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of side recesses and an intermediate recess alined with each other transversely of said base between opposite ends of the latter, each of said side recesses being of inverted, stepped, substantially pyramidal form in vertical cross section longitudinally of said base, a coiled compression spring having its lower end seated in the lower or smallest portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within the next larger portion of said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper or largest portion of said recess, each of said contactors comprising a bimetallic strip bent flatwise to the form defined, said strip having a layer of metal containing copper and a layer of metal containing silver, the arrangement being such that said last mentioned layer of metal is exposed at the upper surfaces of said bent ends of the contactor arms, a flat insulating member having end portions reciprocable with the respective side recesses, said end portions being adapted to respectively fit between the arms of said contactors to assist in guiding the latter for movement in a straight line, two sets of sheet metal contact members having portions thereof seated flatwise upon said base in a substantially flush relation to the upper surface of the latter, each of said contact members having a tip portion of metal containing silver attached to the lower surface thereof for cooperation with its associated contactor, a flat, punched insulating plate rigidly secured to the upper surface of said base and adapted to positively retain all of said parts in assembled relation, means comprising a movable member operable at will to effect downward movement of said insulating member and said contactors against the bias of said springs, said last mentioned means including an insulating cam member pivotally supported within said intermediate recess and also positively retained in assembled relation by said insulating plate, said last mentioned means also including means cooperable with said cam member and tending to normally releasably retain the latter, said insulating member and said contactors in their lower extreme positions upon the aforementioned downward movement thereof, and means comprising a single spring associated with said movable member and adapted upon manual release of the latter to bias all of said last mentioned parts to said lower extreme positions against the action of said coiled compression springs.

20. In a single pole, single throw, four-break switch of the slow break type, in combination, a molded insulating base having a group of three transversely alined parallel recesses formed therein and opening to the upper surface thereof, a substantially U-shaped contactor slidably mounted in each of the end recesses of said group, a coiled compression spring interposed between the bottom wall of each end recess and its associated contactor thereby said con-

tactors are normally biased toward their upper extreme positions, the adjacent walls of said recesses having vertical notches formed therein, a flat, punched insulating plate positioned edgewise within said notches and having end portions located between the arms of said contactors and overlying the connecting portions of the latter, a coiled compression spring interposed between the bottom wall of the central recess and the lower edge of said plate to normally bias the latter toward its upper extreme position, a pair of longitudinally spaced stationary contacts overlying the upper end of each of said end recesses for cooperation with the respective contactors, said contacts having portions thereof seated upon said base in a substantially flush relation and interlocked against transverse movement with respect thereto, two of the transversely alined contacts of said pairs having wiring terminal portions formed integrally therewith and exposed at one end of said base, the other two transversely alined contacts of said pairs having a bus portion forming an integral connection therebetween, said base having a transversely extending groove formed in the upper surface thereof to accommodate said bus portion, an insulating cam member oscillatably supported within said central recess and adapted to overlie the upper edge of said plate, and a flat, punched insulating plate rigidly secured to the upper surface of said base to retain all of said parts in assembled relation.

21. In an electric switch of the slow-break type, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, substantially U-shaped contactors positioned within said recess, coiled compression springs interposed between the bottom wall of said recess and the connecting portions of the contactors respectively positioned therewithin whereby said contactors are normally biased toward their upper extreme positions, a flat plate of insulating material reciprocable vertically within said recess, said plate being positioned between the arms of said contactors and adapted to seat against the connecting portions of the latter, the side walls of said recess cooperating with opposite ends of said plate to assist in guiding the latter, manually operable means, including a cam member, carried by said base to provide for depression of said plate and said contactors against the bias of said springs, a plurality of pairs of longitudinally alined contacts positioned within said recess for bridging engagement by the respective contactors in the upper extreme positions of the latter, the tips of said contacts being positioned in substantially flush relation to the upper surface of said base, and a flat plate of insulating material secured to the upper surface of said base and adapted to overlie said contact tips and said contactors.

22. In an electric switch of the slow break type, in combination, a molded insulating base having a recess opening to the upper surface thereof, said base having downwardly offset ledges formed thereon, a pair of punched and stamped sheet metal contacts having portions seated upon said ledges, the tips of said contacts being positioned in a substantially flush relationship to the upper surface of said base, means to prevent substantial lateral displacement of said contacts relatively to said base, the tips of said contacts overlying the upper end of said recess in spaced relationship to each other longitudinally of said base, a substantially U-shaped contactor positioned within said recess, a coiled compression spring interposed between the bottom wall of said recess and said contactor to normally bias the latter into bridging engagement with said contact tips, a flat, punched insulating plate positioned edgewise within said recess and having a portion overlying the connecting portion of said U, and manually operable means including a cam member movably supported by said base and overlying the upper edge of said plate, said cam member being movable at will to effect depression of said plate and said contactor against the bias of said spring.

23. In an electric switch of the slow break type, in combination, a molded insulating base having a pair of said recesses and an intermediate recess aligned with each other transversely of said base between opposite ends of the latter, a coiled compression spring having its lower end seated in the lower portion of each side recess, a bridging contactor of substantially U-shape having its arms and connecting portion positioned within said recess and seated against the upper end of said spring, the ends of said arms being bent to extend therefrom in opposite directions longitudinally of said base for vertical movement within the upper portion of said recess, the side walls of said intermediate recess having notches formed therein and extending throughout the major portion of the depth thereof, a flat insulating member slidably positioned within said notches, the opposite end portions of said insulating member being adapted to fit rather loosely between the arms of the respective contactors, said springs acting to bias said contactors and said insulating member toward their upper extreme positions, two pairs of stationary contacts carried by said base and having the tips thereof arranged in a substantially flush relation to the upper surface of the base, the tips of each pair of contacts overlying the bent ends of the arms of one of said contactors, and an insulating cover member secured to the upper surface of said base, said cover having an opening formed therein to provide clearance for an operating element of suitable form.

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