

March 25, 1941.

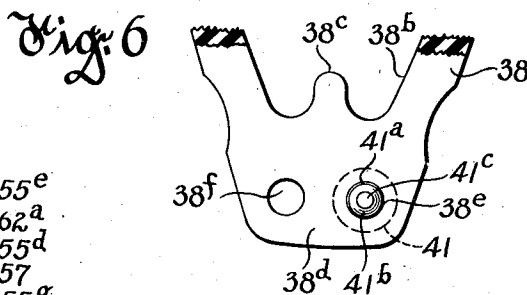
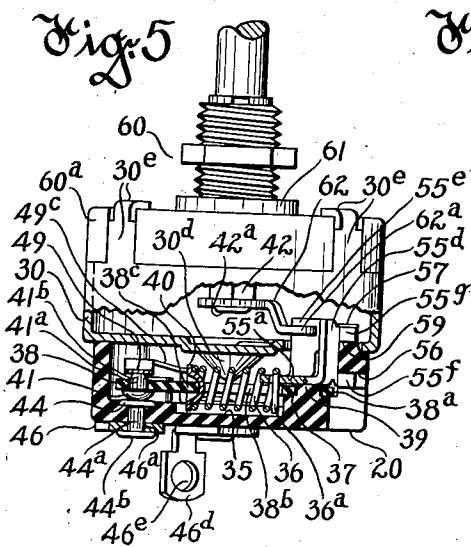
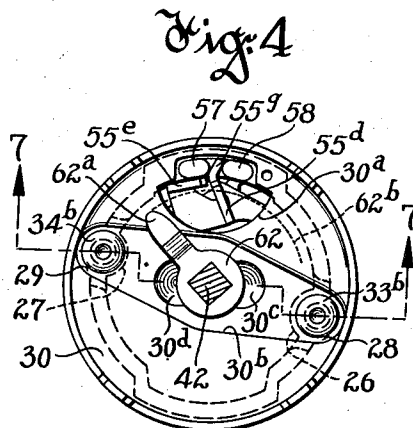
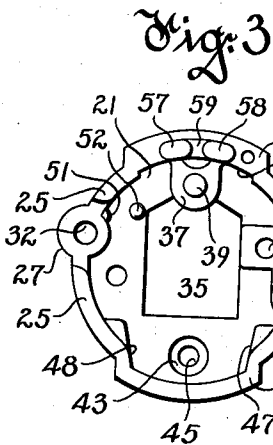
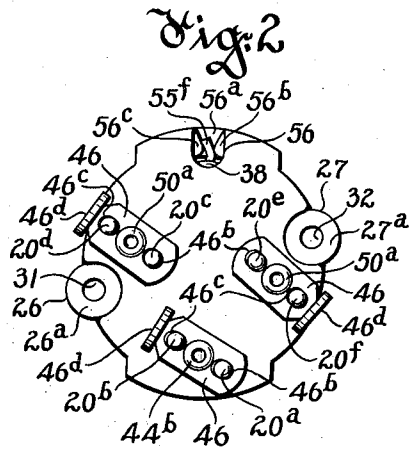
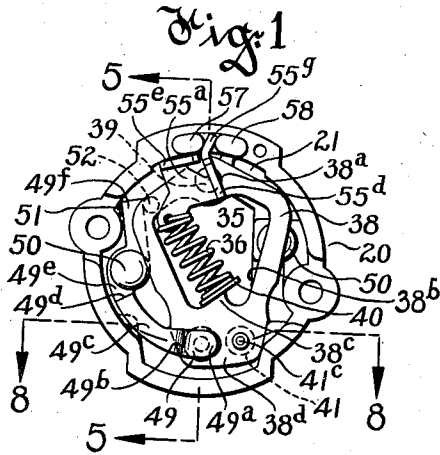
G. J. MEUER

2,236,344

ELECTRIC SNAP SWITCH

Filed June 20, 1940

3 Sheets-Sheet 1



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March 25, 1941.

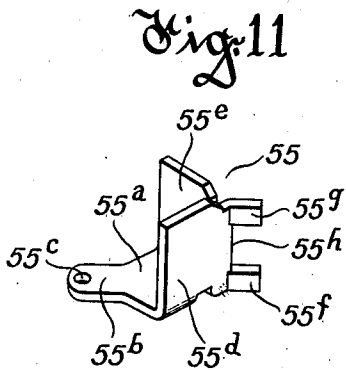
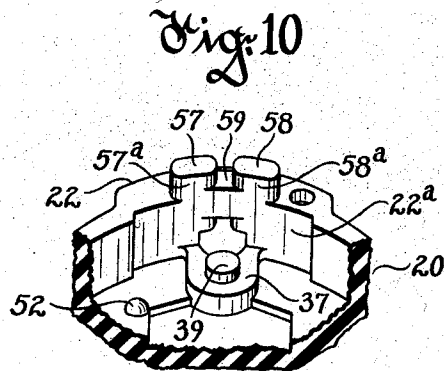
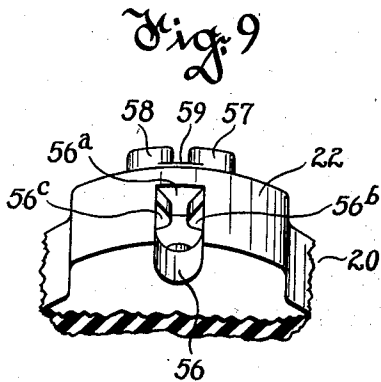
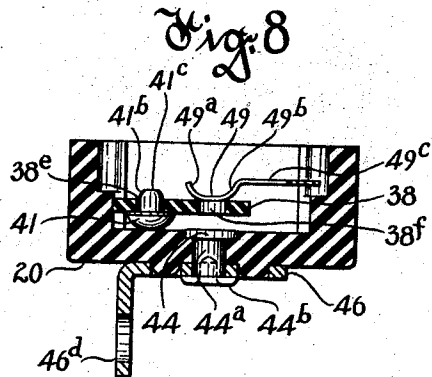
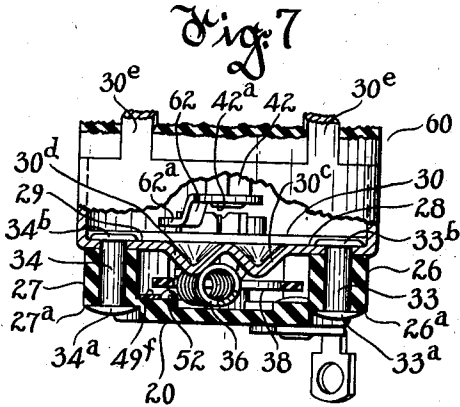
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2,236,344

ELECTRIC SNAP SWITCH

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3 Sheets-Sheet 2



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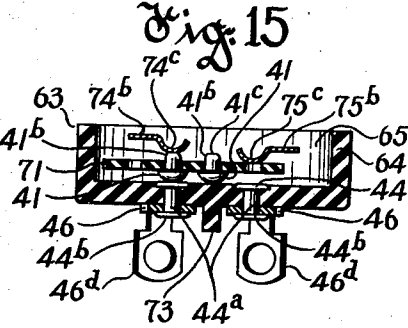
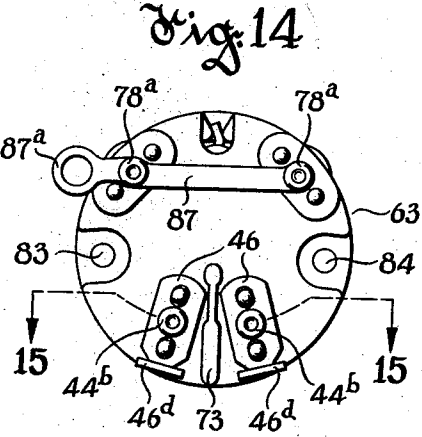
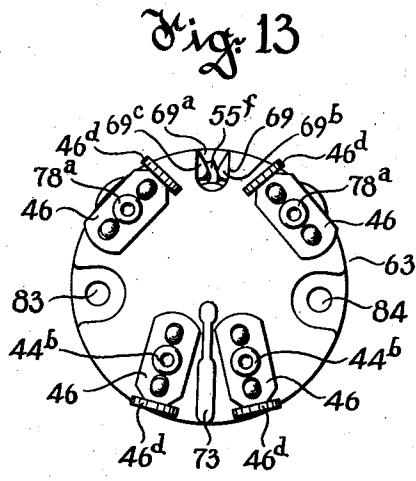
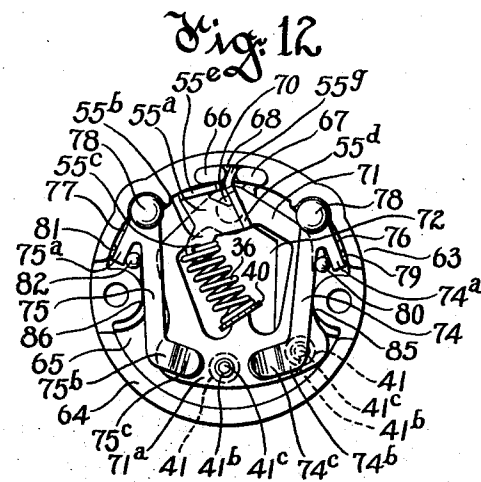
G. J. MEUER

2,236,344

ELECTRIC SNAP SWITCH

Filed June 20, 1940

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,236,344

ELECTRIC SNAP SWITCH

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Application June 20, 1940, Serial No. 341,518

24 Claims. (Cl. 200—67)

This invention relates to improvements in electric snap switches. Although not limited thereto, the invention relates more particularly to electric snap switches adapted for attachment to and for cooperation with radio rheostats or similar electrical devices.

A primary object of the invention is to minimize the required size of the insulating base of such a switch, with reference to the electrical rating or current-controlling capacity of the latter.

Another object is to reduce the number of metal parts required for construction of a switch of the aforementioned character.

Another object is to obviate the necessity for the usual metal pivot pin for supporting the actuating element and the insulating contactor-carrying plate of the switch.

Another object is to provide a novel form and arrangement of the switch parts whereby the required angular throw of the operating member to effect movement of the actuating element to each of its extreme positions is minimized.

Another object is to provide a novel form of metal actuating element for the switch.

Another and more specific object is to provide a novel form of insulating base having integral elements affording separate and direct pivotal support for the actuating element and the aforementioned contactor-carrying plate of the switch.

Another object is to provide an insulating base having novel means to provide for rigid and non-rotatable attachment of a terminal element thereto by means of a single fastening member.

Another object is to provide novel supporting means for the insulating base of the switch whereby the actuating element and the spring associated therewith are grounded in each of the extreme positions thereof.

Another object is to provide a switch base of the aforementioned character and a minimum number of different switch parts adapted for assembly to alternatively provide switches of the single pole, double-pole, three-way, and four wire types.

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 invention is susceptible of embodiment in forms specifically different from those illustrated without departing from the spirit and scope of the appended claims.

In the drawings,

Figure 1 is a top plan view (double size) of a single pole snap switch constructed in accordance with my invention.

Fig. 2 is a bottom plan view of said switch.

Fig. 3 is a top plan view of the insulating base of the switch shown in Figs. 1 and 2.

Fig. 4 is a plan view of the inside of a sheet metal cover member for a rheostat or the like, showing the switch of Figs. 1 to 3 attached thereto—the switch being shown in its "off" position, and the correlation of the switch and rheostat parts being illustrated.

Fig. 5 is a sectional view, on the broken line 5—5 of Fig. 1, but with the switch in "on" position, and in fully assembled relationship to a radio rheostat or the like.

Fig. 6 is a fragmentary plan view (four times actual size) of the flat, punched insulating contact-carrying plate of the switch—showing the bridging contactor in the right-hand opening at the forward end of the plate.

Fig. 7 is a fragmentary view, partly in vertical section on the line 7—7 of Fig. 4, showing the switch in assembled relationship to a radio rheostat or the like, and illustrating the manner of forming the metallic cover member to provide for grounding of the spring and the actuating element in each extreme position of the latter.

Fig. 8 is an enlarged sectional view, on the line 8—8 of Fig. 1, showing the switch in the "off" position, and illustrating the manner in which the terminal members are interlocked against rotation relatively to the insulating base.

Fig. 9 is an enlarged fragmentary perspective view of the exterior of the insulating base, illustrating the manner in which the peripheral wall of the base recess is formed at one point to provide for direct pivotal support of the actuating element of the switch.

Fig. 10 is a view similar to Fig. 9, but showing the formation of the inner surface of the peripheral wall, and the adjacent portion of the base recess, at the aforementioned point.

Fig. 11 is a detail perspective view of the punched and stamped sheet metal actuating element of the switch.

Fig. 12 is a top plan view (double scale) of a double-pole snap switch constructed in accordance with my invention—the insulating base, contact-carrying plate and resilient stationary contacts being modified, but the other parts being identical with the corresponding parts of Figs. 1 to 11.

Fig. 13 is a bottom plan view of the switch shown in Fig. 12.

Fig. 14 is a bottom plan view of a three-way switch constructed in accordance with my invention.

Fig. 15 is a vertical sectional view, on the broken line 15-15 of Fig. 14.

Fig. 16 is a sectional view of a four-wire switch constructed in accordance with my invention—such a switch being generally similar to that of Figs. 12 and 13, except that means are provided for permanently electrically connecting the switch contactors.

Fig. 17 is a detail perspective view of the compound or double contactor element employed in the four-wire switch of Fig. 16, and

Fig. 18 is a top plan view of the insulating contactor carrying plate employed in the switches of Figs. 12 to 17, inclusive.

Certain features of the switches herein disclosed are like or similar to those disclosed and claimed in the copending application of George J. Meuer and William C. Stevens, Serial No. 537,774, filed May 16, 1931, for improvements in Electric snap switches, now Patent No. 2,230,187, granted January 28, 1941, and in Patent No. 2,050,359, granted August 11, 1936, to George J. Meuer, for improvements in Electric snap switches—to which application and patent reference may be had for a better understanding of the purpose and/or utility of switches of this general character.

Referring first to the single pole snap switch illustrated in Figs. 1 to 11 hereof, the numeral 20 designates a recessed insulating base adapted to be produced by a straight-line molding operation, preferably from a material of the phenol-formaldehyde condensation type such as that sold commercially under the trade name of "Bakelite." Base 20 is preferably of the contour best illustrated in Fig. 3, wherein the base recess 21 is provided with a peripheral wall having relatively short diametrically opposed segments 22 and 23 of a given radius, and having interposed therebetween relatively longer diametrically opposed segments 24 and 25 of relatively smaller radius, with respect to the geometrical center of the base. The segments 24 and 25 are provided at diagonally opposite points with substantially cylindrical enlargements 26 and 27, the upper ends of which are offset downwardly to a slight extent to accommodate the corresponding downwardly offset portions 28 and 29 of a sheet metal cover member 30—as best illustrated in Figs. 4 and 7. Said enlargements 26 and 27 are provided with centrally located openings or passages 31 and 32 adapted to accommodate the shanks of rivets 33 and 34 (Figs. 4 and 7)—the lower ends of enlargements 26 and 27 being offset upwardly from the bottom surface of base 20, as shown at 26^a and 27^a in Figs. 2 and 7, to accommodate the heads 33^a and 34^a of rivets 33 and 34. The hollow upper ends of said rivets 33 and 34 penetrate aligned openings in the aforementioned offset portions 28 and 29 and are upset over the latter, as shown at 33^b and 34^b in Figs. 4 and 7, to rigidly and permanently secure the switch to said metal cover member 30.

The bottom wall of base recess 21 is provided approximately centrally thereof with a sub-recess 35 of the contour best illustrated in Fig. 3—said recess 35 serving to provide ample clearance for the coiled compression spring 36 employed in the switch, as best illustrated in Fig. 5. Offset upwardly from the bottom wall of recess 21, at one

end of recess 35, is a ledge 37 (Figs. 3 and 5) upon which one end of a flat, punched insulating, contactor-carrying plate 38 (Figs. 1 and 5) is adapted to bear. Formed integrally with ledge 37 is an upstanding cylindrical stud 39 which preferably has a height only slightly greater than the thickness of plate 38, as best illustrated in Fig. 5. Plate 38 is provided at the rear end thereof (Fig. 1) with a substantially circular opening 38^a which is adapted to rotatably fit over stud 39—thus providing for oscillatory support of said plate.

Plate 38 is provided with a symmetrically arranged, relatively large, intermediate opening 38^b (Fig. 1), the purpose of which is to provide oscillatory clearance between said plate and spring 36. The forward end wall of opening 38^b is formed to provide an abutment 38^c for the forward end of spring 36—the usual metal cup 40 being positioned within said end of the spring to insure proper bearing engagement with said abutment 38^c. Plate 38 is provided with a forward end portion 38^d of reduced width, and said end portion is provided with a pair of symmetrically arranged substantially circular openings 38^e and 38^f, which are spaced equal radial distances from the aforementioned opening 38^a in said plate. A metal contactor has its relatively large substantially hemispherical head 41 (Figs. 1, 5 and 6) interposed between the bottom wall of recess 21 and the lower surface of plate 38, and has its reduced shank portion 41^a extending upwardly, freely, through one or the other of the openings 38^e or 38^f, to a plane substantially above the upper surface of plate 38. The upper exposed end of shank 41^a is of substantially hemispherical form, as shown at 41^b in Figs. 5 and 6, except that the extreme upper end of said shank is provided with a flat circular area 41^c (see Fig. 6) to provide for good electrical engagement thereof with the resilient stationary contact, hereinafter described. As will be apparent, the hemispherical portion 41^b of shank 41 assists in guiding the contactor into engagement with said resilient stationary contact.

In the switch of Figs. 1 to 11, inclusive, the bridging contactor is positioned within the right-hand opening 38^e in plate 38, whereby the circuit to be controlled by the switch is completed upon clockwise oscillation of plate 38 upon stud 39 (see Fig. 1)—which movement of said plate is effected, by a relatively small degree of rotary clockwise movement of the rheostat shaft 42 (Fig. 4), through the medium of spring 36 and the actuating element hereinafter described. It will be apparent to those skilled in the art, however, that a direct reversal of the circuit completing and interrupting functions of the switch may be effected by merely inserting the shank of contactor 41 into opening 38^f, instead of into the opening 38^e.

As best illustrated in Fig. 3, the bottom wall of recess 21 is provided with a shallow substantially circular countersink 43, which is adapted to accommodate, in a substantially flush relationship to said bottom wall (see Fig. 5), the flat circular head 44 of a rivet, the shank 44^a of which penetrates an opening or passage 45 in said bottom wall, and an aligned opening 46^a in a metal terminal member 46; the hollow end of said rivet shank 44^a being upset over said terminal member, as shown at 44^b (Figs. 2 and 5), whereby said rivet and said terminal member are rigidly and permanently attached to base 20 and to each other. As shown in Fig. 5, rivet head 44 forms the lower stationary contact of the switch.

As will be apparent from consideration of Figs. 3 and 5, the contact head 44 is positioned midway between the shoulders 47 and 48 formed within the base recess 21, and at such a radial distance from pivot stud 39 (Fig. 3) as to be aligned with one or the other of the openings 38^a or 38^b in plate 38 in the respective extreme positions of the latter. Thus with the contactor positioned in the right-hand opening 38^a, the same will be dis-

engaged from contact head 44 in the right-hand extreme position of plate 38, and said contactor will be engaged with said contact head when plate 38 is in its other extreme position. The upper resilient contact element of the switch has its contactor-engaging portion 49 directly overlying and biased toward the contact head 44 (Figs. 1, 5 and 8)—the free end of said contact element being curved or flared upwardly, as best illustrated at 49^a Fig. 8, to facilitate movement of surface 41^c of the contactor shanks into engagement with said portion 41—the curved or hemispherical surface 41^b of said shank assisting, as aforescribed. In like manner (see Fig. 8) an upwardly curved or flared portion 49^b is arranged on the opposite side of portion 49 for cooperation with the contactor, in the event that the latter is positioned within opening 38^b in plate 38. Formed integrally with portions 49, 49^a and 49^b (Fig. 8) is the upwardly offset resilient arm portion 49^c which provides clearance for plate 38 (and for the shank end of the contactor, if positioned within said plate opening 38^a). A portion of said resilient contact element is bent downwardly at substantially a right angle to portion 49^c, as indicated at 49^d in Figs. 1 and 5, and is integral with the portion 49^c (Fig. 1) which seats against the bottom wall of base recess 21. Portion 49^d, said bottom wall of the base recess, and a terminal member 46, like that aforescribed, are provided with aligned openings to accommodate the shank of a rivet whose hemispherical head 50 is seated against the upper surface of said portion 49^c. The hollow end of said rivet shank is upset, as shown at 50^a in Fig. 2, to secure said resilient contact element and said terminal member to base 20 and to each other.

In practice I prefer to provide portion 49^c with a rearward extension 49^f (Fig. 1) which fits rather closely between a fillet or boss 51 and a boss 52, formed integrally with the bottom wall of recess 21 (see Fig. 3). The resilient contact element is thus positively held against rotary displacement relatively to base 20. I prefer to provide the bottom wall of base recess 21 (see Fig. 2) with a flat ledge 53 having a height substantially corresponding to the thickness of portions 49^c and 49^f of the resilient contact element aforesmentioned, and an opening or passage 54 is provided within the area of said ledge to accommodate another rivet 50, whose hollow end 50^a is upset over a third terminal member 46—as shown at the left-hand side of Fig. 2, which serves as a bussing lug.

As best illustrated in Fig. 2, each of the terminal members 46 is provided with a pair of relatively small openings 46^b and 46^c, on opposite sides respectively of the rivet-receiving opening 46^a (Fig. 5) formed therein. The bottom surface of base 20 is provided with pairs of bosses 20^a, 20^b; 20^c, 20^d, and 20^e, 20^f, to rather closely fit into the respective pairs of openings 46^b, 46^c, whereby each of said terminal members is positively restrained against rotation relatively to base 20. Each of the members 46 has a portion 46^d formed integrally therewith, and preferably

bent to extend therefrom at a right angle to the bottom surface of base 20; and each of the portions 46^d is provided with a perforation 46^e (see Fig. 5) to provide for attachment thereto of a circuit wire or wires (not shown), as by looping, twisting and soldering in the usual manner. If the over-all depth of the assembled switch parts is required to be minimized, the portions 46^d of the terminal members may be left in the plane of the main body portions 46 thereof; in which event the lower terminal member in Fig. 2, for instance, would be reversed in position—so that all of the wire-attaching portions 46^d would extend laterally beyond the peripheral contour of base 20 in a plane parallel with and closely adjacent to the bottom surface of the latter.

The one-piece punched and stamped sheet metal actuating element is best illustrated in Fig. 11, and is designated in general by the numeral 55. More particularly, said element 55 comprises a flat base portion 55^a which overlies the upper end of pivot stud 39 (Figs. 1 and 5) and the adjacent portion of plate 38, to prevent substantial upward displacement of the latter relatively to said pivot stud. Portion 55^a is provided with a forward extension 55^b, preferably located in the plane of the former; said extension 55^b having a relatively small opening 55^c, which is adapted to receive the diametrically downwardly extending straight end portion 36^a of the coiled wire compression spring 36—as best illustrated in Fig. 5. Formed integrally with base portion 55^a and extending vertically upwardly therefrom at a predetermined angle to each other (preferably slightly greater than ninety degrees) are a pair of arm portions 55^d and 55^e, the upper edges of which are substantially convergent with respect to each other. Arm portion 55^d is provided with an integral lug 55^f whose lower edge is substantially flush with the lower edge of said arm portion, and a second integral lug 55^g whose upper edge is offset downwardly from the upper edge of said arm portion. Lugs 55^f and 55^g are bent to extend rearwardly at a corresponding angle to each of the arm portions 55^d and 55^e at the line of convergence of the latter—said lugs being adapted for direct engagement with suitable bearing surfaces provided at one point in the peripheral wall of the base recess 21.

As aforesaid, base 20 is adapted to be produced by a straight line molding operation, and accordingly the bearing surfaces last mentioned are provided by forming said peripheral wall in the manner best illustrated in Figs. 5, 9 and 10. That is to say, the segment 22 of the peripheral wall is provided with a recess 56 of approximately semi-elliptical form in horizontal cross section, said recess extending upwardly a predetermined distance from the bottom surface of base 20 and opening laterally to the exterior of said segment 22. The upper end of recess 56 is in the form of a horizontal surface 56^a, with a pair of integral insulating bosses or lugs 56^b and 56^c of substantially V-contour in horizontal cross section extending downwardly from said surface 56^a and laterally from the opposite parallel side portions of said recess. The apices of the curved vertical edges of bosses 56^b and 56^c are adjacent to but spaced from each other, whereby said vertical edges are adapted to be engaged by the respective sides of the aforementioned lug 55^f on actuator 55. Surface 56^a is adapted to be engaged by the upper edge of lug 55^f (as best illustrated in Fig. 5), thus preventing substantial upward displacement of the actuator.

The segment 22 of said peripheral wall is also provided at its upper edge with a pair of integral upstanding studs or projections 57 and 58 of approximately elliptical form in horizontal cross section—the inner surfaces 57^a and 58^a of said studs being arranged in a substantially flush relation to the curved inner surface 22^a (Fig. 10) of said segment. As best illustrated in Fig. 3, said studs 57 and 58 are arranged in arcuate alinement—with the adjacent vertical sides thereof spaced from each other a distance corresponding to the distance between the aforementioned apices of the curved vertical edges of the bosses 56^b and 56^c, and in vertical alinement with said apices. Said adjacent vertical sides of studs 57 and 58 thus provide bearing surfaces for the aforementioned upper lug 55^e on actuator 55.

I prefer to provide between studs 57 and 58 an integral fillet or ledge which affords a horizontal surface 59 upon which the lower edge of lug 55^e is adapted to bear, as best illustrated in Fig. 5, thus assisting in stabilizing actuator 55 during movement thereof in the manner hereinafter described. As will be apparent from consideration of Figs. 5 and 11, the vertical edge 55^h of arm 55^d between lugs 55^f and 55^g is adapted to bear against or fulcrum upon the inner surface 22^a of segment 22 and upon the alined inner surface of the fillet aforementioned. As will be understood, the compression spring 36 acts at all times to retain actuator 55 in properly assembled relation to said bearing surfaces and to bias said actuator to one or the other of its extreme positions—the forward ends of the arm portions 55^d and 55^e alternately engaging the inner surface of segment 22 of the peripheral wall in the respective extreme positions of the actuator, as best illustrated in Fig. 1.

By the arrangement aforescribed, and as best illustrated in Fig. 5, the actuator projects upwardly a substantial distance beyond the main body of base 20—the aforementioned metal cover member 30 overlying the base recess and having an opening 30^a (Fig. 4) to accommodate studs 57 and 58 and the upper end of actuator 55 and to provide clearance for oscillatory movement of the latter. The aforementioned downwardly offset portions 28 and 29 of member 30 form part of a single, relatively large offset, designated by the numeral 30^b (Fig. 4), and of approximately an elongated diamond-shape. Said offset 30^b is itself provided with an adjacent pair of downwardly extending cone-shaped hollow bosses 30^c and 30^d (Figs. 4, 5 and 7) which are arranged on opposite sides of the geometrical center of the switch base 20, when the parts are in assembled relation. The arrangement is such that during bodily movement of spring 36, as an incident to snap operation of the switch mechanism, an intermediate portion of the spring will engage one or the other of the bosses 30^c or 30^d (see Fig. 7). In practice said cover member 30 is grounded, and thus the spring 36 and actuator 55 will likewise be grounded in each extreme position of the switch parts.

As shown in Fig. 5, the cover member 30 may comprise the lower end wall of a cup-shaped metal housing member for a radio rheostat or the like, designated in general by the numeral 60 (Fig. 5); said housing member having a plurality of upwardly extending lugs 30^e, 30^f which are bent inwardly over the upper end of an insulating base 60^a and into mechanical and electrical engagement with a metal disk or plate (not shown) which is in turn electrically connected with or engaged by the externally threaded metal bush-

ing 61, which provides for one-hole mounting of the combined volume control rheostat and switch unit to a metal panel or other grounding element (not shown).

The aforementioned shaft 42 of the rheostat 5 has rigidly and non-rotatably attached to its lower end, as by riveting or upsetting as shown at 42^a, an operating lever 62, whose free end 62^a extends relatively closely to the inner surfaces of the peripheral wall of the base recess—as indicated 10 by the arc of movement thereof represented by the dotted line 62^b in Fig. 4. By the aforescribed fulcruming or pivoting arrangement of actuator 55 I am enabled to make the lever 62, 62^a of maximum length—thus providing for “on” 15 and “off” positioning of the switch mechanism by a very small degree of rotary movement of the rheostat shaft 42. The important result of this feature is that a maximum degree of rotary movement of shaft 42 is reserved for adjustment of the volume control rheostat, or the like. Also, it will be apparent that the pivoting arrangement of said actuator 55 facilitates assembly thereof with respect to base 20 and to other parts of the switch.

With reference to Fig. 4, it will be understood 25 that the switch mechanism will be operated to “on” position upon an initial relatively small degree of rotary movement of shaft 42 in a clockwise direction—the remainder of the rotary movement of the shaft in such direction being utilized 30 to effect adjustment of the rheostat contactor (not shown). In certain installations, however, it is desired to provide for “on” positioning of the switch mechanism upon an initial relatively small degree of counterclockwise movement of shaft 35 42—with the remainder of such movement reserved for adjustment of the rheostat. To provide for attainment of this result it is only necessary to insert the bridging contactor 41 into the opening 38^f (Fig. 6) instead of into the aforementioned opening 38^e.

As shown in Fig. 5, the lever 62, 62^a is adapted to alternately engage the arms 55^d, 55^e of actuator 55 in a plane above the aforementioned metal cover member 30. Any usual or suitable 45 means (not shown) is provided for limiting the total angle or degree of rotary movement of shaft 42.

The modified forms of snap switches illustrated in Figs. 12 to 18, inclusive, are in general quite 50 similar to the switch aforescribed, and certain parts identical with parts aforescribed are employed—such parts being given the same reference numerals as the corresponding parts in Figs. 1 to 11. In Figs. 12 and 13, however, I have 55 shown a double-pole snap switch primarily adapted for use with a radio volume control rheostat; in Figs. 14 and 15 I have shown a so-called three-way switch; and in Figs. 16 and 17 I have shown a so-called four-wire switch. As will be 60 apparent, the same form of recessed molded insulating base 63 may be employed to construct the various types of switches just mentioned. Also it is obvious that by omitting the right-hand set of stationary contacts and the right-hand 65 bridging contactor from the double-pole switch of Fig. 12, a single pole switch which is functionally identical with that shown in Figs. 1 to 11, inclusive, may be provided; it being likewise obvious that a “reverse” operating single pole switch may 70 be provided by omitting the left-hand set of stationary contacts and the left-hand bridging contactor from the switch of Fig. 12.

In Figs. 12 and 13 the recessed molded insulating base 63 is of substantially circular con- 75

tour—the diameter thereof preferably being the same as the diameter of the base 20 of Figs. 1 and 11 between the segments 22 and 23 of the latter. The substantially circular peripheral wall 64 surrounding the recess 65 in base 63 is provided at the point illustrated with a pair of upwardly extending integral studs 66 and 67 and a fillet providing the bearing surface 68 to provide bearing surfaces for the sides and bottom edge of lug 55^a of actuator 55—which elements may be of the same form as the elements 57, 58 and 59 aforescribed. Base 63 is further provided with the recess 69 (Fig. 13) of semi-elliptical contour in horizontal cross section which opens to the bottom and peripheral surfaces of said base. The upper end wall 69^a of recess 69 has depending therefrom and from the opposed side walls the pair of bosses 69^b and 69^c, which elements provide bearing surfaces for the upper edge and the sides of the lower lug 55^a of the actuator. By this means the actuator 55 is supported for pivotal movement thereof in the manner described in connection with Figs. 1 to 11.

The bottom wall of base recess 65 is provided with an upstanding, integral, cylindrical stud 70 which serves as a pivot for the flat, punched insulating contactor-carrying plate 71. Plate 71 is quite similar to the plate 38 aforescribed—except that the forward end 71^a of plate 71 is made relatively wider than the forward end 38^a of plate 38. The arrangement is preferably such that plate 71 will have the same degree of oscillatory movement within recess 65 (Fig. 12) as the plate 38 (Fig. 1) has within the recess 21. Plate 71 is provided in its forward end 71^a with a series of equally spaced circular openings 71^b, 71^c, 71^d and 71^e (see Fig. 18) of a size corresponding to the size of openings 38^c and 38^d (Fig. 6). In providing a double-pole switch like that shown in Fig. 12, a pair of bridging contactors 41 have their reduced or shank ends extending upwardly through the extreme right-hand opening 71^b and through the opening 71^d (see Fig. 18).

A pair of rigid stationary contacts 44 (see Fig. 15), like the contact 44 aforescribed, are so positioned upon the bottom wall of recess 65 as to be simultaneously engaged by the aforementioned pair of contactors upon oscillatory movement of plate 71 to its left-hand extreme position, and to be simultaneously disengaged therefrom upon movement of plate 71 to its right-hand extreme position, as shown in Fig. 12. A coiled compression spring 36, like that aforescribed is interposed between actuator 55 and plate 71 to effect such oscillatory movements of the latter with a snap action upon opposite movements of said actuator. Plate 71 is provided with a relatively large intermediate opening 71^f, and recess 65 is provided with a sub-recess 72 (Fig. 12) to provide ample clearance for said spring 36. The forward end wall of the opening 71^f is formed to provide an abutment 71^g for the metal cup or bearing member associated with said spring. Stationary contacts 44 have their shanks penetrating aligned openings in the bottom wall of recess 65 and terminal members 46 and have the hollow ends of said shanks upset over said terminal members, as shown at 44^b, 44^b in Fig. 13. The bottom surface of base 63 is preferably provided with an integral downwardly extending barrier 73 between the pair of terminal members 46 last mentioned (see Figs. 13 and 15).

A pair of resilient stationary contacts 74 and 75 have their rear ends seated upon and fixed to ledges 76 and 77 (Fig. 12) offset upwardly to a slight extent above the plane of movement of

plate 71. The means for fixing said rear ends of said contacts comprise a pair of rivets 78, 78, the hollow ends 78^a, 78^a of which are upset over a second pair of terminal members 46, 46 (Fig. 13). Said rear ends of contacts 74 and 75 are preferably provided with integral lugs or projections 74^a and 75^a located in the plane thereof—which lugs respectively engage pairs of bosses 79, 80 and 81, 82 formed upon the respective ledges 76 and 77 (Fig. 12) to positively prevent rotary displacement of contacts 74 and 75 relatively to the base recess 65. Contacts 74 and 75 have free end portions 74^b and 75^b angled toward each other (Fig. 12), and said free end portions are bent, as shown at 74^c and 75^c to provide tips directly overlying the aforementioned contacts 44, 44, as best illustrated in Fig. 15.

Base 63 is provided with a pair of openings 83 and 84 to provide for attachment of the switch to a rheostat cover or the like, as by means of rivets in a manner similar to that shown in Fig. 4. The plate 71 (Fig. 12) has its opposite movements positively limited by engagement thereof with the vertical wall portions 85 and 86 formed in the base recess; the degree of oscillatory movement of actuator 55 in each direction being similarly limited by engagement of the respective arms 55^d and 55^e with the inner surface of the peripheral wall of said recess. Terminal members 46 have pairs of openings which accommodate and interlock with pairs of bosses formed upon the lower surface of base 63 to restrain said terminal members against rotary displacement.

As will be obvious from the description of the switch of Figs. 1 to 11, the switch of Figs. 12 and 13 may be modified to provide a reversal of its electrical functions by merely transposing the pair of bridging contactors to the openings 71^c and 71^e in plate 71 (see Fig. 18).

In the three-way switch of Figs. 14 and 15, most of the switch elements are identical with those shown in Figs. 12 and 13. In Figs. 14 and 15, however, the bridging contactors 41, 41 have their shanks positioned within the two intermediate openings 71^c, 71^d (see Fig. 18), and the two resilient stationary contacts are permanently electrically connected as by means of a single terminal or bus member 87 having properly spaced openings to accommodate the hollow ends of the rivet shanks, which are upset thereover, as shown at 78^a, 78^a. Member 87 is provided with a perforated end 87^a to provide for attachment of a circuit wire. With the arrangement shown in Figs. 14 and 15 it will be apparent that the left- and right-hand terminal members 46, 46 are alternately rendered active for completion of a circuit from the common terminal or bus member 87.

In the four-wire switch shown in Fig. 16, it is to be understood that the various switch parts and circuit connections may be the same as for the double-pole switch of Figs. 12 and 13—with the exception that the two individual bridging contactors 41, 41 of Figs. 12 and 13 are omitted, and in their place, in openings 71^b and 71^d (see Fig. 18), are inserted the shank ends 88^a and 88^b of a one-piece double contactor 88, which preferably consists of a flat punching of copper or similar metal of good conductivity. In the "off" position of the switch parts shown in Fig. 16 the four terminals of the switch are all disconnected from each other; whereas in the opposite or "on" position all of the four switch terminals will be electrically connected with each other. A reversal of the electrical functions provided by the

switch of Fig. 16 may be effected by merely inserting the shank ends 88^a, 88^b of the double contactor 88 into the other pair of openings 71^c and 71^e of plate 71 (Fig. 18) prior to assembly of the switch parts.

As will be apparent to those skilled in the art, the resilient contacts 74 and 75 are produced from metal blanks of identical form—such blanks being merely bent in opposite directions, as illustrated, to provide contacts of right-hand and left-hand form.

Although I have herein disclosed a switch base of molded insulation, it will be obvious to those skilled in the art that a similar arrangement of parts, mechanically and electrically, may be provided by employment of a recessed casing comprising a cylindrical metal portion, with a punched insulating base plate attached to and supported by the latter at one end thereof. With such an arrangement, of course, the metal portion of the casing may be grounded, with consequent grounding of the switch actuating element or cam and the coiled compression spring—thus obviating the necessity for direct engagement of the spring with portions of the metal member 30 aforementioned.

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

1. As an article of manufacture, a punched and stamped sheet metal actuating element for an electric snap switch, said element comprising a base portion having a pair of integral arm portions upstanding therefrom at substantially right angles thereto and at a predetermined angle to each other, one of said arm portions having vertically spaced lugs formed integrally therewith, and said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions.

2. As an article of manufacture, a punched and stamped sheet metal actuating element for electric snap switches, said element including a flat base portion having a pair of integral arm portions upstanding therefrom at substantially right angles thereto and at a predetermined angle to each other, one of said arm portions having vertically spaced lugs formed integrally therewith, and said lugs being correspondingly bent to extend at a like angle outwardly from the adjacent edges of the respective arm portions.

3. As an article of manufacture, a recessed molded insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having vertically spaced and vertically aligned apertures formed therein by the molding operation with an integral portion of the base material positioned therebetween, the walls of the respective apertures being adapted to provide pivot bearings for a pair of spaced lugs upon a switch actuating element of suitable form, and at least one horizontal surface of said integral portion of the base being adapted for cooperation with the actuating element to prevent substantial vertical displacement of the latter relatively to said base.

4. In an electric snap switch, in combination, a recessed molded insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having vertically spaced and vertically aligned apertures formed therein by the molding operation with an integral portion of the base material positioned therebetween, a punched and stamped sheet metal actuating element, said element including a flat base portion having a pair of up-

standing integral arm portions arranged in planes at a predetermined angle to each other, one of said arm portions having a pair of vertically spaced lugs formed integrally therewith, said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions at the line of convergence of the planes of the latter, the side walls of said apertures providing pivot bearings for said lugs, and at least one of said lugs cooperating with said integral portion of the insulating base to prevent substantial vertical displacement of said actuating element relatively to said base.

5. As an article of manufacture, a punched and stamped sheet metal actuating element for electric snap switches, said element including a flat base portion having integral upstanding portions angularly disposed relatively to each other and adapted for alternate transient engagement by an oscillatable operating member of suitable form, said base portion having an integral extension located in the plane thereof forwardly of said upstanding portions, said element having a pair of vertically spaced aligned lugs formed integrally therewith and extending rearwardly therefrom in a plane aligned with said integral extension of said base portion, said lugs being adapted for pivotal engagement with the walls of notches in an insulating base of suitable form, and said integral extension having an opening formed therein for interlocking engagement with the straight end portion of a coiled compression spring.

6. In an electric switch, in combination, a recessed molded insulating base, a snap switch mechanism carried by said base; said mechanism including stationary and movable contact elements and means for effecting engagement and disengagement of said elements with a snap action; said means comprising an insulating carrier, an oscillatable metal actuating element, and a coiled compression spring interposed therebetween; said actuating element having a portion thereof extending upwardly beyond the main body of said base and adapted for transient driving engagement by an oscillatable operating member of suitable form; a grounded sheet metal member overlying the recessed face of said base and rigidly secured to the latter, said metal member having an opening formed therein to provide clearance for said upwardly extending portion of said actuating element, said metal member having a pair of downwardly extending substantially conical bosses formed thereon and arranged on opposite sides of said spring at a point intermediate the length of the latter, the arrangement being such that said spring is engaged with one or the other of said bosses in each extreme position of the former, whereby said spring and said actuating element are grounded upon movement of the latter to each of its extreme positions.

7. In an electric snap switch of the character described, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having a pair of vertically spaced and aligned notches formed therein, a formed sheet metal actuating element positioned within the base recess, said actuating element having lugs adapted for pivotal engagement with the walls of the respective notches, said actuating element having upstanding arm portions angularly arranged relatively to each other with the point of convergence thereof located closely adjacent to said peripheral wall, said arm portions

being respectively adapted for close positioning thereof bodily relatively to the peripheral wall of the base recess in each extreme position of said actuating element, and an oscillatable operating member mounted concentrically relatively to said base and adapted for transient driving engagement with said actuating element, said operating member having a transverse length substantially corresponding to the radius of said base recess, whereby the arc of movement of said operating member required for operation of said actuating element in each direction is minimized.

8. As an article of manufacture, a recessed molded insulating base adapted to be produced by a straight-line molding operation, the bottom wall of said base recess having a substantially cylindrical insulating stud formed integrally therewith, said stud being located adjacent to but spaced from the peripheral wall of said base recess to provide for pivotal support of an insulating contact-carrying member of suitable form, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud with reference to the geometrical center of said base recess, the side walls of the respective apertures being adapted to provide open pivotal bearings for a pair of vertically spaced lugs upon a spring-pressed actuating element of suitable form, and the portion of said base between said apertures being adapted to receive the thrust of said actuating element.

9. In an electric snap switch of the character described, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having a plurality of vertically spaced pivot bearings formed therein, an actuating element positioned within the base recess, said actuating element having a plurality of vertically spaced integral rearward extensions adapted for direct engagement with the aforementioned pivot bearings, said extensions cooperating with said bearings to prevent substantial relative vertical displacement of said parts, said actuating element also having a pair of upstanding integral arm portions arranged at a predetermined angle relatively to each other, the point of convergence of said arms being located closely adjacent to said peripheral wall, and an oscillatable operating member adapted for transient engagement with said arm portions alternately to effect corresponding oscillatory movements of said actuating element.

10. In an electric snap switch of the character described, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having a plurality of vertically spaced pivot bearings formed therein, an actuating element positioned within the base recess, said actuating element having a plurality of vertically spaced rearward extensions adapted for direct engagement with the aforementioned pivot bearings, the lower one of said extensions cooperating with its associated bearing to prevent substantial upward displacement of said actuator, said actuating element also having a pair of upstanding integral arm portions arranged at a predetermined angle relatively to each other, the point of convergence of said arms being located closely adjacent to said peripheral wall, an oscillatable operating member adapted for transient engagement with said arm portions alternately to

effect corresponding oscillatory movements of said actuating element, and associated spring means to effect at least portions of said last mentioned movements with a snap action.

11. In an electric snap switch of the character described, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having a pair of vertically spaced pivot bearings formed therein, an actuating element positioned within the base recess, said actuating element having a pair of vertically spaced integral rearward extensions adapted for direct engagement with the aforementioned pivot bearings, the lower extension of said pair cooperating with its associated bearing to prevent substantial upward displacement of said actuator, said actuating element also having a pair of upstanding integral arm portions arranged at a predetermined angle relatively to each other, an oscillatable operating member adapted for transient engagement with said arm portions alternately to effect corresponding oscillatory movements of said actuating element, the bottom wall of said base recess having a substantially cylindrical insulating stud formed integrally therewith adjacent to and radially aligned with said pivot bearing, an insulating contact-carrying member having pivotal engagement with said stud, and a coiled spring interposed under compression between said insulating member and said actuating element to insure snap movements thereof to each of their extreme positions.

12. In an electric snap switch, in combination, a recessed molded insulating base adapted to be produced by a straight-line molding operation, the bottom wall of said base recess having a substantially cylindrical insulating stud formed integrally therewith, said stud being located adjacent to but spaced from the peripheral wall of said base recess, a flat punched plate of insulating material having a perforation adjacent to one end thereof for pivotal engagement with said stud, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud with reference to the geometrical center of said base recess, a punched and stamped sheet metal actuating element, said element including a flat base portion overlying said stud and the portion of said plate surrounding the latter, said element having a pair of upstanding integral arm portions adapted for transient engagement alternately by an oscillating operating member of suitable form, said element also having a pair of vertically spaced lugs formed integrally therewith and extending rearwardly therefrom for pivotal engagement with the walls of said apertures, one of said lugs cooperating with an end wall of its associated aperture to prevent substantial upward displacement of said actuating element, and said actuating element acting to prevent substantial upward displacement of said insulating plate, for the purpose set forth.

13. In an electric snap switch, in combination, a recessed molded insulating base adapted to be produced by a straight-line molding operation, said base having a flat ledge portion formed integrally with and offset upwardly from the bottom wall of the recess, said flat ledge portion having a substantially cylindrical insulating stud formed integrally therewith and extending upwardly therefrom, said stud being located adjacent to but spaced from the peripheral wall of said base recess, a flat plate of insulating ma-

terial having a perforation adjacent to one end thereof, whereby said plate is pivotally engaged with said stud and supported in part by said ledge, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud, a metal actuating element; said element including a flat base portion overlying said stud to prevent substantial upward displacement of said plate, a pair of upstanding integral arm portions arranged in converging relation with the point of convergence thereof closely adjacent to said peripheral wall, a pair of vertically spaced lugs formed integrally therewith and extending rearwardly therefrom for pivotal engagement with the side walls of said apertures; one of said lugs cooperating with an end wall of its associated aperture to prevent substantial upward displacement of said actuating element, an oscillatable operating member mounted concentrically relatively to said base and adapted for transient driving engagement with said arm portions alternately, and said operating member having a transverse length substantially corresponding to the radius of said base recess, whereby the arc of movement of said operating member required for operation of said actuating element in each direction is minimized.

14. In an electric snap switch, in combination, a recessed molded insulating base adapted to be produced by a straight-line molding operation, said base having a substantially cylindrical insulating stud formed integrally therewith and extending upwardly from the bottom wall of the recess, said stud being located adjacent to but spaced from the peripheral wall of said base recess, a flat punched plate of insulating material having a perforation adjacent to one end thereof, whereby said plate is pivotally engaged with said stud, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud, a punched and stamped sheet metal actuating element; said element including a flat base portion overlying said stud to prevent substantial upward displacement of said plate relatively to said stud, a pair of upstanding integral arm portions arranged in converging relation with the point of convergence thereof closely adjacent to said peripheral wall, a pair of vertically spaced lugs formed integrally therewith and extending rearwardly therefrom for pivotal engagement with the side walls of said apertures; the lower one of said lugs cooperating with the upper end wall of its associated aperture to prevent substantial upward displacement of said actuating element, an oscillatable operating member mounted concentrically relatively to said base and adapted for transient driving engagement with said arm portions alternately, said operating member having a transverse length substantially corresponding to the radius of said base recess, whereby the arc of movement of said operating member required for operation of said actuating element in each direction is minimized, a spirally coiled compression spring interposed between said actuating element and said insulating plate, a grounded sheet metal member overlying the recessed face of said base and rigidly secured thereto, and said metal member having a pair of downwardly extending bosses formed thereon and arranged on opposite sides of said spring at a point intermediate the length of the latter, the arrangement being such that said spring is engaged with one or the other of said bosses in each extreme position of the former,

whereby said spring and said actuating element are grounded upon movement of the latter to each of its extreme positions.

15. In an electric snap switch, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, said base having a substantially cylindrical insulating stud formed integrally therewith and extending upwardly therefrom, said stud being located adjacent to but spaced from the peripheral wall of said base recess, a flat plate of insulating material having a perforation for pivotal engagement with said stud, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud, a sheet metal actuating element; said element including a flat base portion overlying said stud and said plate to prevent substantial upward displacement of the latter, a pair of upstanding integral arm portions arranged in converging relation with the point of convergence thereof closely adjacent to said peripheral wall, a pair of vertically spaced integral lugs extending rearwardly therefrom for pivotal engagement with the side walls of said apertures; an oscillatable operating member adapted for transient driving engagement with said arm portions alternately, said operating member having a transverse length substantially corresponding to the radius of said base recess, a spirally coiled compression spring interposed between said actuating element and said insulating plate and extending lengthwise of the latter, a grounded sheet metal member overlying the recessed face of said base, said metal member having a pair of downwardly extending bosses formed thereon and arranged on opposite sides of said spring for alternate engagement by the latter, for the purpose set forth, a contactor carried by said insulating plate adjacent to the free end of the latter, and a pair of stationary contacts carried by the bottom wall of said recess and into and out of bridging engagement with which said contactor is adapted to move.

16. In an electric snap switch, in combination, a recessed insulating base adapted to be produced by a straight-line molding operation, said base having a substantially cylindrical insulating stud formed integrally therewith and extending upwardly therefrom, said stud being located adjacent to but spaced from the peripheral wall of said base recess, a flat plate of insulating material having a perforation for pivotal engagement with said stud, said peripheral wall having aligned vertically spaced apertures formed therein by the molding operation and radially aligned with said insulating stud, a sheet metal actuating element; said element including a flat base portion overlying said stud and said plate to prevent substantial upward displacement of the latter, a pair of upstanding integral arm portions arranged in converging relation with the point of convergence thereof closely adjacent to said peripheral wall, a pair of vertically spaced integral lugs extending rearwardly therefrom for pivotal engagement with the side walls of said apertures; an oscillatable operating member adapted for transient driving engagement with said arm portions alternately, said operating member having a transverse length substantially corresponding to the radius of said base recess, a spirally coiled compression spring interposed between said actuating element and said insulating plate and extending lengthwise of the latter, a grounded sheet metal member overlying the recessed face of said

base, said metal member having a pair of downwardly extending bosses formed thereon and arranged on opposite sides of said spring for alternate engagement by the latter, for the purpose set forth, a contactor carried by said insulating plate adjacent to the free end of the latter, a pair of stationary contacts carried by the bottom wall of said recess and into and out of bridging engagement with which said contactor is adapted to move, a pair of metal wiring terminal members positioned upon the lower surface of said base, each of said members having an opening adapted to accommodate a rivet shank which is upset over said member to provide a permanent mechanical and electrical connection between the latter and its associated contact, each of said members also having a pair of openings arranged on opposite sides of said last mentioned opening, and said insulating base having integral studs extending into said last mentioned openings to positively restrain said terminal members against rotation relatively to said base.

17. In an electric snap switch of the character described, in combination, a recessed molded insulating base, a plurality of stationary contacts carried by the bottom wall of the recess, an oscillatable insulating plate, a contactor carried by said plate for snap movement into and out of bridging engagement with said contacts, a plurality of flat, punched sheet metal wiring terminal members positioned upon the lower surface of said base, each of said members having an opening, a rivet shank extending from each contact through the bottom wall of said recess and said opening and upset over the respective member to provide a permanent mechanical and electrical connection between the latter and its associated contact, each of said members also having a pair of openings arranged on opposite sides of said last mentioned opening, and said insulating base having pairs of integral studs formed thereon by the molding operation, said studs extending into said last mentioned openings to positively restrain said terminal members against rotation relatively to said base.

18. As an article of manufacture, a punched and stamped sheet metal actuating element for electric snap switches, said element including a flat base portion having a pair of upstanding integral arm portions arranged in planes at a predetermined angle to each other, one of said arm portions having a pair of vertically spaced lugs formed integrally therewith, and said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions at the line of convergence of the planes of the latter.

19. As an article of manufacture, a punched and stamped sheet metal actuating element for electric snap switches, said element including a flat base portion having a pair of upstanding integral arm portions arranged in planes at a predetermined angle to each other, one of said arm portions having a pair of vertically spaced lugs formed integrally therewith, said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions at the line of convergence of the planes of the latter, and said base portion having an integral extension located in the plane thereof at a point opposite to said pair of lugs, said extension having a perforation adapted to accommodate a substantially diametrically extending end portion of a coiled wire compression spring.

20. As an article of manufacture, a recessed

casing, the peripheral wall of the casing having vertically spaced and vertically aligned apertures formed therein with an integral portion of the casing material positioned therebetween, and the walls of the respective apertures being adapted to provide pivot bearings for a plurality of spaced lugs upon a switch actuating element of suitable form.

21. As an article of manufacture, a recessed molded insulating base adapted to be produced by a straight-line molding operation, the peripheral wall of the base recess having vertically spaced and vertically aligned apertures formed therein by the molding operation with an integral portion of the base material positioned therebetween, and the walls of the respective apertures being adapted to provide pivot bearings for a plurality of spaced lugs upon a switch actuating element of suitable form.

22. In an electric snap switch, in combination, a recessed casing, the peripheral wall of the casing having vertically spaced and vertically aligned apertures formed therein with an integral portion of the casing material positioned therebetween, a punched and stamped sheet metal actuating element, said element having a pair of upstanding integral arm portions, one of said arm portions having vertically spaced lugs formed integrally therewith, said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions, and the walls of said apertures providing pivot bearings for said lugs.

23. In an electric snap switch, in combination, a recessed casing, the peripheral wall of the casing having vertically spaced and vertically aligned apertures formed therein with an integral portion of the casing material positioned therebetween, a punched and stamped sheet metal actuating element, said element having a pair of upstanding integral arm portions, one of said arm portions having vertically spaced lugs formed integrally therewith, said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions, the walls of said apertures providing pivot bearings for said lugs, and at least one of said lugs cooperating with said integral portion of the casing material to prevent substantial vertical displacement of said actuating element relatively to said casing.

24. In an electric snap switch, in combination, a recessed molded insulating casing, the peripheral wall of said casing having vertically spaced and vertically aligned apertures formed therein with an integral portion of the casing material positioned therebetween, a punched and stamped sheet metal actuating element, said element having a pair of upstanding integral arm portions arranged in planes at a predetermined angle to each other, the points of convergence of said arms being located closely adjacent to said peripheral wall, one of said arm portions having vertically spaced lugs formed integrally therewith, said lugs being correspondingly bent to extend at a like angle outwardly from the respective arm portions, the walls of said apertures providing pivot bearings for said lugs, an oscillatable operating member adapted for transient engagement with said arm portions alternately to effect corresponding oscillatory movements of said actuating element, and associated spring means to effect at least portions of the last mentioned movements with a snap action.

GEORGE J. MEUER.