

Aug. 10, 1943.

A. W. KRIEGER

2,326,232

ELECTRIC SWITCH

Filed Nov. 16, 1942

5 Sheets-Sheet 1

Fig. 1

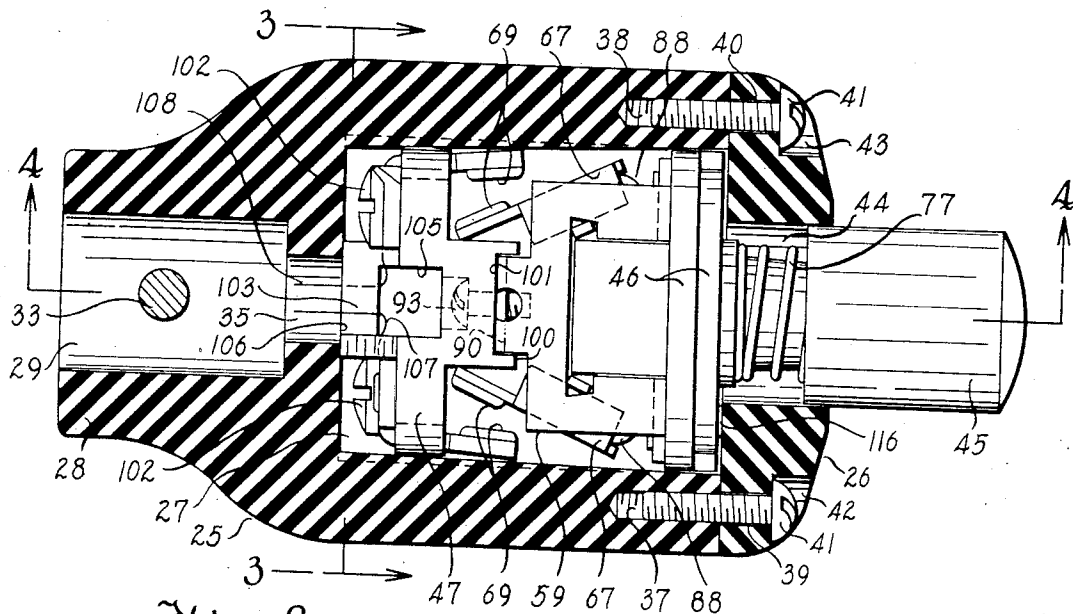


Fig. 2

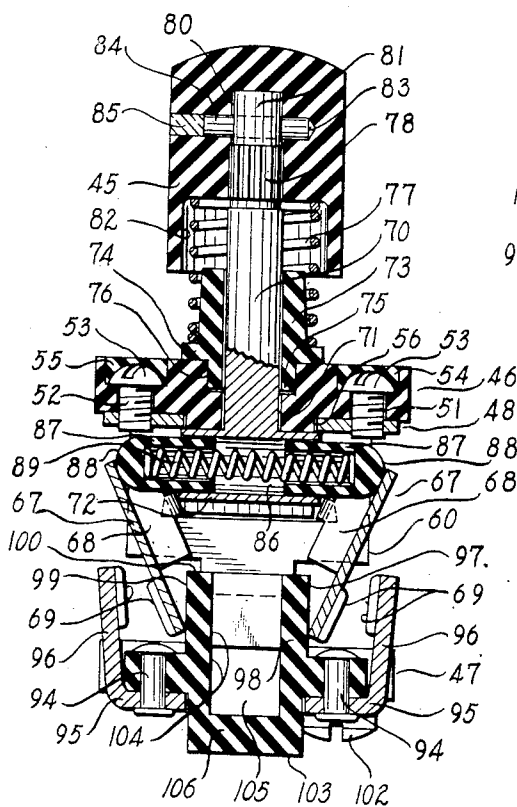
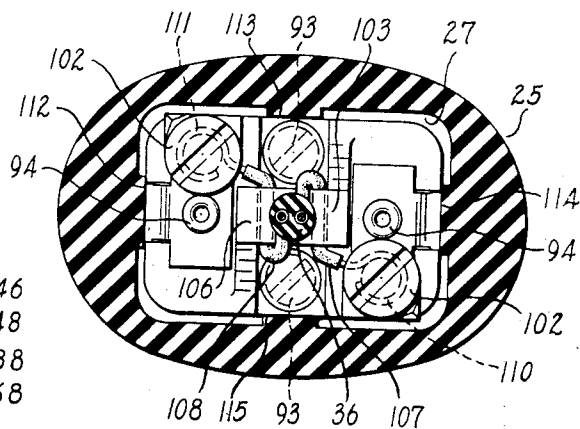


Fig. 3



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5 Sheets-Sheet 2

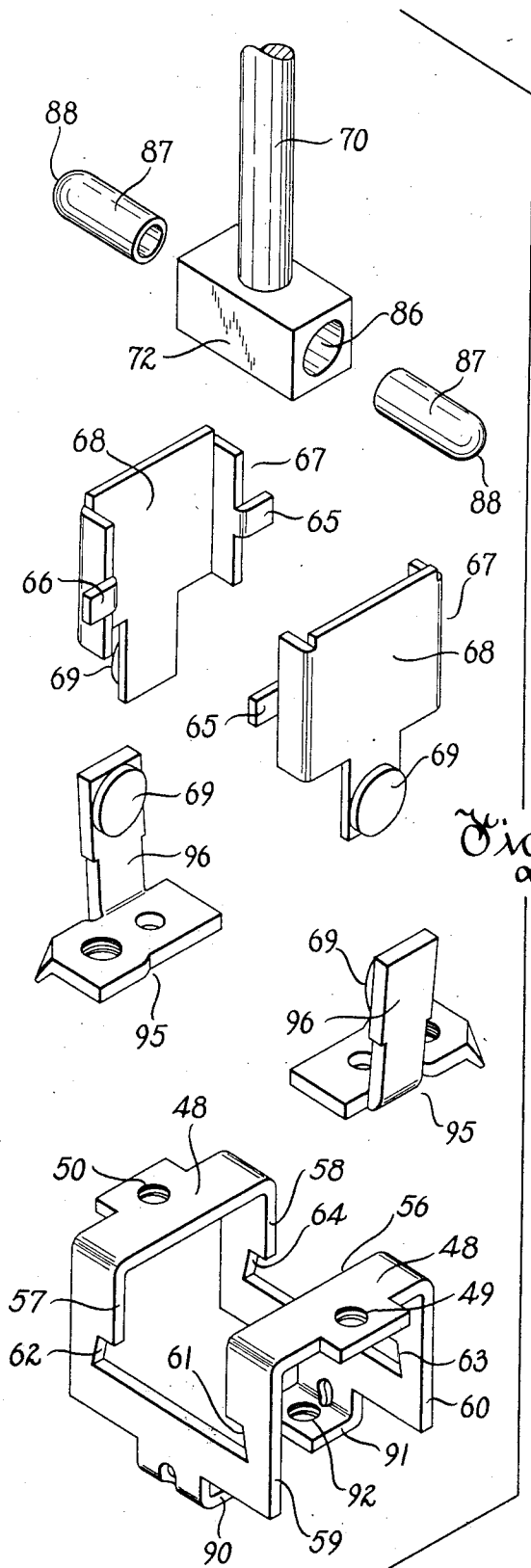


Fig. 5

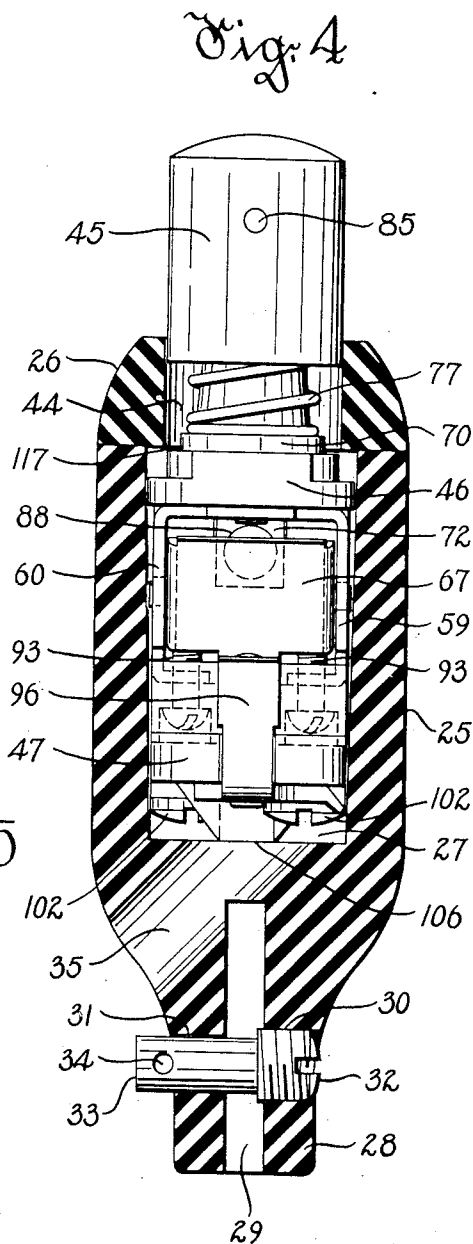


Fig. 4

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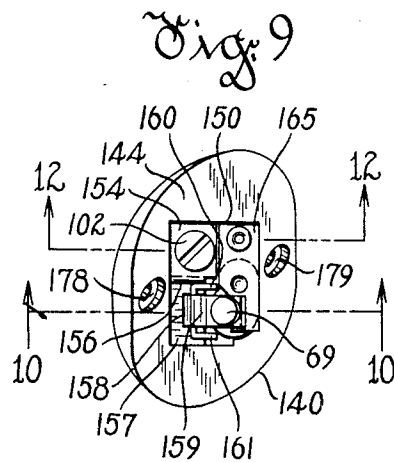
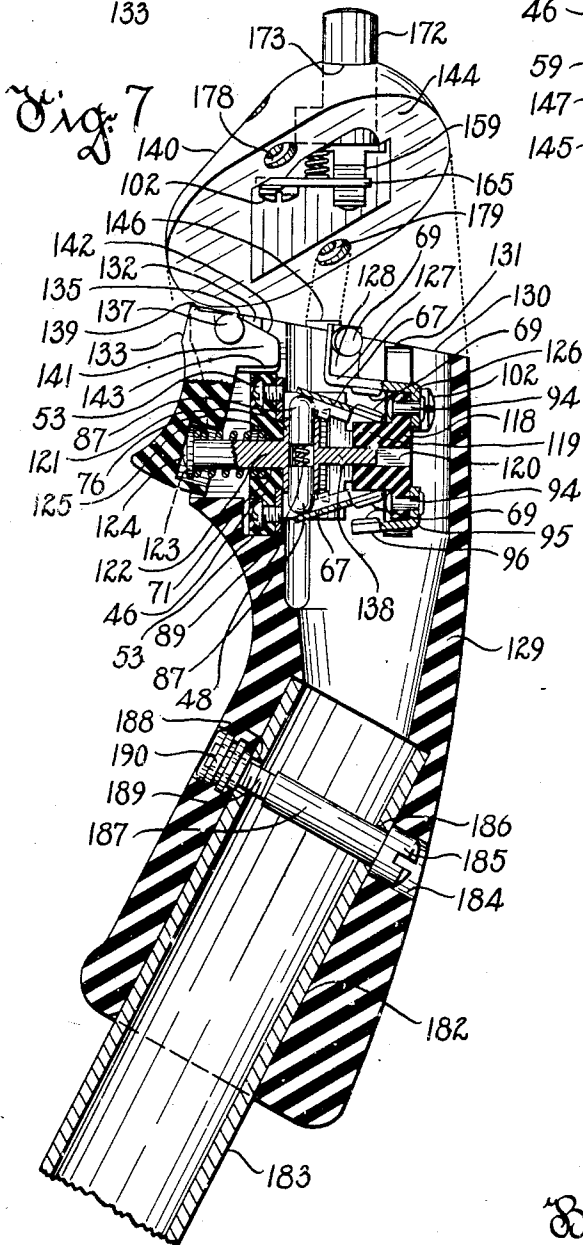
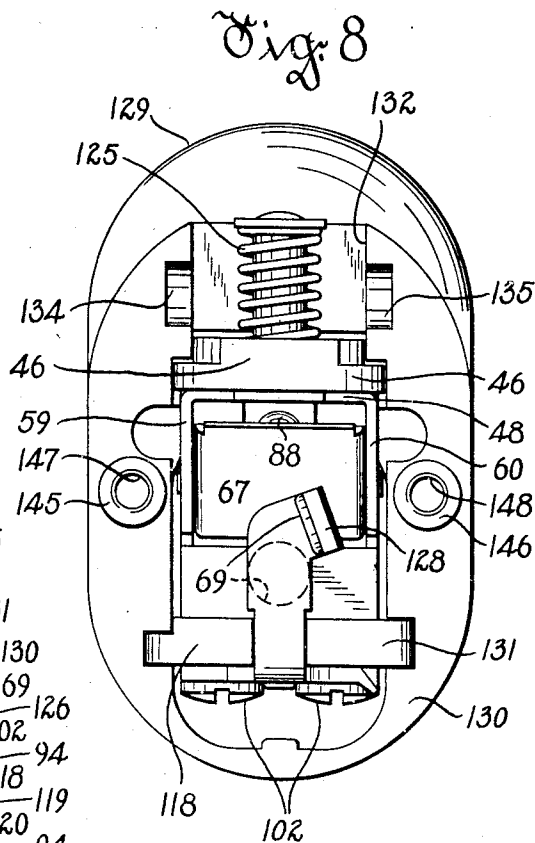
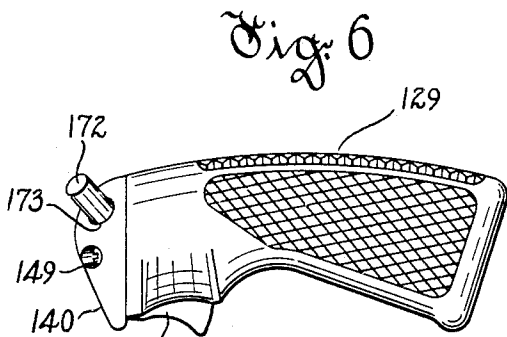
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ELECTRIC SWITCH

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5 'Sheets-Sheet 3



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2,326,232

ELECTRIC SWITCH

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5 Sheets-Sheet 4

Fig. 10

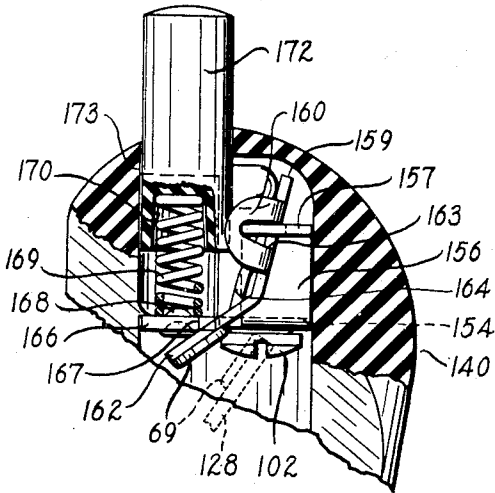


Fig. 11

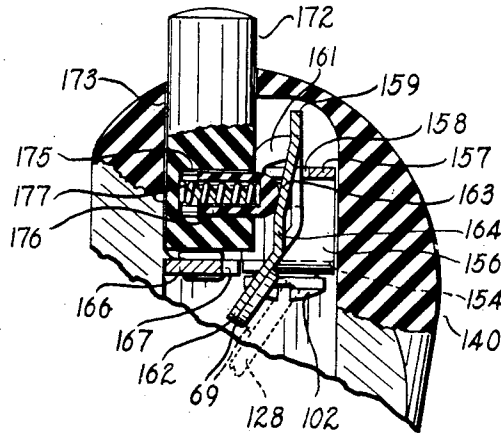


Fig. 12

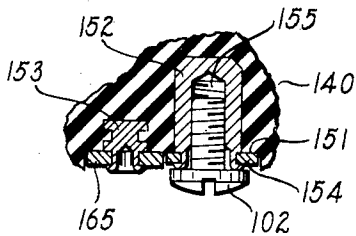


Fig. 13

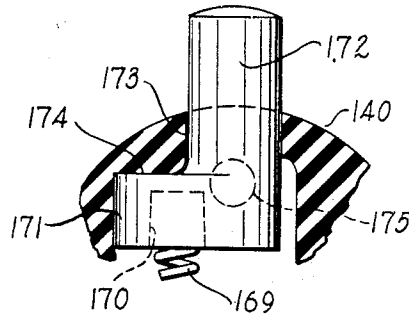


Fig. 15

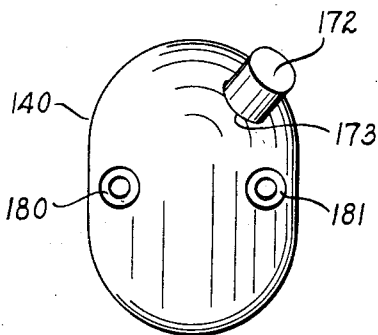
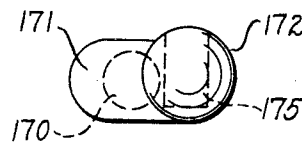


Fig. 14



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ELECTRIC SWITCH

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5 Sheets-Sheet 5

Fig. 16

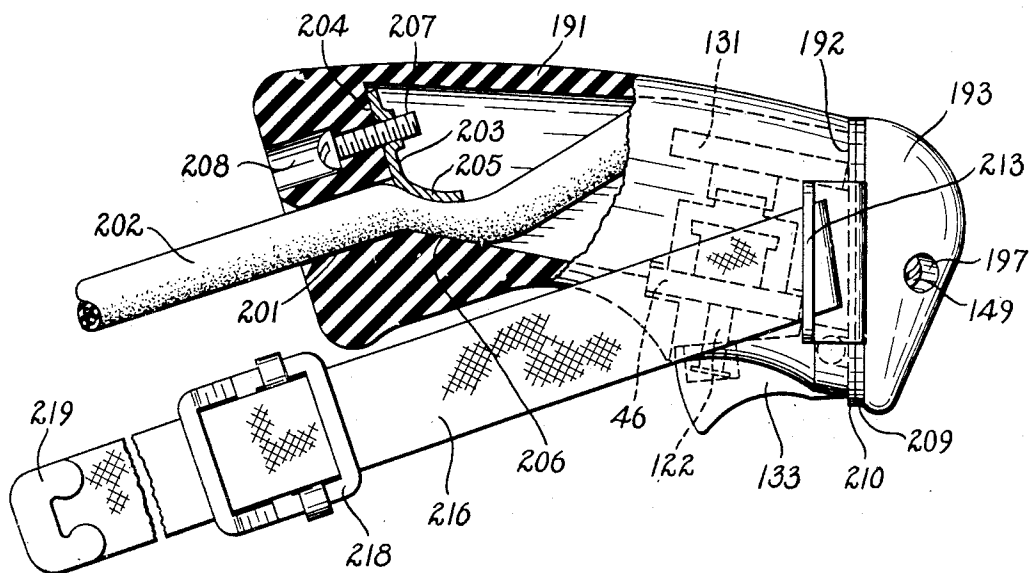
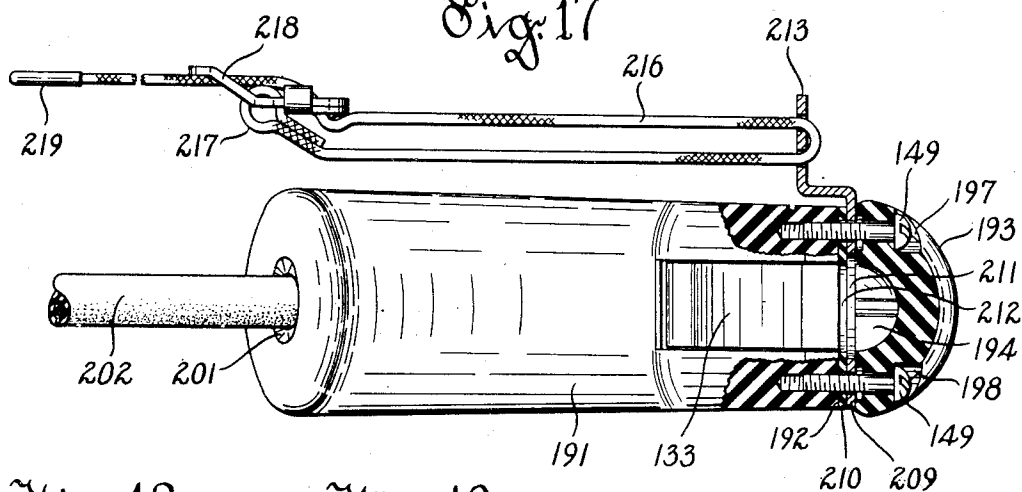


Fig. 17



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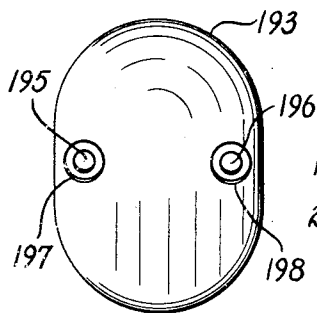
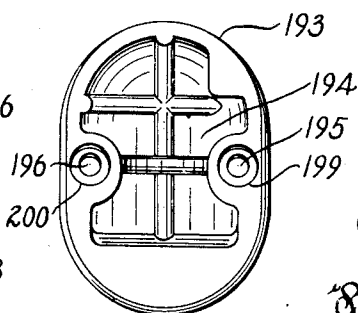


Fig. 19



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UNITED STATES PATENT OFFICE

2,326,232

ELECTRIC SWITCH

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poration of Delaware

Application November 16, 1942, Serial No. 465,747

19 Claims. (Cl. 200—157)

This invention relates to improvements in electric switches.

An object of the invention is to provide an electric snap switch mechanism having parts of relatively simple construction which may be readily and quickly assembled, and the assembled parts of which are not likely to get out of order.

Another object is to provide a snap switch mechanism of relatively high capacity, the parts of which may be assembled and inserted as a unit into an insulating enclosing and supporting casing of suitable form, and readily removed from the casing for inspection or replacement.

Another object is to provide a snap switch mechanism of the aforementioned character adapted for use of a relatively small number of substitute parts to afford a number of different mechanical operating and electrical characteristics.

Another object is to provide such a snap switch mechanism adapted for mounting and use either individually or in conjunction with an auxiliary snap switch mechanism of somewhat similar character within an insulating enclosing and supporting casing of suitable form.

Another and more specific object is to provide a snap switch mechanism which is particularly well adapted for use upon airplanes—as a microphone switch, as a gunfire control switch, as a bomb release switch, or as a combination of switches having a plurality of such functions.

Another object is to provide novel forms of insulating supporting casings for electric snap switch mechanism of the character aforementioned.

Another object is to provide novel means for relieving strains upon the terminal portions of the circuit wires associated with such switches.

Another object is to provide switches of the aforementioned character and novel forms of insulating enclosing and supporting casings therefor whereby manual operation thereof is facilitated.

Another object is to provide a novel form of thumb-operated auxiliary switch and a novel form of insulating supporting member therefor.

Various other objects and advantages of the invention will hereinafter appear.

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

In the drawings,

Figure 1 is a vertical sectional view (approximately twice normal scale) of a microphone switch casing, showing, in side elevation, one form of my improved snap switch unit or mechanism positioned therewithin.

Fig. 2 is a central vertical sectional view of the switch mechanism shown in Fig. 1—certain portions thereof being shown in side elevation for purposes of illustration.

Fig. 3 is a transverse section, on the line 3—3 of Fig. 1, showing the strain relief for the terminal wires.

Fig. 4 is a vertical sectional view of the switch casing, at right angles to that of Fig. 1—the switch unit being shown in elevation.

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

Fig. 6 is a side elevational view (approximately half-scale) of a pistol grip insulating casing for enclosing and supporting a main switch unit, most of the parts of which are identical with the parts of the switch of Figs. 1 to 5, and an auxiliary switch mechanism having a pushbutton operable by the thumb of the hand which effects operation of said main switch.

Fig. 7 is a vertical sectional view, actual size, of the main body of the insulating casing and the main switch carried thereby—the insulating cover member and the parts of the auxiliary switch carried thereby being shown in perspective.

Fig. 8 is a top plan view of the main body of the insulating casing, with the switch unit in position, but with the operating trigger removed.

Fig. 9 is another perspective view of the insulating cap or cover member and its auxiliary switch parts shown in Fig. 7.

Fig. 10 is a sectional view, on the line 10—10 of Fig. 9—the auxiliary switch parts being in elevation in their normal circuit interrupting positions.

Fig. 11 is a view quite similar to Fig. 10—but with the switch parts shown in section in their circuit-completing positions.

Fig. 12 is a fragmentary sectional view, on the line 12—12 of Fig. 9—assuming the insulating cap to have been turned approximately 180 degrees.

Fig. 13 is a fragmentary view, partly in section and partly in elevation, to better illustrate the relationship of the biasing spring to the pushbutton and of the latter to the insulating cap.

Fig. 14 is a top plan view of the pushbutton of the auxiliary switch.

Fig. 15 is a top plan view of the insulating cap of Figs. 7 and 9 to 13, showing the relationship of the pushbutton thereto.

Fig. 16 is a view (actual size), partly in side elevation and partly in section, showing a switch exactly like that of Figs. 7 and 8 associated with a different form of insulating supporting and enclosing casing, including a different form of insulating cover or cap; an associated hand-strap and a cord strain relief being also illustrated.

Fig. 17 is a view, partly in elevation and partly in section, looking upward toward the device of Fig. 16.

Fig. 18 is a front elevational view of the insulating cap of Figs. 16 and 17, and

Fig. 19 is a rear elevational view of the cap of Fig. 18.

Referring first to the switch shown in Figs. 1 to 5, the numeral 25 designates the main body portion of a transversely divided molded insulating casing, the cap or cover section of which is designated by numeral 26. Portion 25 is provided with a relatively large substantially rectangular recess 27—preferably of substantially greater transverse width than thickness. The portion 25 and cap 26 are preferably of approximately elliptical contour in transverse cross section, as best illustrated in Fig. 3, to provide for convenient gripping thereof by hand—but portion 25 is of gradually reduced size below the lower end wall of recess 27 to provide the lower end or extension 28 of substantially rectangular contour. End 28 is provided with a symmetrical-ly located, relatively narrow, downwardly opening, rectangular recess 29 (Figs. 1 and 4) which is adapted to receive with a rather close fit the correspondingly shaped end or extension (not shown) of a lever or other support. End 28 is provided with aligned circular openings 30 and 31 which communicate with recess 29—the relatively larger threaded opening 30 being adapted to accommodate the correspondingly threaded enlarged end portion 32 of a bolt, whose smooth shank portion of smaller diameter is accommodated by opening 31, as shown in Fig. 4. The aforementioned end or extension (not shown) of the lever is likewise provided with an aligned opening to accommodate said shank, whereby the insulating casing 25, 26 may be attached to the lever. I prefer to provide shank 33 with a transverse opening or passage 34, which is adapted to be positioned as illustrated to receive a cotter pin or other fastening means (not shown) to prevent accidental displacement of said bolt.

Casing portion 25 is provided with an angular passage 35 of circular cross section which extends from one side thereof just above the shank 33 of the bolt and opens to the lower end wall of recess 27 (Figs. 1 and 4) to accommodate a two-wire conductor cord 36 (see Fig. 3). Portion 25 is provided in its flat upper end with a pair of threaded recesses 37 and 38 (Fig. 1) with either of which the respective clearance passages 39 and 40 in cap 26 are adapted to be aligned. The shanks of a pair of like bolts 41, 41 penetrate openings 39 and 40 and take into the tapped recesses 37 or 38 respectively to secure cap 26 to portion 25; cap 26 preferably being provided with countersinks 42 and 43 (Fig. 1) to accommodate the heads of bolts 41.

Cap 26 is provided with a relatively large, centrally located opening 44 which is adapted to provide sliding clearance for the insulating push-

button 45 which serves as the manual operating member of the switch.

The switch unit, which is best illustrated in Fig. 2, comprises a pair of molded insulating members 46 and 47 of substantially similar rectangular contour in horizontal cross section; the dimensions of member 47 preferably being slightly less than those of member 46. The lower face of member 46 is adapted to seat against the connecting portion 48 of a punched and stamped sheet metal frame of substantially inverted U-shape (see Fig. 5), said connecting portion 48 having a pair of tapped openings 49 and 50, and member 45 having a pair of passages 51 and 52 aligned therewith to provide clearance for the shanks of a pair of screws or bolts 53, 53, the heads of which are accommodated in countersinks 54 and 55 in the upper surface of said member. The countersinks 54 and 55 are preferably filled with a suitable insulating wax or cement to cover the heads of screws 53 and to prevent accidental loosening thereof, as shown in Fig. 3.

Said frame is provided with a relatively large substantially rectangular opening, thus forming in the frame an upwardly opening notch, the portion 56 of which extends across the connecting portion 48, and the portions 57 and 58 of which extend downwardly throughout the major portion of the length of the parallel arms 59 and 60 of said frame. Arms 59 and 60 are provided adjacent the lower ends thereof with pairs of opposed notches 61, 62 and 63, 64 opening to the respective notch portions 57 and 58 aforementioned; the aligned pairs of notches 61, 63 and 62, 64 in the frame arms forming open pivotal bearings for the pairs of lugs 65 and 66 formed integrally with each of the like pairs of contactor members 67, 67. Thus the lugs 65, 66 extend laterally from the edges of the channel-shaped portions 68, 68 of members 67; which portions are oscillatable between and are guided by the inner surfaces of the frame arms.

Prior to attachment of member 46 to said metal frame the lugs of the respective contactor members are positioned within said pairs of aligned pivotal bearings, as shown in Fig. 2, with the tips 69, 69 (which are spot-welded, brazed or otherwise rigidly secured to members 67, 67) facing outwardly or away from each other. Also prior to such assembly, the inverted Y-shaped machined metal member has its shank 70, of circular cross section, inserted upwardly between the arms 59 and 60 of the frame through the centrally located circular opening 71 in insulating member 46—the head portion 72 being simultaneously moved upwardly between the adjacent faces of contactor members 67, 67.

Thereupon the hollow molded insulating bushing or ferrule 73 is slid downward over shank 70, said bushing having a flange 74 which seats against the upper face of member 46 and a cylindrical extension 75 which fits snugly with a recess or countersink 76 (Fig. 2) in said upper face. A substantially cylindrical coiled compression spring 77 has its lower end seated against the upper face of flange 74. A portion of shank 70 adjacent the upper end thereof is provided upon its periphery with alternate grooves and ridges 78—as by a suitable rolling operation, to enlarge the peripheral size of that portion. The aforementioned molded insulating pushbutton 45 is provided with a centrally located cylindrical recess 80 to freely recess the extreme upper end

portion 81 of shank 70, while accommodating with a press fit the portion 78 of said shank.

Pushbutton 45 is provided at its lower end with a relatively large cylindrical recess 82 which is preferably of sufficient length or depth to accommodate spring 77 in the fully compressed condition of the latter—the end wall of recess 82 being adapted to abut or engage the upper end of spring 77 to effect a predetermined degree of compression of the latter when the parts are in assembled position, and with the switch in its normal or "off" position, as shown in Fig. 2.

After assembly of pushbutton 45 to shank 70, I prefer to drill a recess 83 which extends diametrically through the major portion of said button and through portion 81 of shank 70. A pin 84 of shorter length than said recess is freely insertable thereinto, whereupon the remaining length of said recess is filled with a suitable cement or the like, as shown at 85 to retain the pin in position. In this manner button 45 is positively locked against movement relatively to shank 70.

As best illustrated in Fig. 2, the head portion 72 of said sheet metal member is of slightly greater length than the width of notch 56 in the frame, so that said head portion is adapted to abut the inner surface of the connecting portion of the frame in the normal positions of the switch parts—to which they are biased by spring 77. Head 72 is provided with a cylindrical passage 86 which is adapted to accommodate with a sliding fit a pair of like hollow cylindrical insulating members 87, 87 having closed outer ends 88, 88 of hemispherical contour. A coiled compression spring 89 is slidably fitted into the adjacent hollow ends of members 87, 87 and acts to bias the latter away from each other.

With the parts assembled in the manner thus far described members 87, 87 and spring 89 may be freely inserted into passage 86 by folding one of the contactor members 67 inwardly by movement thereof about its pivots, whereupon the lower ends of both of the contactor members 67, 67 may be pivotally moved outwardly to the extreme positions thereof permitted by the connecting portion 48 of the frame—with resultant camming of the hemispherical ends 88, 88 downwardly beyond the pivotal centers of said contactor members (against the bias of both springs 89 and 77)—so that the assembled parts will be held against accidental separation.

As best illustrated in Fig. 5 the arms 59 and 60 of the metal frame are respectively provided with integral lugs 90 and 91 bent inwardly at substantially right angles thereto—said lugs each having a tapped opening (as shown at 92 in Fig. 5) to accommodate the shanks of a pair of screws 93, 93 which extend upwardly through openings provided in the second insulating member 47 aforementioned; said openings having countersinks to accommodate the heads of screws 93, 93, and the portions of said countersinks unoccupied by the screw heads being filled with a suitable insulating wax or cement to form an insulating covering for the heads and to prevent accidental loosening of the screws.

Insulating member 47 has attached to the lower surface thereof, as by rivets 94, 94 a pair of like combined contact and terminal members 95, 95. The contact portions 96, 96 of said members extend upward at an angle slightly greater than a right angle to the respective terminal portions thereof (see Fig. 2)—member 47 being provided

with vertical notches or grooves at its opposite ends to accommodate said contact portions. Contact portions 96, 96 have rigidly attached to their inner surfaces, as by spot-welding or otherwise, the contact tips 69, 69, for co-operation with the aforementioned tips 69, 69 upon contactor members 67, 67.

In assembling insulating member 47 (with its attached parts) to the metal frame, the lower end of one of the contactor members 67 is positioned between one of the contact portions 96 and a vertical wall (say, 97) formed by the integral upward extension 98 of member 47. The other (left-hand, Fig. 2) contactor 67 pivotally moved inwardly to clear the other contact portion 96—member 47 being at the same time moved upwardly, so that said left-hand contactor 67 upon continued inward movement will abut or engage the other vertical wall 99 formed upon extension 98. The walls 97, 99 thus act to limit the inward movement of the contactors 67, 67; whereas the contact portions 96, 96, with their attached tips, limit the outward or circuit-completing movements of the contactors, jointly.

Extension 98 is provided at its upper end with a flat surface 100 (Fig. 2) which is adapted to be engaged by the flat lower face of the aforementioned head 72 to limit downward movement of the latter and of the spring-pressed plungers 87, 87 carried thereby. Offset downward from surface 100, and arranged on opposite sides are a pair of ledges, one of which is shown at 101 in Fig. 1, against which the respective inwardly bent frame lugs 90 and 91 are adapted to seat. Upon attachment of member 46 to the metal frame by screws 93, 93 all of the switch parts will be maintained in properly assembled relation. The members 95, 95 have tapped openings in their terminal portions to accommodate the shanks of binding screws 102, 102 of well known form.

Member 47 has formed integrally with its lower surface a substantially rectangular downward extension 103, and the same and the upward extension 98 have formed therein a common recess 104 (Fig. 2)—which recess is open on opposite sides of the lower end portion thereof, as shown at 105 in Figs. 1 and 2. The arrangement illustrated provides for production of member 47 by a straight-line molding operation, and affords the bridge portion 106 which may be utilized as a snubber or strain relief for the individually insulated wires 107 and 108 of said conductor cord 36—the bared and looped ends of which wires are adapted to be clamped by the respective screws 102, as shown in dotted lines at 110 and 111 in Fig. 3. Thus the cord 109 with the individual wire portions 107 and 108 may be inserted upwardly through opening 35 (Fig. 4) and a sufficient length thereof extended beyond the upper end of recess 27 in section 25 of the casing, for wiring of the switch.

As shown in Fig. 3 the wire 107 is led in one direction around the inner surface of bridge portion 106 and thence upwardly and over the right-hand terminal portion to be clamped by binding screw 102; whereas the other wire 108 is led in the opposite direction around bridge 106 and thence to the left-hand terminal portion to be clamped by the screw 102 associated therewith. The wired switch unit is then inserted bodily into recess 27 in either of two positions—the cord 36 being pulled in a reverse direction through said passage 35, Fig. 4.

As shown in Figs. 1, 3 and 4 recess 27 is pro-

vided at the mid-width of each of its four walls with ribs 112, 113, 114 and 115 of gradually increasing thickness from the upper end of said recess to the lower. The main purpose of said ribs is to provide a fairly close fit of both insulating members 46 and 47 within said recess, while substantially avoiding any tendency toward wedging or sticking of said parts in the event of warpage of the molded section 25.

As shown in Figs. 1 and 4, the switch unit is adapted to fit into recess 27 with the flat lower face of the bridge 106 overlying the upper end of passage 35 and seated against the flat end wall of said recess. In such relationship of the parts the flat upper surface of insulating member 46 is positioned slightly below the flat upper end of section 25. In order to resiliently retain the switch unit against movement or rattling within recess 27, I prefer to provide a pair of diagonally disposed cylindrical rubber members 116 (Fig. 1) and 117 (Fig. 4) which have portions of their length positioned and cemented within corresponding shaped recesses (not shown) in the flat lower face of cap 26—the projecting portions of members 116 and 117 being initially greater than the space between cap 26 and insulating member 46, so that upon tightening of assembling screws 41, 41 said rubber members are compressed to effectively hold the switch unit against bodily movement or rattling within the insulating casing.

The molded various insulating members herein disclosed are preferably composed of "Bakelite" molding powder, or a similar hot molded material. As aforeindicated the switch mechanism is normally biased to circuit-interrupting position by the spring 77—the switch being closed upon a predetermined degree of inward movement of button 45, and so long as said button is held in. As will be understood the circuit is adapted to extend from one terminal to the other through the metal frame when the contacts are engaged by the contactors. For this reason I prefer to form the frame, the contactors and the combined contact and terminal members of a highly conductive metal, such as brass.

Although I have herein referred to "upper" and "lower" elements or surfaces for convenience in description, it is, of course, to be understood that such terms have no necessary reference to the manner in which the switch unit may be positioned when in use.

In the modification illustrated in Figs. 6 to 14, inclusive, I have shown a pistol grip form of molded insulating casing carrying a main switch unit, substantially like that aforedescribed, which is utilized for control of gunfire from an airplane, in combination with an auxiliary switch, including a thumb-operated pushbutton, for release of a bomb or bombs from the airplane at will.

Thus the parts of said main switch corresponding to the parts aforedescribed have been given like numerals of reference, such like parts serving in the manner aforedescribed to perform the functions specified. However, due to the manner of mounting and operating the main switch unit (Figs. 7 and 8) I prefer to provide an approximately rectangular molded insulating member 118 whose peripheral dimensions are substantially greater than those of insulating member 46. Member 118 is provided with an integral upward extension 119 which is adapted to perform the functions of the extension 98 (Fig. 2) aforedescribed—the extension 119 being provided

with a centrally located passage 120 of circular cross section which opens to the lower face of member 118. Said passage is adapted to accommodate, with a sliding fit, the lower shank 138 of circular cross section which is formed integrally with the intermediate enlargement or head 121 of a machined metal member, which head is provided with a transverse bore or passage to accommodate the insulating plungers 87, 87 and their associated spring 89. The upper shank 122 of said metal member is of the same circular cross sectional dimensions as the shank 70 aforedescribed, and is likewise adapted to slide within the passage 71 in member 46. Shank 122 is provided at its upper end with a reduced portion adapted to receive a washer 123 or the like of greater diameter than said shank—said reduced portion of the shank being upset over the washer, as shown at 124, to secure said parts to each other. A coiled compression spring 125 surrounds shank 122, the same being interposed between the inner face of washer 124 and the bottom or end wall of the recess 76 in the outer face of member 46. Spring 125 acts in the manner aforedescribed to bias the switch to circuit-interrupting position.

Although one of the combined contact and terminal members 95 is identical with those aforedescribed, the other member 126 differs in respect of having a relatively longer contact portion 127, from which an integral portion 128 is bent to extend at a predetermined angle. Portion 128 has attached thereto an additional tip 69 (Fig. 7) for cooperation with the contactor tip of the auxiliary switch mechanism herein-after described.

The main body portion 129 of the pistol grip preferably comprises a one-piece member composed of "Bakelite" or a similar hot-molded insulating material. Member 129 is hollow, as illustrated—the same being provided with grooves opening to the flat end 130 thereof to freely receive the switch unit and to position the same with the outer end of part 131 of member 118 in a plane substantially flush with the aforementioned flat end 130 of body portion 29. Body portion 129 is provided at its upper end with an upwardly and laterally opening notch 132 which is adapted to accommodate shank 122, spring 125 and the oscillatory trigger member 133, which trigger is likewise composed of a suitable molded insulating material, such as "Bakelite." Said notch 132 has formed in its opposite side walls a pair of open pivotal bearings 134 and 135 of a depth slightly greater than the diameter of a pair of laterally extending cylindrical lugs (one of which is shown at 137) which are formed integrally with member 133 by the molding operation.

Trigger member 133 is provided at its outer upper edge with an integral transverse rib or projection 139 which is adapted to abut the flat lower face of a molded insulating cap or cover 140, in the assembled position of the latter (see Fig. 6), whereby outward or clockwise movement of member 133 by shank 122, under the bias of spring 125, is positively limited. Member 133 is provided with a relatively large substantially cylindrical recess to accommodate the outer end portions of shank 122 and spring 125. Member 133 is also provided with an inwardly extending integral lug 141 whose downwardly angled upper surface 142 is engageable with cap 140 to limit counterclockwise movement of said member 133 when manually pressed. Lug 141

is provided at its lower surface with a flat rib or extension 143 which overlies the upper edge of insulating member 48 of the switch unit, whereby proper positioning or seating of the unit within portion 129 is insured when the switch parts are in idle or circuit-interrupting position.

Cap 140 is molded to the form best illustrated in Figs. 6, 7, 9 and 15—the same having a flat lower surface 144 which overlies the recessed upper end of pistol grip member 129 and the switch unit and trigger member carried thereby. The flat upper end 130 of member 129 is preferably provided with cylindrical projections 145 and 146 which surround the upper end portions of a pair of relatively deep threaded recesses 147 and 148 (Fig. 8) to accommodate the shanks of a pair of like securing screws, one of which is shown at 149 in Fig. 6. Cap 140 is provided in its lower face with a recess 150 of substantially rectangular contour—the side walls of said recess being arranged at a predetermined angle to surface 144 (see Figs. 7 and 9).

Recess 150 is provided with a ledge 151 (Fig. 12)—a pair of metal inserts 152 and 153 being molded into the material of said cap and having reduced tubular end portions projecting from said ledge. A punched and stamped sheet metal member has a perforated portion 154 seated upon said ledge—the tubular end of insert 152 being upset thereover to secure the same in position. As shown in Fig. 12, insert 152 is provided with a tapped recess 155 to accommodate the shank of a binding screw 102. A portion 156 is bent at a right angle to portion 155, and a portion 157 is bent at a right angle to portion 156, whereby portions 154 and 157 are positioned in substantially parallel planes. Portion 157 is provided with a rectangular notch 158 (Figs. 9 and 11) which forms upon portion 157 a pair of spaced fulcrum arms. A punched and stamped sheet metal contactor member 159 is provided at opposite sides thereof with integral upwardly bent inverted U-shaped lugs 160 and 161 which are adapted to jointly bear against said fulcrum arms.

That portion 162 of member 159 which carries the tip 69 (for co-operation with the tip 69 on extension 128 of the main switch) is arranged at a predetermined angle to the main body thereof—to insure flatwise engagement of said contact tips, as shown in Fig. 11. An intermediate portion of member 159 is preferably sheared along parallel spaced lines, and the strip of metal between said shear lines is bent upwardly to provide flat portions 163 and 164 (Figs. 10 and 11) arranged at an angle to each other—the point of convergence of portions 163 and 164 being located below (Figs. 10 and 11) the fulcrum point of member 159.

A substantially flat punched sheet metal member has its perforated end portion 165 seated upon ledge 151—the tubular end of insert 153 being upset thereover to secure the same in position. The free end portion 166 of said metal member is cut away or narrowed to provide an edge 167 which acts as an abutment to limit the degree of circuit-interrupting movement of member 159. Said member is provided at an intermediate point in its length with a substantially hemispherical boss 168 (Fig. 10) which serves to center the lower end of a coiled compression spring 169. The other end of spring 169 is positioned within a recess 170 in the lateral offset or extension 171 of a molded insulating

pushbutton 172. The cylindrical portion of pushbutton 172 is slidable within an opening 173 in cap 140—a portion of said pushbutton being normally projected outwardly at a predetermined angle to cap 140, under the bias of spring 169, as best illustrated in Figs. 6 and 15. Extension 171 is adapted to engage the wall 174 (Fig. 13) of a recess in said cap to limit the degree of outward displacement of the pushbutton.

Pushbutton 172 is provided at a predetermined point in its length with a diametrically extending cylindrical recess 175 (Figs. 11, 13 and 15), within which a hollow insulating plunger 176 is adapted to slide. Interposed between the end wall of recess 175 and the closed end of plunger 176 is a coiled compression spring 177, which is adapted to bias said plunger outwardly against the aforementioned pivoted contactor member 159. The arrangement is such that upon inward movement or depression of pushbutton 172 from the position shown in Fig. 10 to that shown in Fig. 11 member 159 will be pivotally moved with a quick or snap action to the circuit-completing position shown in Fig. 11. Conversely, upon manual release of pushbutton 172 the spring 169 will act to return the movable parts of said auxiliary switch to the relative positions thereof shown in Fig. 10—the movement of member 159 to such circuit-interrupting position being likewise effected with a quick or snap action.

Referring more particularly to Fig. 6, it will be apparent that upon grasping the pistol grip 129 in the right hand the operator may use his index finger for operation of trigger 133 for electrical control of a gun-firing mechanism—whereas the operator may also either alternately or simultaneously use his thumb for depression of pushbutton 172 for electrical control of a bomb-release mechanism.

As shown in Figs. 7 and 9, cap 140 is provided on its flat inner surface 144 with a pair of recesses or countersinks 178 and 179 to accommodate the aforementioned cylindrical extensions 145 and 146, to insure a good interlocking connection between the cap 140 and portion 129 of the pistol grip. Cap 140 is provided in its outer surface with countersinks 180 and 181 to accommodate the heads of the securing screws.

As will be understood, the main switch unit has a pair of circuit wires attached thereto prior to insertion of the unit into the recess in pistol grip 129—a single wire being also attached to the terminal positioned in cap 140. With this arrangement it is obvious that the terminal member 126 of the main switch unit is common to the circuits controlled by both the main and auxiliary switches.

The pistol grip 129 is preferably mounted upon the control lever or "stick" of an airplane; and for this purpose said pistol grip is provided at its lower end with a cylindrical recess 182 (Fig. 7) which is adapted to accommodate with a rather close fit the hollow cylindrical upper end portion 183 of said lever. Pistol grip 129 and lever 183 are provided with diametrically aligned openings to accommodate a securing bolt of suitable form. Thus as shown the opening 184 in member 129 is of a size to accommodate the head 185 of the bolt; the opening 186 in said lever being adapted to accommodate the shank portion 187 of the bolt. As shown, the opening 188 in lever 183 is preferably of the same size as opening 186, to provide clearance for the reduced and threaded portion 189 of said shank; and a resilient type of lock-nut 190 is molded

in or otherwise rigidly secured to member 129, to receive, with a resilient locking connection the threaded portion 189 of the screw shank. In practice the three-wire cord required for the combination of switches extends upwardly through the hollow lever 183 and through the passage in pistol grip 129—suitable lengths of the individual wires being provided for attachment thereof to the respective terminals.

In Figs. 16 to 19 I have shown a bomb-release control switch mounted within a pistol grip type of insulating and supporting casing. The switch unit shown in dotted lines in Fig. 16 is preferably identical with the main switch unit shown in Figs. 7 and 8—as indicated by the corresponding numerals upon the switch parts in Fig. 16. The molded insulating pistol grip 191 of Figs. 16 and 17 is substantially like that of Figs. 7 and 8, in respect of the switch-receiving end thereof—but the former is relatively shorter and lighter than the latter, for obvious reasons. The forward flat surface 192 of member 191 is preferably free from the cylindrical extensions shown in Figs. 7 and 8. The trigger 133 is pivotally mounted upon the pistol grip 191 in the manner shown in Figs. 7 and 8, and is adapted to effect operation of the switch unit in a like manner.

Inasmuch as an auxiliary switch mechanism is not required for the device of Figs. 16 and 17, a molded insulating cap of the character shown at 193 may be employed. Cap 193 preferably has the same external contour and dimensions as the cap 140 aforescribed. However, cap 193 is merely recessed interiorly as shown at 194 in Figs. 17 and 19 to minimize the weight thereof and to provide clearance for the auxiliary stationary contact (not shown) which normally forms a part of the switch unit, regardless of whether or not an auxiliary switch is employed. Cap 193 is provided with passages or openings 195 and 196—said openings having external countersinks 197 and 197 to accommodate the heads of the aforescribed securing screws 149, 149. Countersinks 199 and 200 (Fig. 19) are also preferably provided at the inner flat face of cap 193, whereby the cap 193 may be substituted for the cap 140 in the device of Figs. 6 to 8, in the event that an auxiliary switch mechanism is not desired or required.

Pistol grip 191 is preferably substantially closed at its rear end—a circular opening 201 being provided to enable insertion of a conductor cord 202 into the same for wiring of the switch exteriorly of the pistol grip. After the switch has been wired and assembled with respect to pistol grip 191 the cord 202 is pulled outwardly therefrom to remove the excess length thereof—only a slight amount of slack being provided, as shown in Fig. 16. In order to provide a strain relief for the cord wires attached to the switch, a punched and stamped sheet metal member 203 is positioned within the recess in pistol grip 191—member 203 being adapted to seat against the surface 204 of the end wall of the recess, said member 203 when so seated, as shown in Fig. 16, acting through its curved end portion 205 to clamp cord 202 against the wall 206 of said recess. A screw 207 penetrates an opening in said end wall of the recess and takes into a tapped opening in member 203; said screw being shown in its tightened position in Fig. 16; whereas obviously upon unscrewing thereof member 203 will be released from cord 202 to permit movement thereof. A relatively deep countersink 208

is preferably provided (Fig. 16) to accommodate the head of screw 207.

The pistol grip of Figs. 16 and 17 is preferably adapted to be strapped to the operator's hand; and for this purpose I provide a punched and stamped sheet metal member, the flat portion 209 of which corresponds in contour with and is interposed between the adjacent flat surfaces of cap 193 and pistol grip 191; a flat punched insulating plate 210 being preferably interposed between said flat portion 209 and pistol grip 191. Said flat portion is provided with a relatively large centrally located opening 211 of substantially elliptical contour, and insulating plate 210 is provided with an opening 212 of similar shape, but of slightly smaller dimensions. The primary purpose of plate 210 is to insure adequate electrical spacing of portion 209 with respect to the aforementioned auxiliary contact extension of the switch. Portion 209 and plate 210 are provided with openings (see Fig. 17) to afford clearance for the shanks of the securing screws 149, 149.

Said flat portion 209 has offset therefrom a flat portion 213, which is provided with two elongated parallel openings 214 and 215 (Fig. 17) through which a strap 216, of woven material or the like, may be looped. Strap 216 has one end 217 permanently attached to a buckle 218 of known form—the other end 219 of said strap being adjustable relatively to the buckle in a well known manner.

In use of the device, the operator inserts four fingers and the palm portion of one hand into the loop of the strap, which is then tightened to the desired degree around the palm. The operator's fingers are then free to grasp the pistol grip and to effect operation of trigger 133; whereas dropping of the pistol grip from the operator's hand is prevented by the strap 216 aforescribed.

As aforesaid, the cap 193 may be used with a pistol grip like 129 (of Figs. 6 to 8), where an auxiliary switch is not required. In like manner, the cap 140 of Figs. 6 to 15 may be employed with the pistol grip 191 of Figs. 16 and 17, where an auxiliary switch is desired or required; but with the strap 216 and its associated parts 209 and 210 omitted.

I claim:

1. In an electric snap switch, in combination, a punched and stamped sheet metal frame of substantially U-shape, said frame having a relatively large substantially rectangular opening common to the connecting portion and the respective arms thereof, the ends of said opening adjacent the lower ends of the respective arms having opposed pivot notches opening thereto, a pair of punched and stamped sheet metal contactor members each having a pair of integral pivot lugs, each pair of lugs being freely insertable into an aligned pair of said pivot notches in the respective arms of the frame, a molded insulating member secured to the outer face of the connecting portion of said frame, said insulating member having a pair of spaced downward projections formed integrally therewith, said projections being adapted to substantially fill the portions of said opening located within the respective arms to thereby close all of said pivot notches whereby said contactor members are retained in assembled relation to said frame, an operating member carried by said insulating member and reciprocable relatively thereto, a pair of plungers carried by said operating member at the lower end thereof, a coiled compres-

sion spring interposed between said plungers to bias the same jointly against the respective contactor members, said plungers being adapted to effect movements of said contactor members jointly with a snap action to opposite extreme positions upon predetermined degrees of movement of said operating member in opposite directions respectively.

2. In an electric snap switch, in combination, a molded insulating member having a centrally located opening formed therein, a metal member of substantially inverted T-shape having its shank extending upwardly through said opening, means attached to said shank after upward penetration of said opening to provide a downwardly facing shoulder, a coiled compression spring interposed between the upper face of said insulating member and said shoulder to bias the lower end portion of said metal member toward the lower face of said insulating member, a punched and stamped sheet metal frame of substantially inverted U-shape, the connecting portion of said U being secured to the lower face of said insulating member, the latter having a pair of downwardly projecting, substantially rectangular extensions formed integrally therewith to accommodate and guide the lower end portion of said metal member, the arms and the connecting portion of said frame being cut away to provide a relatively large upwardly opening slot for accommodation of said extensions whose outer sides are located in planes substantially flush with the outer surfaces of the respective arms, each arm having a pair of opposed pivot notches formed therein adjacent the lower end thereof, a pair of sheet metal contactor members each of which has a pair of integral lugs adapted for support within the aligned pivot notches in the respective arms, said pivot notches being closed by the extensions of said insulating member, the lower end portion of said metal member having a passage formed therein, a pair of insulating plungers located within said passage, a coiled compression spring interposed between said plungers to bias the latter against the respective contactor members between the pivot lugs thereon, said plungers being movable jointly by said metal member across the lines of pivotal support of said contactor members to effect oscillatory snap movements of the latter in opposite directions respectively, stationary contacts associated with but insulated from said frame to limit the degrees of movement of said contactor members in one direction, and additional means associated with said frame to limit the degrees of movement of said contactor members in the opposite direction.

3. In an electric snap switch, in combination, a molded insulating member having a centrally located opening formed therein, a metal member of substantially inverted T-shape having its shank extending upwardly through said opening, means attached to said shank after upward penetration of said opening to provide a downwardly facing shoulder, a coiled compression spring interposed between the upper face of said insulating member and said shoulder to bias the lower end portion of said metal member toward the lower face of said insulating member, a punched and stamped sheet metal frame of substantially inverted U-shape, the connecting portion of said U being secured to the lower face of said insulating member, the latter having a pair of downwardly projecting, substantially rectangular extensions formed integrally therewith to accom-

modate and guide the lower end portion of said metal member, the arms and the connecting portion of said frame being cut away to provide a relatively large upwardly opening slot for accommodation of said extensions whose outer sides are located in planes substantially flush with the outer surfaces of the respective arms, each arm having a pair of opposed pivot notches formed therein adjacent the lower end thereof, a pair of sheet metal contactor members each of which has a pair of integral lugs adapted for support within the aligned pivot notches in the respective arms, said pivot notches being closed by the extensions of said insulating member, the lower end portion of said metal member having a passage formed therein, a pair of insulating plungers located within said passage, a coiled compression spring interposed between said plungers to bias the latter against the respective contactor members between the pivot lugs thereon, said plungers being movable jointly by said metal member across the lines of pivotal support of said contactor members to effect oscillatory snap movements of the latter in opposite directions respectively, stationary contacts associated with but insulated from said frame to limit the degrees of movement of said contactor members in one direction, additional means associated with said frame to limit the degrees of movement of said contactor members in the opposite direction, said last mentioned means comprising a second molded insulating member underlying said frame and secured thereto, said last mentioned member having said stationary contacts rigidly secured thereto, and the same having spaced walls formed integrally therewith to act as limiting abutments for said contactor members when disengaged from said contacts.

4. In an electric switch, in combination, a punched and stamped sheet metal frame member of substantially inverted U-shape, the arms and the connecting portion of said U having a common opening formed therein to provide a relatively large upwardly opening substantially rectangular notch in said frame, those portions of the opening adjacent the lower ends of the respective arms having opposed notches opening thereto, a pair of punched and stamped sheet metal contactors each having a pair of pivot lugs formed integrally therewith, the lugs of each pair being engageable with aligned notches in the respective arms of said frame, a molded insulating member having a portion overlying said frame and secured thereto, said insulating member having a downwardly extending integral portion adapted to fit snugly within said first mentioned notch in said frame, said portion of said insulating member overlapping the open ends of the respective pairs of opposed notches to effect closure of the latter, whereby said contactors are retained in pivotally assembled relation to said frame, said insulating member having an opening therethrough, a reciprocable member extending upwardly through said opening, a pair of elements carried by said reciprocable member at the lower end thereof, a spring common to said elements for biasing the same jointly into engagement with the respective contactors, said elements being simultaneously movable by said reciprocable member across the plane of pivotal support of said contactors to effect snap movements of the latter in opposite directions respectively, and a pair of stationary contacts adapted

to be engaged or disengaged by said contactors jointly.

5. In an electric switch, in combination, a punched and stamped sheet metal frame member of substantially inverted U-shape, the arms and the connecting portion of said U having a common opening formed therein to provide a relatively large upwardly opening substantially rectangular notch in said frame, those portions of the opening adjacent the lower ends of the respective arms having opposed notches opening thereto, a pair of punched and stamped sheet metal contactors each having a pair of pivot lugs formed integrally therewith, the lugs of each pair being engageable with aligned notches in the respective arms of said frame, a molded insulating member having a portion overlying said frame and secured thereto, said insulating member having a downwardly extending integral portion adapted to fit snugly within said first mentioned notch in said frame, said portion of said insulating member overlapping the open ends of the respective pairs of opposed notches to effect closure of the latter, whereby said contactors are retained in pivotally assembled relation to said frame, said insulating member having an opening therethrough, a reciprocable member extending upwardly through said opening, a pair of elements carried by said reciprocable member at the lower end thereof, a spring common to said elements for biasing the same jointly into engagement with the respective contactors, said elements being simultaneously movable by said reciprocable member across the plane of pivotal support of said contactors to effect snap movements of the latter in opposite directions respectively, the arms of said frame each having an integral lug at the lower end thereof bent at substantially a right angle thereto, a second insulating member underlying said last mentioned lugs and secured thereto, and a pair of combined stationary contact and terminal members secured to said last mentioned insulating member into and out of engagement with which said contactors are movable jointly with a quick action.

6. In an electric switch, in combination, a punched and stamped sheet metal frame member of substantially inverted U-shape, the arms and the connecting portion of said U having a common opening formed therein to provide a relatively large upwardly opening substantially rectangular notch in said frame, those portions of the opening adjacent the lower ends of the respective arms having opposed notches opening thereto, a pair of punched and stamped sheet metal contactors each having a pair of pivot lugs formed integrally therewith, the lugs of each pair being engageable with aligned notches in the respective arms of said frame, a molded insulating member having a portion overlying said frame and secured thereto, said insulating member having a downwardly extending integral portion adapted to fit snugly within said first mentioned notch in said frame, said portion of said insulating member overlapping the open ends of the respective pairs of opposed notches to effect closure of the latter, whereby said contactors are retained in pivotally assembled relation to said frame, said insulating member having an opening therethrough, a reciprocable member extending upwardly through said opening, a pair of elements carried by said reciprocable member at the lower end thereof, a spring common to said elements for biasing the same jointly into engage-

ment with the respective contactors, said elements being simultaneously movable by said reciprocable member across the plane of pivotal support of said contactors to effect snap movements of the latter in opposite directions respectively, the arms of said frame each having an integral lug at the lower end thereof bent inwardly at substantially a right angle thereto, a second insulating member underlying said last mentioned lugs and secured thereto, a pair of combined stationary contact and terminal members secured to said last mentioned insulating member into and out of engagement with which said contactors are movable jointly with a quick action, and spring means associated with said first mentioned insulating member and said reciprocable member to normally bias the latter in a direction to effect disengagement of said contactors from said contacts.

7. In an electric switch, in combination, a punched and stamped sheet metal frame member of substantially inverted U-shape, the arms and the connecting portion of said U having a common opening formed therein to provide a relatively large upwardly opening substantially rectangular notch in said frame, those portions of the opening adjacent the lower ends of the respective arms having opposed notches opening thereto, a pair of punched and stamped sheet metal contactors each having a pair of pivot lugs formed integrally therewith, the lugs of each pair being engageable with aligned notches in the respective arms of said frame, a molded insulating member having a portion overlying said frame and secured thereto, said insulating member having a downwardly extending integral portion adapted to fit snugly within said first mentioned notch in said frame, said portion of said insulating member overlapping the open ends of the respective pairs of opposed notches to effect closure of the latter, whereby said contactors are retained in pivotally assembled relation to said frame, said insulating member having an opening therethrough, a reciprocable member extending upwardly through said opening, a pair of elements carried by said reciprocable member at the lower end thereof, a spring common to said elements for biasing the same jointly into engagement with the respective contactors, said elements being simultaneously movable by said reciprocable member across the plane of pivotal support of said contactors to effect snap movements of the latter in opposite directions respectively, the arms of said frame each having an integral lug at the lower end thereof bent inwardly at substantially a right angle thereto, a second insulating member underlying said last mentioned lugs and secured thereto, a pair of combined stationary contact and terminal members secured to said last mentioned insulating member into and out of engagement with which said contactors are movable jointly with a quick action, spring means associated with said first mentioned insulating member and said reciprocable member to normally bias the latter in a direction to effect disengagement of said contactors from said contacts, and manually operable insulating means associated with the upper end of said reciprocable member to provide for a given degree of movement of the latter at will against the bias of said spring means, whereby engagement of said contactors with said contacts jointly is effected.

8. In an electric snap switch, in combination, a one-piece punched and stamped sheet metal

frame of substantially U-shape in transverse cross section, the free ends of the arms of said U having lugs formed integrally therewith and bent at substantially right angles thereto, the arms of said frame having aligned pairs of open pivotal bearings formed therein, a pair of sheet metal contactor members each having a pair of integral lugs freely insertable into the respective pairs of aligned bearings, a molded insulating member secured to the connecting portion of said frame, said insulating member having portions overlapping the respective bearings to retain said contactor members in pivotal relation to said frame, a second molded insulating member secured to said frame lugs, a pair of combined stationary contact and terminal members secured to said last mentioned insulating member, an operating member reciprocable relatively to said first mentioned insulating member and having a portion located within said frame, a pair of plungers slidably carried by said portion of said operating member, a coiled compression spring interposed between said plungers to bias the same against the respective contactor members, said plungers being movable jointly across the pivotal axes of said contactor members to effect snap movement of the latter in opposite directions respectively, the stationary contact portions of said members aforementioned limiting movement of said contactor members in one direction, and said second insulating members having integral portions to limit movement of said contactor members in the reverse direction.

9. In an electric snap switch, in combination, a one-piece punched and stamped sheet metal frame of substantially U-shape in transverse cross section, the free ends of the arms of said U having lugs formed integrally therewith and bent at substantially right angles thereto, the arms of said frame having aligned pairs of open pivotal bearings formed therein, a pair of sheet metal contactor members each having a pair of integral lugs freely insertable into the respective pairs of aligned bearings, a molded insulating member secured to the connecting portion of said frame, said insulating member having portions overlapping the respective bearings to retain said contactor members in pivotal relation to said frame, a second molded insulating member secured to said frame lugs, a pair of combined stationary contact and terminal members secured to said last mentioned insulating member, an operating member reciprocable relatively to said first mentioned insulating member and having a portion located within said frame, a pair of plungers slidably carried by said portion of said operating member, a coiled compression spring interposed between said plungers to bias the same against the respective contactor members, said plungers being movable jointly across the pivotal axes of said contactor members to effect snap movement of the latter in opposite directions respectively, the stationary contact portions of said members aforementioned limiting movement of said contactor members in one direction, said second insulating member having integral portions to limit movement of said contactor members in the reverse direction, said operating member having a shoulder formed thereon at a predetermined point exteriorly of said first mentioned insulating member, and a coiled compression spring interposed between the latter and said shoulder, to thereby normally bias said operating member and said contactor members in one direction to given extreme positions thereof.

10. In an electric snap switch mechanism, in combination, a pair of molded insulating members, a one-piece punched and stamped sheet metal frame member to which said insulating members are rigidly secured in spaced relationship to each other, said frame including a pair of substantially parallel arms, said arms having two pairs of aligned pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of aligned pivot bearings, one of said insulating members having an opening therethrough, an operating member having a shank portion reciprocable within said opening and an enlarged end portion positioned within said frame, said frame co-operating with said end portion to limit the degree of movement of said operating member in one direction, said end portion having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to the other of said insulating members, said contactor members being jointly movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, said last mentioned insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the opposite direction and to limit the degree of disengaging movement of each of said contactor members, and means comprising a coiled compression spring interposed between said first mentioned insulating member and a part of said operating member to bias the latter for movement in the direction thereof first mentioned.

11. In an electric snap switch mechanism, in combination, a pair of molded insulating members, a one-piece punched and stamped sheet metal frame member to which said insulating members are rigidly secured in spaced relationship to each other, said frame including a pair of substantially parallel arms, said arms having two pairs of aligned pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of aligned pivot bearings, one of said insulating members having an opening therethrough, an operating member having a shank portion reciprocable within said opening and an enlarged end portion positioned within said frame, said frame co-operating with said end portion to limit the degree of movement of said operating member in one direction, said end portion having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to the other of said insulating members, said contactor members being jointly movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, said last mentioned insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the opposite direc-

tion and to limit the degree of disengaging movement of each of said contactor members, means comprising a coiled compression spring interposed between said first mentioned insulating member and a part of said operating member to bias the latter for movement in the direction thereof first mentioned, and a manually operable insulating member associated with said operating member to effect movement thereof at will against the bias of said coiled compression spring last mentioned.

12. In an electric snap switch mechanism, in combination, a pair of molded insulating members, a one-piece punched and stamped sheet metal frame member to which said insulating members are rigidly secured in spaced relationship to each other, said frame including a pair of substantially parallel arms, said arms having two pairs of alined pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of alined pivot bearings, one of said insulating members having an opening therethrough, an operating member having a shank portion reciprocable within said opening and an enlarged end portion positioned within said frame, said frame co-operating with said end portion to limit the degree of movement of said operating member in one direction, said end portion having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to the other of said insulating members, said contactor members being jointly movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, said last mentioned insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the opposite direction and to limit the degree of disengaging movement of each of said contactor members, means comprising a coiled compression spring interposed between said first mentioned insulating member and a part of said operating member to bias the latter for movement in the direction thereof first mentioned, one of said combined contact and terminal members having an auxiliary stationary contact rigidly connected thereto and projecting therefrom, an auxiliary switch mechanism including a pivoted contactor member, an insulating support for said contactor member separate from said insulating members aforementioned, manually operable means associated with said insulating support, and spring-biased to a given position with respect to the latter to provide for oscillatory movement of said last mentioned contactor member at will into and out of engagement with said auxiliary stationary contact, said last mentioned means including a spring-biased plunger continuously engaged with said contactor member to effect such movements thereof with a snap action, and means including an auxiliary terminal member forming a pivotal support for said last mentioned contactor member.

13. In an electric snap switch mechanism, in combination, a pair of molded insulating members, a one-piece punched and stamped sheet metal frame member to which said insulating

members are rigidly secured in spaced relationship to each other, said frame having two pairs of alined pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of alined pivot bearings, an operating member having a portion thereof reciprocable within said frame, said frame coacting with said operating member to limit the degree of movement thereof in one direction, said operating member having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to one of said insulating members, said contactor members being jointly movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, and said last mentioned insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the opposite direction and to limit the degree of disengaging movement of each of said contactor members.

14. In an electric snap switch mechanism, in combination, a pair of molded insulating members, a one-piece punched and stamped sheet metal frame member to which said insulating members are rigidly secured in spaced relationship to each other, said frame having two pairs of alined pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of alined pivot bearings, an operating member having a portion thereof reciprocable within said frame, said frame coacting with said operating member to limit the degree of movement thereof in one direction, said operating member having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to one of said insulating members, said contactor members being jointly movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, said last mentioned insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the opposite direction and to limit the degree of disengaging movement of each of said contactor members, means comprising a coiled compression spring interposed between the other of said insulating members and a part of said operating member to bias the latter for movement in the direction thereof first mentioned, and a manually operable insulating member associated with said operating member to effect movement thereof at will against the bias of said coiled compression spring last mentioned.

15. In combination, a one-piece, recessed, molded insulation pistol grip, a one-piece molded insulation cap to be attached thereto, a snap switch mechanism insertable as a unit into the recess in said pistol grip, said switch mechanism including a spring-biased reciprocating operating element projecting laterally from said recess, a

molded insulation trigger member having trunnions formed integrally therewith, said pistol grip having open pivotal bearings to accommodate said trunnions to provide for direct pivotal support of the latter by the former, said trigger member being connected with said reciprocating element to provide for operation of the latter against its bias upon manual movement of said trigger member in one direction, and said cap when attached to said pistol grip overlying said switch unit and said trigger trunnions to positively retain the same in assembled relation to said pistol grip.

16. In combination, a one-piece, recessed, molded insulation pistol grip, a one-piece molded insulation cap to be attached thereto, a snap switch mechanism insertable as a unit into the recess in said pistol grip, said switch mechanism including a spring-biased reciprocating operating element projecting laterally from said recess, a molded insulation trigger member having trunnions formed integrally therewith, said pistol grip having open pivotal bearings to accommodate said trunnions to provide for direct pivotal support of the latter by the former, said trigger member being connected with said reciprocating element to provide for operation of the latter against its bias upon manual movement of said trigger member in one direction, said cap when attached to said pistol grip overlying said switch unit and said trigger trunnions to positively retain the same in assembled relation to said pistol grip, said switch mechanism having an auxiliary stationary contact element common to one of the wiring terminals thereof, said auxiliary contact projecting beyond said pistol grip, a snap switch mechanism carried by said cap, said mechanism including a contactor movable into and out of engagement with said auxiliary contact, a pushbutton projecting at a predetermined angle from said cap and adapted when depressed to effect snap movement of said contactor into engagement with said auxiliary contact, and a spring associated with said pushbutton to normally bias the same to its projected position to effect disengagement of said contactor from said auxiliary contact.

17. As an article of manufacture, a recessed molded insulation cap for a pistol grip, a switch mechanism carried by said cap, said switch mechanism including a combined wiring terminal element and frame formed of sheet metal attached to said cap within said recess, a contactor pivotally supported by said frame, a pushbutton having an enlarged portion positioned within said recess and a manually operable portion slidable through an opening in said cap at a predetermined angle to the latter, spring means for normally biasing said pushbutton outwardly from said cap, said pushbutton having a cylindrical recess opening radially at a predetermined point in its length, an insulating plunger slidable within said last mentioned recess, a coiled compression spring interposed between the end wall of said recess and said plunger to continuously bias the latter against said contactor, said plunger being movable by said pushbutton across the point of pivotal support of said contactor to effect snap movements of the latter in opposite directions respectively, and an auxiliary stationary contact carried by said pistol grip into and out of engagement with which said contactor is adapted to move.

18. In an electric switch, in combination, a

frame composed of punched and stamped sheet metal, said frame having parallel arm portions respectively cut away to form at each side of said frame a relatively large substantially rectangular notch, the lower ends of the side edges of said notches having relatively small notches opening thereto, a pair of punched and stamped sheet metal contactors each having a pair of pivot lugs formed integrally therewith, the lugs of each contactor being engageable with an aligned pair of said relatively small notches in the opposite sides of the frame, an upper molded insulating member having a portion overlying said frame and secured thereto, said insulating member having an integral downward extension portions of which are adapted to fit snugly within said relatively large notches in the sides of the frame, said portions of said downward extension overlapping the open ends of all of said relatively small notches to effect closure of the latter, whereby said contactors are retained in pivotally assembled relation to said frame, said upper insulating member having an opening therethrough, a reciprocable member extending upwardly through said opening, a pair of insulating elements carried by said reciprocable member at the lower end thereof, a spring common to said elements for biasing the same jointly into engagement with the respective contactors, said elements being simultaneously movable by said reciprocable member across the plane of pivotal support of said contactors to effect snap movements of the latter in opposite directions respectively, a lower insulating member underlying said frame and secured thereto, and a pair of stationary contacts carried by said lower insulating member and adapted to be simultaneously engaged or disengaged by said contactors.

19. In an electric snap switch mechanism, in combination, a pair of upper and lower insulating members, a frame composed of punched and stamped sheet metal to which said insulating members are rigidly secured in spaced relationship to each other, said frame having two pairs of aligned pivot bearings formed therein, a pair of punched and stamped sheet metal contactor members each having a pair of integral lugs positioned within the respective pairs of aligned pivot bearings, an operating member having a portion thereof reciprocable within said frame, said frame coacting with said operating member to limit the degree of movement thereof in one direction, said operating member having a transverse passage formed therein, a pair of insulating plungers slidably positioned within said passage, a coiled compression spring interposed between said plungers whereby the latter are continuously biased against the respective contactor members, a pair of combined contact and terminal members rigidly secured to said lower insulating member, said contactors being simultaneously movable with a snap action into and out of engagement with said contact members upon movement of said operating member in opposite directions respectively, and said lower insulating member having a part formed integrally therewith to limit the degree of movement of said operating member in the direction opposite to that first mentioned and to also limit the degree of disengaging movement of each of said contactor members.

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