Aug. 31, 1948. A. W. KRIEGER 2,448,444

ELECTRIC SWITCH

Filed Sept. 13, 1945 2 Sheets-Sheet 1

Fig. 1

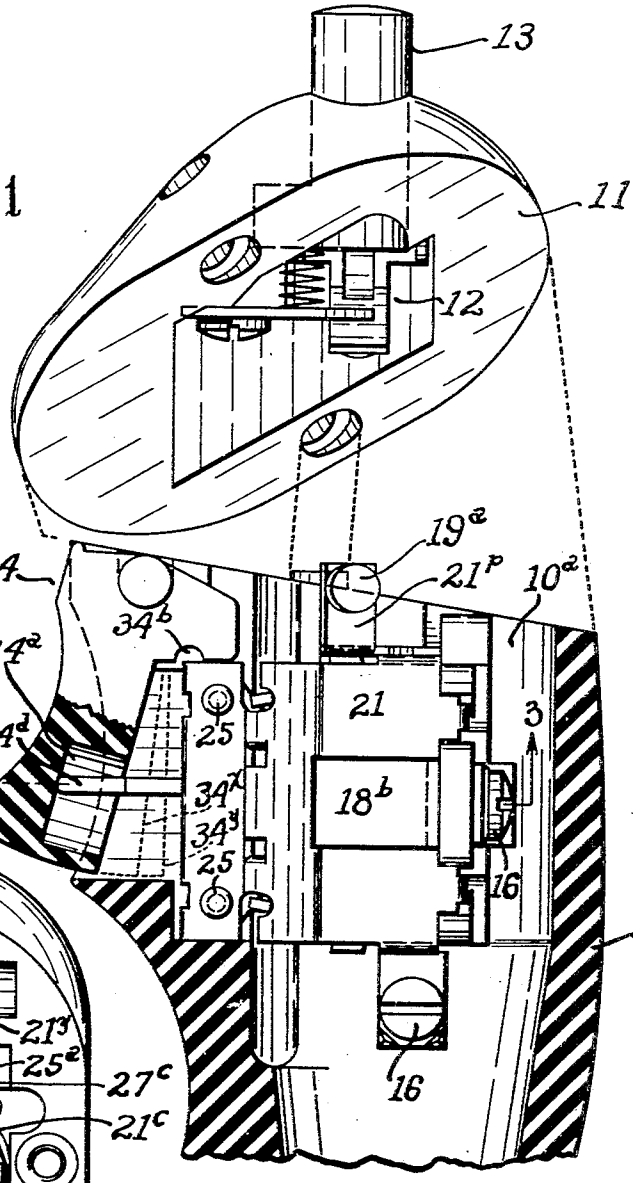
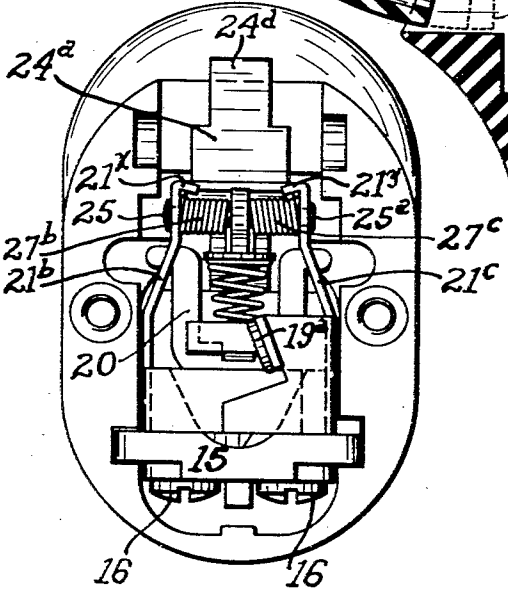


Fig. 2



Inventor
Alvin W. Krieger
By Frank H. Hubbard
Attorney

Aug. 31, 1948. A. W. KRIEGER 2,448,444

ELECTRIC SWITCH

Filed Sept. 13, 1945 2 Sheets-Sheet 2

Fig. 3

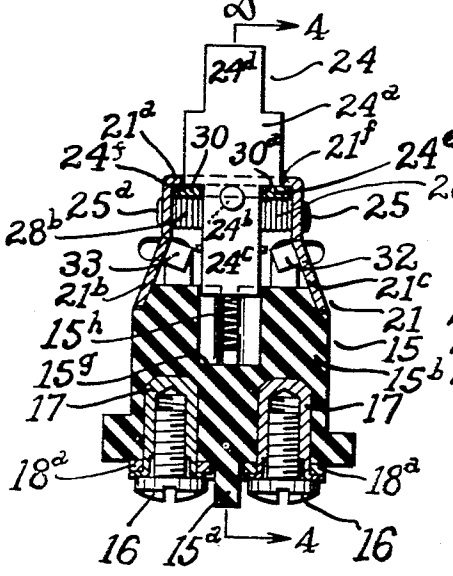


Fig. 4

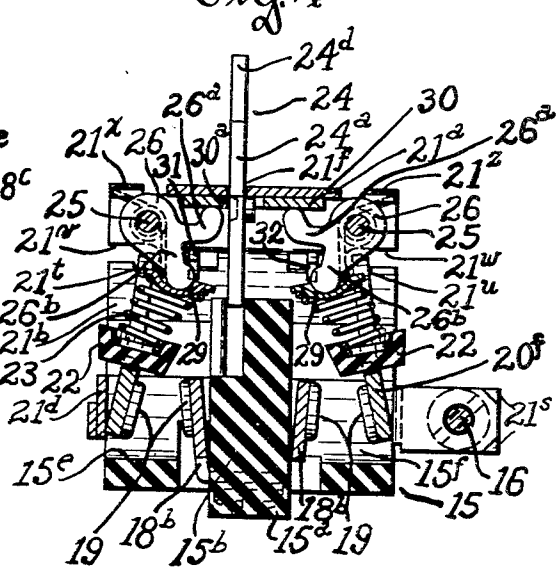


Fig. 5

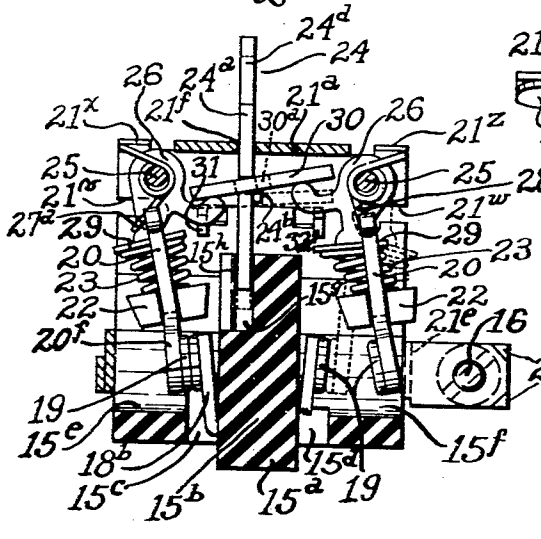


Fig. 6

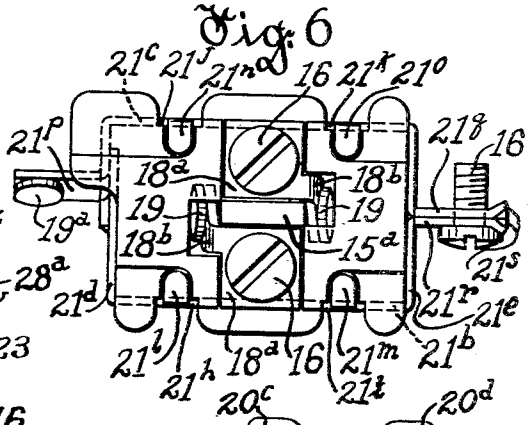
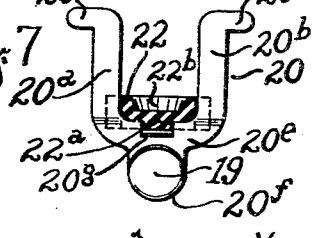


Fig. 7



Inventor
Alvin W. Krieger
By Frank A. Hubbard
Attorney

Patented Aug. 31, 1948

2,448,444

UNITED STATES PATENT OFFICE

2,448,444

ELECTRIC SWITCH

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

Application September 13, 1945, Serial No. 615,985

7 Claims. (Cl. 200—5)

1

This invention relates to improvements in electric switches.

A primary object of the invention is to provide an improved and simplified switch mechanism for multiple-circuit control.

Another and more specific object is to provide novel and simple means to insure engagement of a pair of contactors with their respective contacts in a predetermined sequence, and to thereafter insure disengagement of the contactors from their respective contacts in inverse sequence.

Another object is to provide a switch of the aforementioned character of relatively small size but of relatively large current controlling capacity.

Another object is to provide a novel form of one-piece sheet metal frame for switches of the aforementioned character.

Another object is to provide a switch of the aforementioned character which is particularly adapted for mounting within and support by an insulating pistol grip.

Another object is to provide a switch of the aforementioned character having a novel form and arrangement of an additional contact forming part of an auxiliary switch mechanism.

Another object is to provide such a switch wherein the frame itself forms a conducting part common to at least three different electric circuits.

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

The accompanying drawings illustrate a preferred embodiment of my invention, which will now be described; it being understood that the invention is susceptible of embodiment in other forms within the scope of the appended claims.

In the drawings,

Figure 1 is a vertical sectional view (twice normal scale) of a fragment of the main body of the insulating pistol grip; the main switch mechanism and a portion of the trigger lever being shown in elevation, and the insulating cover member and the parts of the auxiliary switch mechanism carried thereby being shown in perspective.

Fig. 2 is a top plan view of the main body of the pistol grip, with the switch unit in position, but with the trigger lever omitted.

Fig. 3 is a sectional view of the switch unit, on the line 3—3 of Fig. 1, the operating plunger being shown in elevation.

Fig. 4 is a sectional view, on the line 4—4 of Fig. 3, with both of the contactors in their circuit interrupting positions.

2

Fig. 5 is a view similar to Fig. 4, but with the operating plunger partly depressed to effect circuit completing operation of the left-hand contactor, and showing in dotted lines the positions required to be assumed by the operating parts to effect circuit completing operation of the right-hand contactor.

Fig. 6 is a bottom plan view of the switch unit, showing the wiring terminal element formed integrally with one end wall of the frame, and the auxiliary switch contact formed integrally with the other end wall of the frame, and

Fig. 7 is a side elevational view of one of the two like punched sheet metal contactors, with the tip attached thereto.

The insulating pistol grip 10, and the insulating cap or cover 11, with the auxiliary switch parts 12 and 13 carried thereby (Fig. 1) may be of the same shape and size as the corresponding parts shown in Figs. 6 to 9, inclusive, of my prior Patent No. 2,326,232, granted August 10, 1943, for an Electric switch; to which patent reference may be had for structural details of these parts. The switch unit shown in Figs. 1 to 6, inclusive, is adapted to seat within the recess 10^a in the upper end of pistol grip 10, so as to be interchangeable with the switch unit shown in Figs. 7 and 8 of said patent No. 2,326,232. However, as best illustrated in Figs. 3 to 7, the present switch unit is substantially different, in respect of structure, function and mode of operation, from that disclosed in said Patent No. 2,326,232.

More particularly, the present switch unit comprises a one-piece insulating base 15 adapted to be prdouced by a straight-line molding operation; said base having at its lower surface a substantially rectangular integral extension 15^a which is adapted to serve as an insulating barrier between the heads of a pair of like binding screws 16, 16. The shanks of screws 16 are adapted to take into the correspondingly threaded recesses in a pair of metal members 17, 17 (Fig. 3) which are preferably molded as inserts within the relatively high intermediate portion 15^b of base 15. The countersunk ends of inserts 17, 17 project substantially below the lower surface of base 15, and like stationary contact members have perforated portions 18^a which fit over said projecting ends of the inserts, which ends are spun or upset thereover, as shown in Fig. 3, to rigidly secure the contact members in position. Said contact members are provided with upwardly extending angularly offset arms 18^b, 18^b (see Fig. 6), the rounded upper ends of

which have suitable contact tips 19, 19 spot-welded, brazed or otherwise rigidly attached thereto; base 15 having offset openings 15c, 15d formed therein to provide for upward insertion of said arms with the tips so attached. As shown in Figs. 4, 5 and 6, the arrangement is such that contact tips 19, 19 are adapted to face outwardly in opposite directions along the longitudinal center line of base 15, and slightly angled away from the opposite sides of said intermediate portion 15b.

The upper surface of base 15 is provided at opposite sides of intermediate portion 15b with transversely curved or trough-like grooves or recesses 15e and 15f whose upper edges are preferably in a plane substantially flush with the upper ends of the aforementioned tips 19. Said grooves 15e and 15f provide arcing chambers for the respective tips 19 of the stationary contacts and the like tips 19 of the oscillatable contactors 20 associated therewith. Contactors 20 are punched and stamped from sheet metal to the yoke form thereof best illustrated in Fig. 7. Thus, the arms 20a and 20b thereof are located in a common plane, and the same have outwardly extending end portions 20c and 20d, respectively, which are adapted to fit into upwardly opening open pivotal bearings formed in the opposite sides of the one-piece punched and stamped sheet metal frame 21, as hereinafter described.

The connecting portion 20e of each contactor is preferably bent to extend outwardly in a plane at a predetermined angle to the plane of arms 20a and 20b; said connecting portion having an extension 20f (Fig. 7) which has a rounded edge portion to accommodate in a substantially flush relation the circular tip 19 which is welded, brazed, or otherwise rigidly and permanently attached to the inner surface thereof (Figs. 4 and 5). Said connecting portion is provided in its upper edge with a substantially rectangular notch 20g (Fig. 7) to accommodate a correspondingly shaped integral portion 22a of a molded insulating abutment member 22. Member 22 is preferably of rectangular contour, and the same is grooved in the lower surface and in the side edges thereof, as indicated in dotted lines in Fig. 7, to straddle and seat against the upper edge of connecting portion 20e and the inner edges of arms 20a and 20b, whereby substantial lateral movement of member 22 in any direction with respect to contactor 20 is positively prevented. Member 22 is provided in its upper surface with an inverted frusto-conical recess 22b, against the bottom wall of which the lower end of a compression spring 23, of inverted frusto-conical form, is adapted to seat, as shown in Fig. 4.

The aforementioned frame 21 is provided with a top wall 21a, side walls 21b and 21c, and end walls 21d and 21e. Top wall 21a is provided with a relatively narrow rectangular opening 21f extending transversely thereof to accommodate the relatively wide intermediate portion 24a of a flat punched sheet metal plunger 24. Plunger 24 is provided just below the enlarged portion 24a with an extruded substantially cylindrical boss 24b, which is adapted to abut against the lower surface of top wall 21a to limit upward movement of said plunger, as shown in Fig. 4. As best illustrated in Figs. 4 and 5 plunger 24 is slightly offset longitudinally of frame 21 toward the left-hand end thereof, for a purpose hereinafter described.

As best illustrated in Fig. 3, the side walls 21b and 21c extend vertically downward from the top wall 21a for a short distance, and then extend outwardly at a suitable angle to merge with the vertically extending lower portions of said side walls. The lower edges of said side walls seat against the upper surface of base 15, and said side walls have integral lugs 21h, 21i and 21j, 21k which fit into notches of substantially corresponding width formed in the respective side edges of base 15. Each of said lugs has an integral relatively narrower extension 21l, 21m and 21n, 21o, respectively, which is bent inwardly over the lower surface of base 15 into correspondingly shaped recesses in the latter, to rigidly secure frame 21 to said base.

As shown in Figs. 4, 5 and 6, the end wall 21d preferably consists of a relatively narrow rectangular extension of side wall 21b bent inwardly at substantially a right angle to the latter, and a relatively wider but shorter extension of side wall 21c bent inwardly from the latter, into overlapping engagement with the outer surface of the first mentioned extension, as best illustrated in Figs. 2 and 6; said extensions being spot-welded, brazed or otherwise rigidly connected to each other. Also, as shown in Figs. 1, 2 and 6, a portion of said second mentioned extension is spaced from the overlapping portion and bent outwardly at a predetermined angle to provide a stationary contact for cooperation with the auxiliary switch mechanism 12 carried by the aforementioned pistol grip cover or cap 11. Portion 21p has attached thereto in any suitable manner a silver or silver base contact tip 19a of substantially smaller size than the aforementioned tips 19.

The end wall 21e preferably consists of a pair of relatively narrow rectangular extensions formed integrally with the respective side walls 21b and 21c; said extensions being of like length, and the same being bent inwardly at right angles to the respective side walls and outwardly at right angles in engaging relationship to each other, as shown at 21q and 21r in Fig. 6. The portions 21q and 21r of said extensions are permanently connected to each other, as by spot-welding or brazing, or in any other suitable manner. Portions 21q and 21r are tapped to jointly accommodate the shank of a binding screw 16; the corners of each portion being bent outwardly as shown at 21s to provide wire beard guards for either direction of insertion of the shank of screw 16.

One upwardly opening open pivotal bearing of each pair is shown in Figs. 4 and 5, and the same are respectively designated by numerals 21t and 21u; said bearings all having slots opening to the end edges of the side walls of frame 21, as illustrated at 21v and 21w in Figs. 4 and 5, to facilitate assembly of contactors 20, 20 with respect to frame 21. Said bearings are spaced inwardly like distances from said end edges of the frame side walls.

Located above, and preferably vertically alined with, said open pivotal bearings (see 21t and 21u) are pairs of bearing openings adapted to rotatably accommodate the shanks of headed pivot pins 25, 25; the hollow ends of said shanks being spun or upset, as indicated at 25a in Figs. 2 and 3; said pins in turn forming rotatable supports for a pair of like flat, punched sheet metal bell-crank levers 26, 26. Each lever is provided with a pair of arms 26a and 26b, the abutment ends of which are spaced apart an angular distance of substantially less than ninety degrees. The left-hand lever 26 (Fig. 5) has the intermediate or loop portion 27a of a double-coiled torsion spring engaged with the outer edge thereof; the groups of coils 27b, 27c (Fig. 2) of such

spring being arranged on opposite sides of said lever, and the substantially straight free ends of said groups of coils being adapted to underlie and engage the pair of downwardly angled lugs 21x and 21y at said end of the frame. The right-hand lever 26 has a similar coiled torsion spring 28a, 28b, 28c, which is preferably of somewhat greater strength or caliber than the torsion spring aforementioned, to assist in insuring the sequence of operation of the contactors 20, 20, as hereinafter described. Thus the intermediate or loop portion of the torsion spring associated with the right-hand lever 20 (Figs. 4 and 5) is designated by numeral 28a in Fig. 5, and the two groups of coils thereof are designated by numerals 28b and 28c in Fig. 3. The straight end portions of the groups of coils 28b and 28c are adapted to underlie a pair of lugs at the right-hand end of frame 21, one of said lugs being shown at 21z in Figs. 4 and 5.

The aforementioned coiled compression springs 23, 23 have their respective lower ends positioned within recesses 22b in insulating abutment members 22; punched and stamped sheet metal cup members 29, 29 being positioned within the relatively larger upper ends of said springs, to be engaged by the curved abutment ends of the respective lever arms 26b, 26b. The aforedescribed torsion springs act to normally bias levers 26, 26 to the respective positions thereof shown in Fig. 4; and the arms 26b, 26b of said levers correspondingly act to throw the upper ends of springs 23, 23 inwardly beyond the pivotal centers of contactors 20, 20, wherefore the latter are biased to their outer extreme positions illustrated in said figure. The arms 26a, 26a of the bell-crank levers are thus biased toward the lower surface of the top wall 21a of frame 21. However, I interpose between arms 26a, 26a and said top wall a flat punched sheet metal plate 30 of substantially rectangular contour; plate 30 having an opening 30a (Fig. 3) of sufficient length to provide clearance for the reduced rectangular lower end portion 24c of plunger 24. Upon inward movement of plunger 24 the shoulders 24e, 24f formed by the juncture of portions 24a and 24c will engage the upper surface of plate 30 to cause inward movement of the latter. Because the abutment end of the arm 26a of left-hand lever 26 is relatively closer to the point of application of pressure by plunger 24 to plate 30 (and also because of the somewhat greater strength of torsion spring 28a, as compared with that of torsion spring 27a) said plate 30 will be tilted in a counterclockwise direction (Fig. 5) to effect clockwise rotation of left-hand lever 26, with consequent movement of the longitudinal center line of left-hand compression spring 23 across the point of pivotal support of its associated contactor 20, whereby the latter is moved with a snap action to the circuit completing position thereof shown in Fig. 5.

Upon continued inward movement of plunger 24 the left-hand end of plate 30 will cause a further degree of counterclockwise rotation of the left-hand lever 26 (without any operative result) until said end of the plate 30 engages a pair of lugs formed integrally with and partially sheared and struck inwardly from the respective opposite side walls of frame 21, one lug of said pair being shown at 31 in each of Figs. 4 and 5. Further inward movement of plunger 24 will therefore result in clockwise tilting of plate 30 with consequent counterclockwise movement of right-hand lever 26 (see Fig. 4) until

the right-hand spring 23 is moved across the point of pivotal support of right-hand contactor 20, so that the latter is moved with a snap action into the circuit completing position thereof shown in dotted lines in Fig. 5. Plate 30 will then be in the dotted line position thereof shown in Fig. 5; whereas upon continued inward movement of plunger 24 the right-hand end of plate 30 will engage a second pair of integral lugs partially sheared from and bent inwardly at a predetermined angle with respect to the opposite side walls of the frame 21, as shown at 32 and 33 in Figs. 1, 4 and 5.

Upon partial release of the inward pressure upon plunger 24, the right-hand contactor 20 will first be moved to its circuit interrupting position shown in full lines in Fig. 5, and upon complete release of the plunger pressure left-hand contactor 20 will be moved automatically to the circuit interrupting position shown in full lines in Fig. 4. As best illustrated in Fig. 4, the respective end walls of frame 21 serve to limit the degrees of movement of the contactors to their circuit interrupting positions, thus insuring the desired response thereof to the action of their associated compression springs 23.

As shown in Figs. 3, 4 and 5 said intermediate portion 15b of base 15 is provided in its upper end with a recess 15g of rectangular contour in transverse cross section, within which the lower end portion 24c of the plunger has a fairly close sliding fit, to assist at all times in guiding plunger 24 for movement in a single plane. The flared slot 15h leading laterally from recess 15g to the exterior of portion 15b is merely incidental to use of a reinforcing die part formed integrally with the die part (not shown) which forms said recess 15g.

When the switch unit and the molded insulating trigger lever 34 are assembled with respect to pistol grip 10, as shown in Fig. 1, the reduced upper or outer end portion 24d of plunger 24 is adapted to be accommodated within a substantially cylindrical recess 34a in said lever, in a manner similar to the showing in Fig. 7 of my aforementioned Patent No. 2,326,232. Trigger lever 34 may be substantially like that shown in said Patent No. 2,326,232, with the exception that lever 34 herein is provided on opposite side edges thereof with a pair of approximately semi-cylindrical recesses, one of which is shown at 34b in Fig. 1. The purpose of this pair of recesses is to insure against any possible interference between lever 34 and the straight end portions of the coiled torsion spring 27a (see Fig. 5). The contact tip 19a carried by the integral portion 21p of frame 21 projects upwardly beyond the upper end of pistol grip 10 for cooperation with the contactor of the auxiliary switch mechanism 12 carried by cap 11. Cap 11 is attached to pistol grip 10 in the manner disclosed in said Patent No. 2,326,232, and the auxiliary switch mechanism is substantially like that of said patent; with the exception that the portion 21p carrying the stationary contact tip 19a of said auxiliary switch is formed integrally with the frame 21, whose terminal portion 21q, 21r with associated screw 16 are common to the circuit controlled by auxiliary switch 12 and the two other circuits controlled by the respective contactors 20, 20.

In Fig. 1 the trigger lever 34 is shown in full lines in its normal position wherein both circuits controlled by the switch unit are interrupted, whereas the dotted line 34x illustrates the relative position of lever 34 to effect engage-

ment of the left-hand contactor 20 (Figs. 4 and 5) with its associated stationary contact; and the dotted line 34^y shows the relative position of said lever required to also effect engagement of the right-hand contactor 20 (Figs. 4 and 5) with its associated stationary contact.

Various uses for a switch mechanism like that shown herein will at once suggest themselves to those skilled in the art. As an example, the device of Fig. 1 has been employed as a two-circuit gun-firing control means, wherein upon movement of trigger lever to the dotted line position 34^x a circuit is completed to effect firing of, say, one gun for the purpose of getting the range of a target, and then to pull the lever 34 into its second operative position to fire more guns. Alternatively, the position 34^x (Fig. 1) of lever 34 might provide for firing of tracer bullets by one or more guns, and the position 34^y might then provide for firing of regular bullets. The auxiliary switch mechanism 12 may act to effect release of a bomb or bombs upon engagement of its movable contactor with contact tip 19^x by depression of pushbutton 13 in cap 11, either jointly with or independently of the aforedescribed operation of the switch. Obviously the switch mechanism herein disclosed is adaptable for various other uses.

I claim:

1. In a multiple circuit-controlling switch unit, in combination, a metal frame, a pair of metal contactors positioned between the side walls of said frame and pivotally supported thereby, said frame having a wiring terminal element formed integrally therewith to provide an electrical circuit connection common to said contactors, a pair of pivoted bell-crank levers, a coiled spring interposed under compression between one arm of each lever and the contactor respectively associated therewith, spring means to normally bias said bell crank levers whereby the other arm of each lever tends to engage an end wall of the frame, a flat plate interposed between the last mentioned arm of each lever and said end wall, a reciprocatable plunger having sliding engagement with said frame, said plate having an opening formed therein to accommodate the reduced lower end portion of said plunger at a point more closely adjacent the pivot point of one of said levers than the other, said plate being tiltable relatively to said plunger as an incident to depression of the latter to thereby provide for partial rotation of said levers in a predetermined sequence with corresponding snap movements of said contactors to their opposite extreme positions respectively, and a pair of stationary contacts for engagement by said contactors in said sequence.

2. In an electric snap switch mechanism, in combination, a pair of stationary contact members, a metal frame, said frame having a wiring terminal element formed integrally therewith, a pair of contactors each having pivotal and electrical connection with said frame, a coiled compression spring individual to each contactor to effect snap movement thereof from each extreme position to the other, additional spring means individual to each contactor to normally bias the same out of engagement with the stationary contact member respectively associated therewith, a reciprocatable manually operable member slidably supported by said frame in unequally spaced relationship to the points of pivotal support of said contactors, and a flat plate interposed between said last mentioned member and said contactors to form a common operating element for the latter, said manually operable member being adapted to drive said plate in one direction and the latter having a tiltable connection with the former, whereby upon movement of said manually operable member and said plate in said one direction engagement of said contactors with their respective contact members is effected in a predetermined sequence.

3. In an electric snap switch mechanism, in combination, a pair of stationary contacts, a sheet metal frame, said frame having a wiring terminal element formed integrally therewith, a pair of contactors each having a pivotal and electrical connection with said frame, a coiled compression spring individual to each contactor to effect snap movement thereof from each extreme position to the other, additional spring means individual to each contactor to normally bias the same out of engagement with the stationary contact member respectively associated therewith, a reciprocatable manually operable member slidably supported by said frame in unequally spaced relationship to the points of pivotal support of said contactors, and a flat punched sheet metal plate interposed between said last mentioned member and said contactors to form a common operating element for the latter, said manually operable member being adapted to drive said plate in one direction and the latter having a tiltable connection with the former, whereby upon movement of said manually operable member and said plate in said one direction engagement of said contactors with their respective contact members is effected in a predetermined sequence, the aforementioned parts acting upon release of said manually operable member to effect disengagement of said contactors from said contact members in inverse sequence.

4. In a two-circuit controlling electric snap switch mechanism, in combination, a pair of stationary contact members facing oppositely and outwardly with respect to each other, a metal frame, a pair of metal contactors pivotally supported by the side walls of said frame, a pair of bell-crank levers also pivotally supported by said side walls, a coiled compression spring interposed between one arm of each lever and the contactor associated therewith to bias the contactors into or out of engagement with their respective contacts according to the positions of said levers, a coiled torsion spring interposed between the frame and one arm of each lever to normally effect movement of said contactors to disengaging position, a metal plate interposed between the other arm of each lever and said frame, a plunger mounted for slidable movement relatively to said frame, said plunger having shoulders engageable with said plate at a point more closely adjacent one of said levers than the other, whereby upon a given degree of depression of said plunger one of said contactors is moved with a snap action into engagement with its stationary contact and upon a further degree of depression of said plunger said other contactor is moved with a snap action into engagement with its stationary contact, said plunger, said plate and said coiled torsion springs acting upon manual release of said plunger to provide for disengagement of said contactors from said contacts in reverse sequence, each contact having a wiring terminal individual thereto, and means including said frame affording a wiring terminal connection common to said contactors.

5. In a two-circuit controlling electric snap

switch mechanism, in combination, a pair of stationary contact members facing oppositely and outwardly with respect to each other, a metal frame, a pair of metal contactors pivotally supported by the side walls of said frame, a pair of bell-crank levers also pivotally supported by said side walls, a coiled compression spring interposed between one arm of each lever and the contactor associated therewith to bias the contactors into or out of engagement with their respective contacts according to the positions of said levers, a coiled torsion spring interposed between the frame and one arm of each lever to normally effect movement of said contactors to disengaging position, a metal plate interposed between the other arm of each lever and said frame, a plunger mounted for slidable movement relatively to said frame, said plunger having shoulders engageable with said plate at a point more closely adjacent one of said levers than the other, whereby upon a given degree of depression of said plunger one of said contactors is moved with a snap action into engagement with its stationary contact and upon a further degree of depression of said plunger said other contactor is moved with a snap action into engagement with its stationary contact, said plunger, said plate and said coiled torsion springs acting upon manual release of said plunger to provide for disengagement of said contactors from said contacts in reverse sequence, each contact having a wiring terminal individual thereto, means including said frame affording a wiring terminal connection common to said contactors, and the side walls of said frame having lugs formed integrally therewith and bent inwardly therefrom to jointly provide stops to limit the degree of disengaging movement of each contactor.

6. In combination, a switching unit comprising a pair of over-the-center snap switch mechanisms the oscillatable contactors of which have a circuit terminal connection common thereto, each switch mechanism having a stationary contact with a circuit terminal individual thereto, a pivoted actuating lever individual to each contactor, spring means for normally biasing said levers to positions wherein said contactors are disengaged from their respective stationary contacts, common operating means for said actuating levers comprising a plate continuously engaged with each lever at one side of its pivot, a manually reciprocatable plunger having a reduced lower end, said plate having an opening formed therein to accommodate said reduced lower end at a point more closely adjacent the pivot of one of said levers than the other, and said plate being tiltable relatively to said plunger as an incident to depression of the latter to thereby provide for engagement of said contactors with their respective contacts in a predetermined sequence.

7. In combination, a switching unit comprising a pair of over-the-center snap switch mechanisms the oscillatable contactors of which have a circuit terminal connection common thereto, each switch mechanism having a stationary contact with a circuit terminal individual thereto, a pivoted actuating lever individual to each contactor, spring means for normally biasing said levers to positions wherein said contactors are disengaged from their respective stationary contacts, common operating means for said actuating levers comprising a plate continuously engaged with each lever at one side of its pivot, a manually reciprocatable plunger having a reduced lower end, said plate having an opening formed therein to accommodate said reduced lower end at a point more closely adjacent the pivot of one of said levers than the other, said plate being tiltable relatively to said plunger as an incident to depression of the latter to thereby provide for engagement of said contactors with their respective contacts in a predetermined sequence, and the aforementioned parts acting upon manual release of said plunger to effect disengagement of said contactors from said contacts in inverse sequence.

ALVIN W. KRIEGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,266,424	De Reamer	May 14, 1918
2,050,705	Krieger	Aug. 11, 1936
2,117,782	Aldinger	May 17, 1938
2,374,868	Krieger	May 1, 1945

FOREIGN PATENTS

Number	Country	Date
309,415	Great Britain	Apr. 10, 1929