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R. A. MILLERMASTER

2,125,684

ELECTRIC SWITCH

Original Filed July 10, 1936 2 Sheets-Sheet 1

Fig. 1

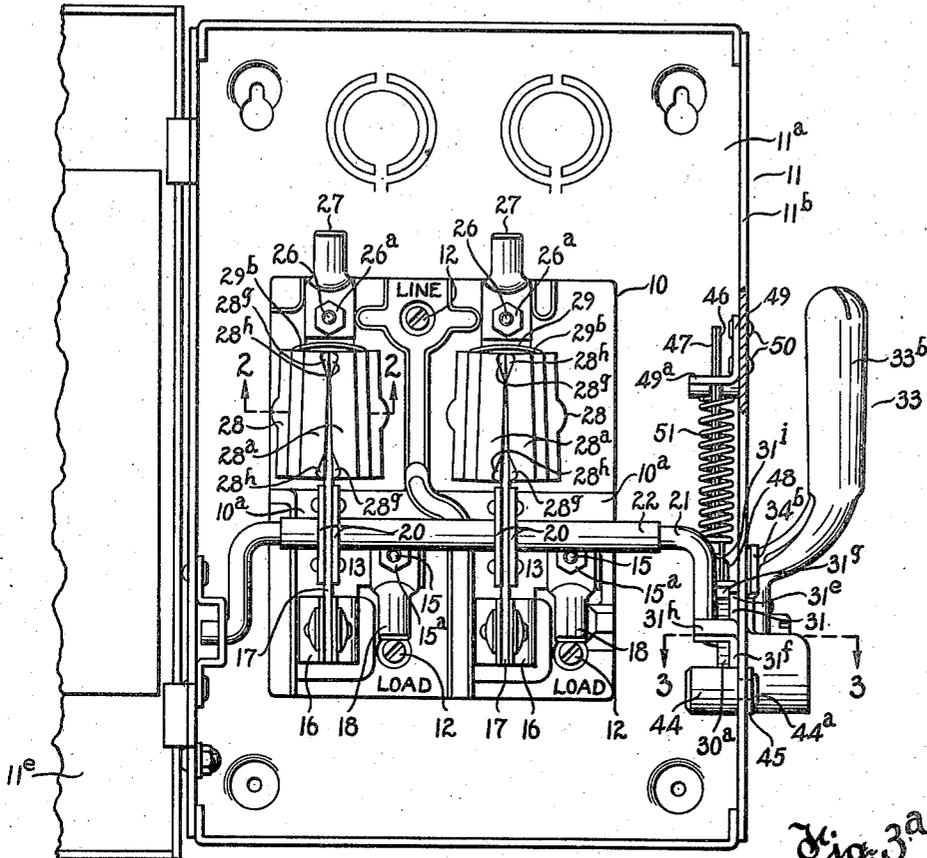


Fig. 2

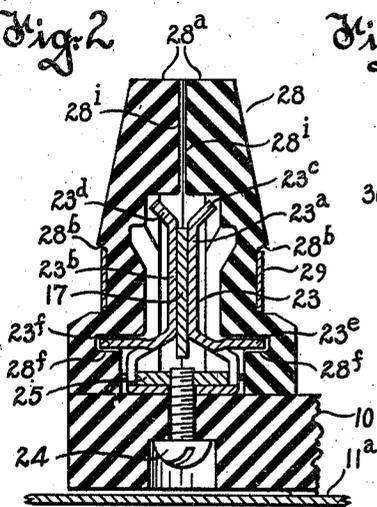


Fig. 3

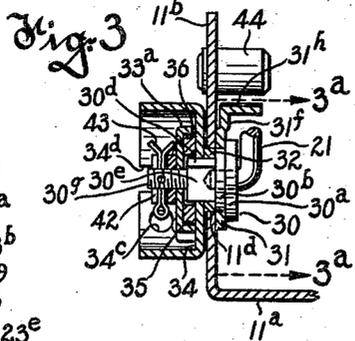
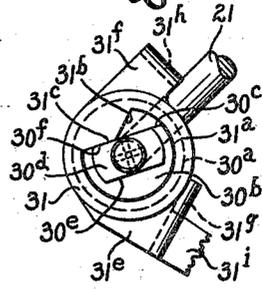


Fig. 3a



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# UNITED STATES PATENT OFFICE

2,125,684

## ELECTRIC SWITCH

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Original application July 10, 1936, Serial No. 89,884, now Patent No. 2,090,764, dated August 24, 1937. Divided and this application July 24, 1937, Serial No. 155,410

3 Claims. (Cl. 200-67)

This invention relates to improvements in electric switches, and the invention relates more particularly to electric safety switches of the snap type.

5 An object of the invention is to generally improve the details of construction and the operation of switches of the aforementioned character.

Another object is to provide an arc snuffer which is particularly well adapted for use with a switch of the free-end, knife-blade type.

10 Another object is to provide improved and simplified means for effecting snap operation of the switch to open-circuit or closed-circuit position of the parts.

15 Another object is to provide an improved form of operating handle and handle attaching means for switches of the aforementioned character.

Other objects and advantages of the invention will hereinafter appear.

20 This application is a division of my copending application, Serial No. 89,884, filed July 10, 1936, for improvement in Electric switches, which has resulted in Patent No. 2,090,764, dated Aug. 24, 1937.

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

In the drawings, Figure 1 is a top plan view, half-size, of an enclosed or safety switch of the snap type,—the hinged cover of the sheet metal casing of the switch being shown fragmentarily in open position,—and a portion of the side wall of the casing which carries the cover latch being broken away.

40 Fig. 2 is a fragmentary vertical sectional view, slightly greater than normal size, on the line 2-2 of Fig. 1, showing in detail the interlocking connections between the insulating arc snuffer elements and the stationary contact clip, and illustrating the relative positions of the parts when the switch blade is in circuit closing position.

45 Fig. 3 is a fragmentary vertical sectional view, on the line 3-3 of Fig. 1,—certain of the parts being shown in elevation.

Fig. 3a is a fragmentary elevational view of certain of the parts, looking in the direction of the arrows 3a-3a of Fig. 3.

55 Fig. 4 is a side elevational view of certain of the switch parts shown in Fig. 1,—the switch cas-

ing being omitted,—and certain of the parts being broken away or in section.

Fig. 5 is a fragmentary elevational view, as seen from the right-hand side of the device in Fig. 1.

Fig. 6 is a fragmentary elevational view of certain of the switch parts, as seen from the opposite side of the casing wall in Fig. 5, and

Fig. 7 is a side elevational view, on a reduced scale, of one of the duplicate insulating arc snuffing elements, showing the form of the recess walls, 10 which are shown in section in Fig. 2.

Referring to the drawings, the numeral 10 designates a base molded from a suitable insulating material to the form illustrated in Figs. 1 and 4. Base 10 when positioned within the sheet 15 metal housing 11 is rigidly attached to the bottom wall 11<sup>a</sup> of the latter, as by means of three bolts each designated by the numeral 12. The switch herein illustrated is of the double-pole type,—but it is to be understood that my invention is applicable to switches having any desired number of poles. Base 10 is provided on its upper surface adjacent to one end thereof with a pair of metal blocks or plates 13 of approximately L-shape which are attached thereto by bolts 14 (Fig. 4) 25 and 15 (Figs. 1 and 4). Each bolt 14 with its nut 14<sup>a</sup> (Fig. 4) likewise provides for attachment of the post or support 16 which pivotally carries one end of a knife-blade contactor 17. Each bolt 15 with its nut 15<sup>a</sup> likewise provides for attachment of a tubular soldering terminal element 18 of well known form.

Each contactor 17 preferably has attached to opposite sides thereof, by rivets 19, a pair of relatively thin flat insulating plates 20 of like form. 35 The projecting lower ends of said plates 20 are adapted to engage the rib 19<sup>a</sup> formed upon the upper surface of base 10 to limit the circuit closing movement of the contactors (see Fig. 4). Plates 20 are provided with slots or notches opening in a direction away from the point of pivotal support of the contactor, as shown at 20<sup>a</sup> in Fig. 4. Said notches are adapted to accommodate the crank portion of a switch actuating element 21, said crank portion preferably having telescoped thereonto prior to bending of element 21 45 an insulating tube 22 to properly insulate said element from the contactors.

Arranged in spaced relation to the pivot posts 16 are a pair of one-piece resilient sheet metal 50 contacts 23 of identical form, as shown in section in Fig. 2 and in dotted lines in Fig. 4. Contacts 23 are of constricted U-shape in vertical cross section (Fig. 2), the arms 23<sup>a</sup>, 23<sup>b</sup> being biased toward each other and the upper ends 55

thereof being flared as shown at 23<sup>c</sup>, 23<sup>d</sup> to facilitate insertion of the contactors 17 therebetween. Partly sheared and bent outwardly and upwardly from the arms of each contact 23 at the enlarged lower end portion of the latter are a pair of substantially horizontal tongues 23<sup>e</sup> and 23<sup>f</sup>. Each contact 23 is rigidly secured to base 10 as by means of a bolt 24 the threaded shank of which extends upwardly through a passage in base 10, penetrates an opening provided in the base portion of the contact, and takes into a tapped opening in a metal plate 25. Plate 25 is further attached to base 10 by a bolt 26 the shank of which threads into a second tapped opening in said plate. Said shank extends upwardly a sufficient distance to penetrate a clearance opening provided in the tubular soldering terminal element 27 of well known form,—a nut 26<sup>a</sup> cooperating with said shank to clamp terminal 27 in fixed position.

To minimize arcing between each contact 23 and its cooperating contactor 17, and to thereby increase the life, the current controlling capacity and the safety characteristics of the switch as a whole, I provide for each contact 23 an arc snuffing device designated in general by the numeral 28. Each of said devices comprises a pair of members 28<sup>a</sup> of identical form which are preferably molded from a suitable heat-resisting insulating material. The adjacent faces of members 28<sup>a</sup> are complementally recessed, as shown in Figs. 2 and 7 to jointly accommodate all parts of the stationary contact 23 associated therewith,—the arrangement being such that in the open circuit position of contactor 17 the adjacent faces of members 28<sup>a</sup> may be brought into engagement with each other to completely enclose the contact 23. Members 28<sup>a</sup> are normally biased toward each other by a substantially U-shaped resilient metal clip 29 the respective arms of which seat in grooves 28<sup>b</sup> of corresponding shape upon the outer surfaces of the respective members 28<sup>a</sup> between the upper and lower ends of the latter. The free ends of the arms of member 29 are flared, as shown at 29<sup>a</sup> in Fig. 4, to facilitate insertion thereof into said grooves.

Members 28<sup>a</sup> are likewise preferably provided at the forward and rear sides thereof with complementary recesses 28<sup>c</sup> and 28<sup>d</sup>, any pair of which are adapted to accommodate at least parts of the connecting portion 29<sup>b</sup> of member 29 (see Fig. 4). Each arm of member 29 is preferably provided with an inwardly extending hemispherical boss or projection, and each groove 28<sup>b</sup> is provided with a pair of hemispherical depressions, located at corresponding distances from the respective ends thereof to selectively accommodate said bosses, whereby accidental separation of clip 29 from members 28<sup>a</sup> is prevented. One of said depressions is shown in dotted lines at 28<sup>e</sup> in Fig. 4. As will be understood, the member 29 is so assembled with respect to the members 28<sup>a</sup> that the connecting portion 29<sup>b</sup> is at the end of said members which is remote from the pivot point of contactor 17. The members 28<sup>a</sup>, however, may be reversed with respect to contact 23 and with respect to clip 29.

The members 28<sup>a</sup> of the arc snuffing device are restrained against substantial sliding movement relatively to contact 23 and with respect to each other as by means of the auxiliary recesses 28<sup>f</sup> which accommodate with a loose fit the aforementioned horizontal tongues 23<sup>e</sup>, 23<sup>f</sup> (Fig. 2). The arrangement is such that upon initial engagement of each contactor 17 with the beveled edges 28<sup>g</sup>, 28<sup>h</sup> of members 28 the upper ends

28<sup>a</sup> of the latter will be spread apart against the bias of member 29, and upon continued circuit closing movement of contactor 17 the members 28 will assume the positions thereof shown in Figs. 1 and 2. That is to say, the forward edges of said members will be spread apart to the required degree to accommodate contactor 17 whereas the rear edges thereof will be biased into engagement with each other. As hereinafter described, I preferably provide means for effecting movement of contactors 17 to opposite extreme positions thereof with a snap action, and the arc snuffing members 28 and members 29 are so constructed and arranged as to add only a negligible amount of resistance to such movements of the contactors.

The switch actuating mechanism is preferably so constructed that in the event of breakage or disablement of the snap action spring, the contactors 17 may be moved to open-circuit position by manual operation of the switch handle, but in such event the contactors 17 may not be moved to circuit-closing position pending repair or replacement of the snap action spring. It is to be understood that the snap action mechanism is adapted to become effective upon the contactors 17 just prior to disengagement of the latter from the stationary contacts, wherefore the subsequent rapid movement of said contactors between the relatively large flat surfaces 28<sup>i</sup> on members 28 will tend to cool and extinguish any arcs formed incident to separation of the contactors from the contacts. Moreover, when in the circuit interrupting movement of contactors 17 the same are disengaged from members 28 the entire adjacent flat faces of the latter will be snapped into engagement with each other, under the bias of the respective members 29, thus completely enclosing the contacts 23 with which they are associated to further assist in and insure quenching or snuffing of any arcs so formed.

The switch herein described and illustrated has a rating of 100 amperes at 575 volts A. C. If it is desired to provide a switch of substantially lower rating or current controlling capacity, the arc snuffing devices, including members 28 and 29 may be entirely omitted without in anywise affecting the construction or assembly of the other switch parts. Moreover, the arc snuffing devices may be readily removed to permit inspection, repair or replacement of the respective contacts by merely manually withdrawing the members 29, whereupon the members 28 are free to be removed laterally from their associated contacts. Or the member 29 of each arc snuffing device may be permitted to remain in position and the forward edges of members 28 may be spread apart manually to effect disengagement of the lower walls of auxiliary recesses 28<sup>f</sup> from the tongue 23<sup>e</sup>, 23<sup>f</sup>, whereupon the complete arc snuffing device may be lifted vertically out of interlocking engagement with its contact 23. The reverse of this procedure may, of course, be followed in assembling the arc snuffing devices with respect to their associated contacts.

The switch operating mechanism includes a hub member 30 having a relatively large circular end portion 30<sup>a</sup> one flat face of which is adapted to bear against the adjacent flat face of a punched and stamped sheet metal member 31, the other face of the latter being adapted to bear against the inner surface of the side wall 11<sup>b</sup> of the switch casing (Fig. 3). Member 31 is provided with an opening 31<sup>a</sup>, the form of which is

illustrated in Fig. 3a. The main portion of the peripheral wall of opening 31<sup>a</sup> is in the form of an arc of a circle, to provide a bearing for the arc-shaped peripheral edge of the reduced portion 30<sup>b</sup> of the hub member. Said portion 30<sup>b</sup> is also provided with a flat edge 30<sup>c</sup>, and the opening 31<sup>a</sup> is provided with a pair of flat wall portions 31<sup>b</sup>, 31<sup>c</sup>, arranged at a predetermined angle to each other. By this means a predetermined degree of lost motion is provided between hub member 30 and member 31. Member 31 is provided with integral portions 31<sup>e</sup>, 31<sup>f</sup> which are slightly offset from the main body thereof (Figs. 3 and 3a) to minimize friction between said member and the inner surface of casing wall 11<sup>b</sup>. The portion 31<sup>e</sup> is provided with an integral lug 31<sup>g</sup> which is bent inwardly at substantially a right angle with respect to said casing wall, and the portion 31<sup>f</sup> is similarly provided with an integral lug 31<sup>h</sup>. The lugs 31<sup>g</sup>, 31<sup>h</sup> are spaced a predetermined distance apart and in overlapping relationship to one arm of crank member 21, as best illustrated in Fig. 1,—to provide a predetermined degree of lost motion between member 31 and said crank member. Casing wall 11<sup>b</sup> is provided with a circular opening 11<sup>d</sup> (Fig. 3); and I prefer to position within said opening, in bearing relationship to the wall thereof a circular washer 32,—said washer being of slightly greater thickness than wall 11<sup>b</sup>, for a purpose to be described.

Hub member 30 is provided with a further reduced portion 30<sup>d</sup> of the contour best illustrated in Fig. 3a,—the same having parallel flat sides 30<sup>e</sup> and 30<sup>f</sup>. Washer 32 is provided with an opening of a shape corresponding to the cross sectional contour of portion 30<sup>d</sup>, whereby these parts are constrained to rotate with each other.

The operating handle 33 is non-rotatably attached to hub member 30 in the following manner: A stamped sheet metal member having a main body portion 34 of substantially circular contour is adapted to seat against the outer surface of washer 32 (Fig. 3), and said portion is provided with an opening to non-rotatably accommodate the portion 30<sup>d</sup> of the hub member. The handle 33 is provided with a portion 33<sup>a</sup> of inverted channel-shape which overlies said body portion 34 in the relationship best illustrated in Fig. 5,—it being understood that the longitudinal center line of handle 33 is parallel with the flat sides 30<sup>e</sup> and 30<sup>f</sup> of hub portion 30<sup>d</sup>. Interposed between handle portion 33<sup>a</sup> and body portion 34 is a pair of spaced metal members 35 and 36, all of said elements being rigidly attached to each other, as by means of four rivets 37, the tapered heads of which (not shown) are positioned in countersinks in the surface of portion 34 adjacent to casing wall 11<sup>b</sup>.

Formed integrally with the portion 34 and surrounding the major portion of the periphery thereof is a flange 34<sup>a</sup>. Also formed integrally with portion 34 is a projection or lug 34<sup>b</sup> which is angled away from casing wall 11<sup>b</sup> to a slight degree, as shown in Fig. 1. The shoulder provided at one end of projection 34<sup>b</sup> is adapted to abut against the edge of a right-angled lug 38<sup>a</sup> forming part of a bracket member 38 which is rigidly attached to wall 11<sup>b</sup>, as by means of rivets 39 (see Fig. 5), to positively limit the degree of rotary movement of handle 33 in one direction. The shoulder provided at the other end of projection 34<sup>b</sup> is adapted to abut against the edge of a right-angled lug 40<sup>a</sup> forming part

of a bracket member 40 which is rigidly attached to wall 11<sup>b</sup>, as by means of rivets 41. The lugs 38<sup>a</sup> and 40<sup>a</sup> are respectively provided with perforations shown, respectively, in dotted lines at 38<sup>b</sup> and 40<sup>b</sup> in Fig. 5; and flange 34<sup>a</sup> is provided with a perforation 34<sup>c</sup> and a notch 34<sup>d</sup> (see Figs. 3 and 5), which are selectively registerable with the aforementioned lug openings 38<sup>b</sup>, 40<sup>b</sup> to provide for insertion of the hasp of a padlock of suitable form, whereby the switch may be locked in open-circuit or closed-circuit position.

As best shown in Fig. 3, the handle portion 33<sup>a</sup> is provided with an opening to afford clearance for the still further reduced and threaded end portion 30<sup>c</sup> of the hub member, a nut 42 being engaged with portion 30<sup>c</sup> to clamp the aforescribed parts in assembled relation. Portion 30<sup>c</sup> is preferably provided with one or more drilled passages (see Figs. 3 and 3a) extending diametrically therethrough adjacent to the outer end thereof, and nut 42 is provided with a plurality of kerfs extending from the outer end thereof to provide for insertion of a cotter pin 43, in the manner illustrated in Figs. 3 and 5, whereby loosening of nut 42 is positively prevented.

To limit the degree of circuit-interrupting movement of contactors 17, I prefer to provide a stud 44 projecting inwardly from the casing wall 11<sup>b</sup> to be engaged by the right-hand arm of crank member 21 (see Figs. 1 and 6). The reduced end 44<sup>a</sup> of stud 44 penetrates an opening provided in wall 11<sup>b</sup> and a washer 45 and is upset over the latter, as shown in Figs. 1 and 5.

Referring to Figs. 1, 3a and 6, it will be noted that the portion 31<sup>e</sup> of member 31 is provided with an integral offset lug 31<sup>i</sup> which is provided with an opening to register with openings provided in the enlarged and shouldered ends of a pair of metal members 46 and 47 arranged on opposite sides thereof,—a headed rivet 48 being inserted through said openings and upset as shown to provide a pivotal connection between said parts. Members 46 and 47 are offset into engagement with each other throughout the major portion of the length thereof from a point adjacent to the pivot end thereof,—the free ends of said members being reciprocable through an opening provided in the lug 49<sup>a</sup> forming a part of bracket 49 which is attached to casing wall 11<sup>b</sup> as by means of rivets 50. Lug 49<sup>a</sup> is formed to provide a pair of surfaces angled toward each other to provide a sort of knife-edge bearing for one end of a coiled compression spring 51 which surrounds members 46 and 47,—the other end of said spring being engaged with the aforementioned shoulders at the enlarged ends of members 46 and 47.

A latch member 52 is pivotally supported in spaced relation to casing wall 11<sup>b</sup>, as by means of pin 53 (Fig. 6),—a bracket 54 being attached to said wall, as by means of rivets 55. The horizontal portion 54<sup>a</sup> of said bracket has an opening to provide clearance for latch 52 and to insure proper alignment thereof with an opening or slot (not shown) provided in the casing cover 11<sup>c</sup>. Member 52 is provided on the portion 52<sup>a</sup> thereof with an abutment to accommodate and retain one end of a coiled compression spring,—the other end of which engages a boss or abutment formed upon the lower face of the horizontal portion 54<sup>a</sup> of said bracket. Latch 52 is also preferably provided with an opening 52<sup>b</sup> to accommodate the hasp of a suitable padlock, to pro-

vide for locking cover 11<sup>e</sup> in closed position, or to prevent complete closure thereof, if desired.

The handle 33 which is formed of sheet metal has the grip portion 33<sup>b</sup> thereof drawn or swaged to the hollow form illustrated, and in a manner to avoid exposure of any cut edges.

It is thought that the operation of the snap switch mechanism will be obvious from the foregoing description. It may be pointed out, however, that with the various parts in the respective closed-circuit positions shown in Figs. 1 and 5, upon initial downward movement of handle 33, the lost motion between the hub member 30 and member 31 is first taken up. That is to say (see Fig. 3a), the hub 30 is permitted to move rather freely until the flat edge 30<sup>c</sup> of hub portion 30<sup>b</sup> engages the flat wall portion 31<sup>b</sup> of opening 31<sup>a</sup>. Thereupon member 31 rotates along with hub member 30 to effect compression of spring 51. Before the toggle (represented by the pivot pin 48) reaches dead center the lug 31<sup>c</sup> (Figs. 1 and 6) will engage the right-hand arm of crank member 21 to positively initiate disengagement of contactors 17 from their associated stationary contacts 23. As heretofore pointed out, said contactors 17 may be disengaged by the operating means independently of spring 51, but under normal conditions spring 51 will become effective prior to complete disengagement of said contactors to effect snap movement thereof to circuit interrupting position. Such movement of contactors 17 is limited by engagement of crank member 21 with stop pin 44, as afore-described. The arc snuffing devices will act in the manner aforedescribed to minimize the degree of arc formation and to effectually extinguish or snuff any arcs formed incident to the operation.

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

1. In an electric safety switch, in combination, a sheet metal casing having an openable cover, a metal bracket secured to the inner surface of one side wall of said casing, said bracket having a pivot opening formed therein, a crank member having one end thereof pivotally supported within said bracket opening, the opposite side wall of said casing having a relatively large opening formed therein in alinement with said bracket opening, a washer adapted to bear within said last mentioned opening, a hub member having a relatively large end portion located within said casing, said end portion having a recess adapted to provide a bearing for the other end of said crank member, a switch actuating element having a portion thereof interposed between said hub end and the last mentioned side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a stamped sheet metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a positive driving connection therebetween, a sheet metal handle member having a portion of inverted channel-shape superimposed upon said stamped sheet metal member and rigidly attached thereto, said portion of the handle member having an opening formed therein, said hub member having a reduced and threaded end

portion extending through said opening, and a nut engaging said threaded end and having clamping engagement with said handle portion to retain the latter and said hub member in assembled relation to said casing.

2. In an electric safety switch, in combination, a sheet metal casing having an openable cover, a metal bracket secured to the inner surface of one side wall of said casing, said bracket having a pivot opening formed therein, a crank member having one end thereof pivotally supported within said bracket opening, the opposite side wall of said casing having a relatively large opening formed therein in alinement with said bracket opening, an annular washer adapted to bear within said last mentioned opening, a hub member having a relatively large end portion located within said casing, said end portion having a recess adapted to provide a bearing for the other end of said crank member, a switch actuating element having a portion thereof interposed between said hub end and the last mentioned side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a stamped sheet metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a positive driving connection therebetween, a sheet metal handle member having a portion of inverted channel-shape superimposed upon said stamped sheet metal member and rigidly attached thereto, said portion of the handle member having an opening formed therein, said hub member having a reduced and threaded end portion extending through said opening, a nut engaging said threaded end and having clamping engagement with said handle portion to retain the latter and said hub member in assembled relation to said casing, said threaded end having a diametrical passage formed therein, said nut having a plurality of slots formed therein to selectively register with said passage, and a cotter pin cooperating with said slots and said passage to restrain said nut against separation from said hub member.

3. In an electric safety switch, in combination, a sheet metal casing having an openable cover, a metal bracket secured to the inner surface of one side wall of said casing, said bracket having a pivot opening formed therein, a crank member having one end thereof pivotally supported within said bracket opening, the opposite side wall of said casing having a relatively large opening formed therein in alinement with said bracket opening, a washer adapted to bear within said last mentioned opening, a hub member having a relatively large end portion located within said casing, said end portion having a recess adapted to provide a bearing for the other end of said crank member, a switch actuating element having a portion thereof interposed between said hub end and the last mentioned side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of

non-circular cross section projecting from said casing, a stamped sheet metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a positive driving connection therebetween, a sheet metal handle member having a portion of inverted channel-shape superimposed upon said stamped sheet metal member and rigidly attached thereto, said portion of the handle member having an opening formed therein, said hub member having a reduced and threaded end portion extending through said opening, a nut engaging said threaded end and having clamping engagement with said handle portion to retain the latter and said hub member in assembled relation to said casing, said switch actuating element having a lug formed integrally therewith and located in a plane parallel to and offset from the main body thereof, a pair of sheet metal rods pivotally attached at one end thereof to said lug, said rods having shoulders formed thereon adjacent to the pivot point thereof, a bracket member secured to said casing wall and having an opening to receive and guide said rods, and a coiled compression spring interposed between said bracket and said shoulders to insure snap movement of said element to each of its extreme positions.

4. In an electric safety switch, in combination, a sheet metal casing having an openable cover, a metal bracket secured to the inner surface of one side wall of said casing, said bracket having a pivot opening formed therein, a crank member having one end thereof pivotally supported within said bracket opening, the opposite side wall of said casing having a relatively large opening formed therein in alinement with said bracket opening, a washer adapted to bear within said last mentioned opening, a hub member having a relatively large end portion located within said casing, said end portion having a recess adapted to provide a bearing for the other end of said crank member, a switch actuating element having a portion thereof interposed between said hub end and the last mentioned side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a stamped sheet metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a positive driving connection therebetween, said stamped sheet metal member having an extension formed integrally therewith and adapted to provide a pair of spaced substantially radial shoulders arranged at a slight angle to the outer surface of said casing wall, and a pair of lug members rigidly attached to said outer surface of the casing wall and respectively adapted for engagement by said shoulders to positively limit movement of said member in opposite directions.

5. In an electric safety switch, in combination, a sheet metal casing having an openable cover, a metal bracket secured to the inner surface of one side wall of said casing, said bracket having a pivot opening formed therein, a crank member having one end thereof pivotally supported within said bracket opening, the opposite side wall of said casing having a relatively large opening formed therein in alinement with said bracket opening, an annular washer adapted to

bear within said last mentioned opening, a hub member having a relatively large end portion located within said casing, said end portion having a recess adapted to provide a bearing for the other end of said crank member, a switch actuating element having a portion thereof interposed between said hub end and the last mentioned side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a stamped sheet metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a positive driving connection therebetween, said stamped sheet metal member having an extension formed integrally therewith and adapted to provide a pair of spaced substantially radial shoulders arranged at a slight angle to the outer surface of said casing wall, a pair of lug members rigidly attached to said outer surface of the casing wall and respectively adapted for engagement by said shoulders to positively limit movement of said member in opposite directions, said lug members having openings formed therein, said member having an upstanding flange formed integrally therewith between said shoulders, and said flange having openings formed therein for cooperation with said lug openings to provide for attachment of a padlock or the like.

6. In an electric safety switch, in combination, a metal enclosing casing, a crank member pivotally supported within said casing, said casing having a circular opening formed in one side wall thereof, a metal member of circular contour adapted to bear within said opening, a hub-member having a relatively large end portion located within said casing and an intermediate portion of non-circular cross section adapted to penetrate said metal member and projecting from said casing, a switch actuating element having a portion thereof interposed between said hub end and the inner surface of said side wall of the casing, said element and said hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, a stamped sheet metal member having an opening therein corresponding in shape to said projecting hub portion to provide a positive driving connection therebetween, a metal handle member having a portion of inverted channel-shape superimposed upon said stamped sheet metal member and rigidly attached thereto, said portion of the handle member having an opening formed therein, said hub member having a reduced and threaded end portion extending through said opening, and a nut engaging said threaded end and having clamping engagement with said handle portion to retain the latter and said hub member in assembled relation to each other.

7. In a snap make and break electric safety switch, in combination, a metal enclosing casing, a crank member pivotally supported within said casing, one side wall of said casing having a relatively large opening formed therein in alinement with the pivotal center of said crank mem-

ber, a metal member of circular contour adapted to bear within said opening, a machined metal hub member having a relatively large end portion located within said casing and an intermediate portion of non-circular cross section adapted to penetrate said metal member and projecting from said casing, a switch actuating element having a portion thereof interposed between said hub end and the inner surface of said side wall of the casing, said element and said projecting portion of the hub member being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, a stamped sheet metal member having an opening therein corresponding in shape to said projecting hub portion to provide a positive driving connection therebetween, a metal handle member having a portion of inverted channel-shape superimposed upon said stamped sheet metal member and rigidly attached thereto, said hub member having a reduced end portion penetrating said portion of the handle member and projecting therebeyond, means associated with said reduced end portion of the hub member to retain said handle member in assembled relation to the latter, said switch actuating element having an additional lug formed integrally therewith, a metal rod member pivotally connected at one end thereof to said last mentioned lug, said rod member having shoulders formed thereon adjacent to the pivot point thereof, a bracket member secured to said casing wall and having an opening to receive and guide said rod member, and a coiled compression spring interposed between said bracket and said shoulders to effect snap movement of said element and said crank member to the respective extreme positions thereof.

8. In an electric safety switch of the snap action type, in combination, a metal enclosing casing, a bail-shaped crank member pivotally supported within said casing, one side wall of said casing having a relatively large circular opening formed therein, a flat metal member of corresponding contour adapted to bear edgewise within said opening, a machined metal hub member having a relatively large end flange located within said casing, a punched and stamped sheet metal switch actuating element having a portion

thereof interposed between said hub flange and the inner surface of said side wall of the casing, said element and said hub having shoulders formed thereon to provide a predetermined degree of lost motion therebetween, said element having a pair of angularly spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a punched and stamped sheet metal member having an opening formed therein corresponding in shape to said last mentioned hub portion to provide a rigid and positive driving connection therebetween, said last mentioned sheet metal member having an extension formed integrally therewith and adapted to provide a pair of spaced angular shoulders, and a pair of lug members rigidly attached to said casing wall and adapted for engagement by said shoulders respectively to limit movement of said member in opposite directions.

9. In actuating means for electric switches, in combination, a metal enclosing casing having an opening formed in one side wall thereof, a machined metal hub member penetrating said opening and having a relatively large end flange located within said housing, a bail-shaped crank member one end of which is pivotally supported by said hub member, a switch actuating element having a portion thereof interposed between said end flange of the hub member and said side wall, said element and said hub being cooperatively formed to provide a predetermined degree of lost motion therebetween, said element having spaced lugs formed integrally therewith to provide a predetermined degree of lost motion between the same and said crank member, said hub member having a portion of non-circular cross section projecting from said casing, a metal member having an opening therein corresponding in shape to said last mentioned hub portion to provide a rigid and positive driving connection therebetween, said last mentioned metal member having an extension formed integrally therewith to provide a pair of spaced angularly arranged shoulders, and means carried by said side wall of the casing to be engaged by said shoulders to positively limit movement of said member in opposite directions.

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