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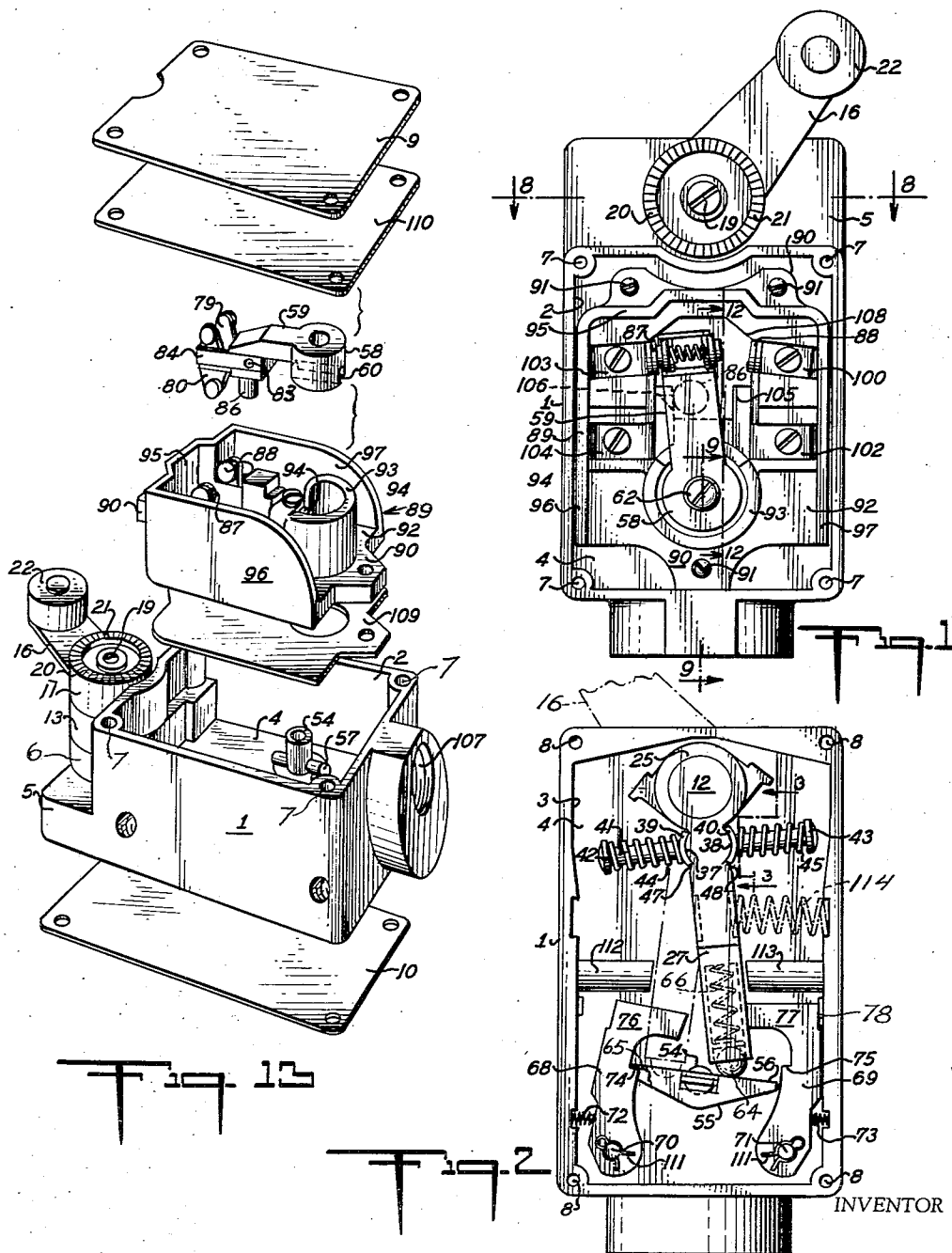
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2,806,912

LIMIT SWITCHES

Filed Dec. 6, 1954

2 Sheets-Sheet 1



BY

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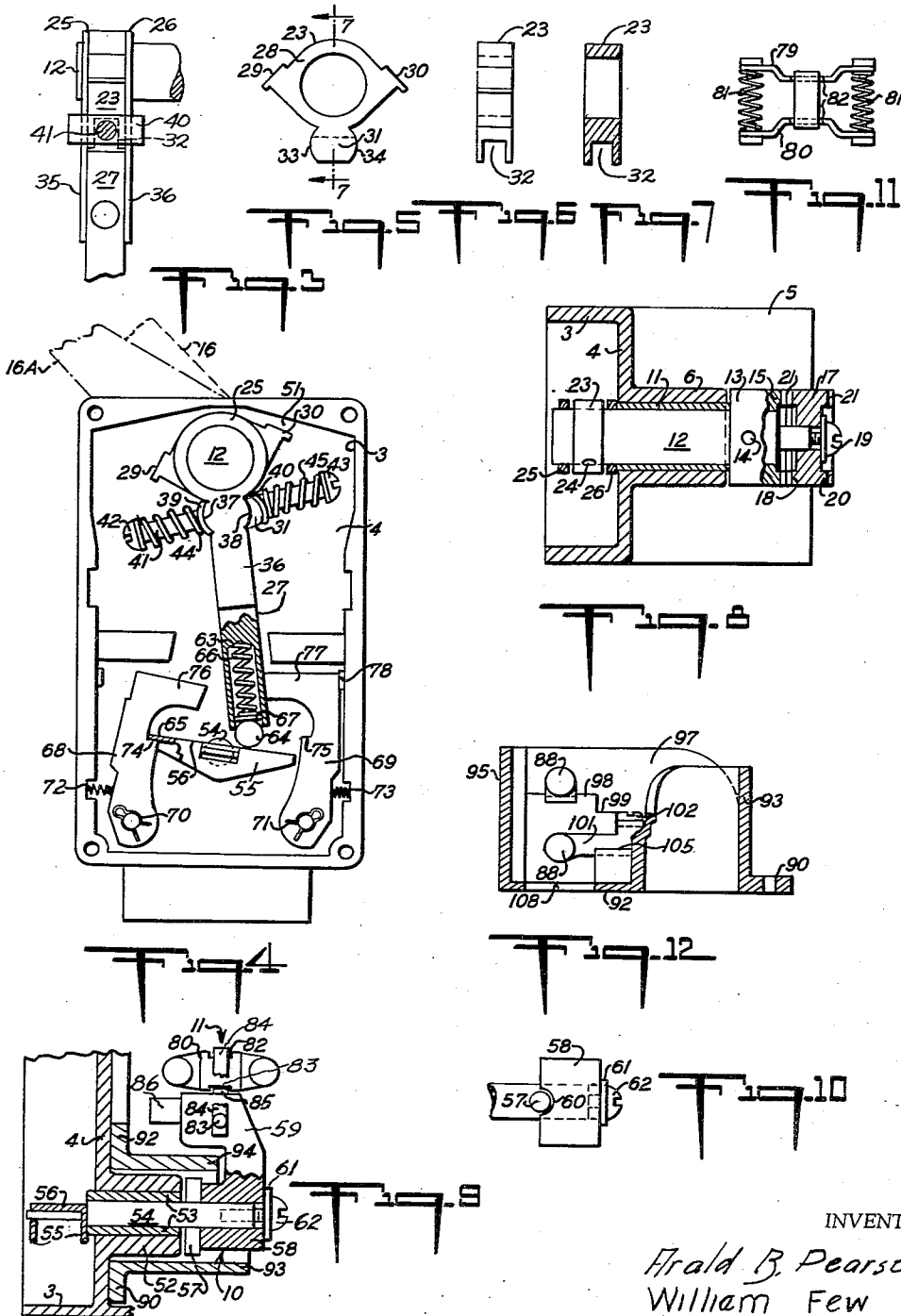
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LIMIT SWITCHES

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13 Claims. (Cl. 200—47)

This invention relates to so-called limit switches that are operated by the travel movement of a machine or the like.

Such switches are known comprising a housing containing switch contacts; and a shaft projecting from the housing on which is an operating arm to be disposed in the path of the moving or travelling part of a machine or the like, to be moved thereby, and then restored, to thereby oscillate the shaft through a small angle. The shaft actuates a mechanism in the housing to cause it to operate and restore the electric contacts with a snap action.

This invention relates to limit switches of this class.

Among the objects of the invention are:

To provide improved means permitting over travel of the operating arm after it has operated the contacts; utilizing coil spring means under compression in an improved manner;

To provide an improved snap action mechanism for the contacts;

To provide an improved housing construction, by which assembly of the parts is facilitated; and electrical insulation is simplified;

To provide a limit switch the main housing of which may be cast in one piece from metal; and the metal switch parts of which may be mounted on improved molded insulation parts and then detachably inserted into the housing, in an improved manner, whereby the cost of the parts is reduced, assembly is facilitated, and permanent electrical insulation insured; and whereby upon removing the detachable insulation parts, the contacts may be readily inspected, renewed etc.

To provide a limit switch of the type having a switch arm carrying spring pressed yieldable bridging contacts, and movable in alternate directions to bridge stationary contacts in each direction, and having improved stop means to positively stop movement of the arm after a predetermined amount of yielding of the contacts.

With these objects in view, and others that will appear to those skilled in the art, the invention comprises the following.

There is a main housing having a circumscribing side wall and an intermediate partition wall; a bearing-bushed boss for a main shaft, and a bearing-bushed boss for a switch operating shaft, rising from the partition wall; and all except the bushings molded in one piece, preferably from die cast metal.

The main shaft goes through the partition and operates a rocker on the switch shaft, to oscillate it with snap movement, and provision is made for overtravel of the main shaft utilizing coil springs always under compression, in an improved manner.

The switch operating shaft goes through the partition, and is provided with a clutch element; and a switch arm carrying movable contacts, is molded in one piece from insulation and has a clutch element formed thereon; and the clutch elements are engageable and disengageable by telescoping the arm on the shaft.

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A box housing molded in one piece from insulation carries spaced pairs of stationary contacts and terminal connections, and is insertable into the metal housing and readily removable therefrom; and by its form, insulates the contacts, and insulates the switch shaft, and cooperates with the switch arm to render its movement free from wires going to the terminals, and to control the limits of contact operating movements of the arm.

The invention is fully disclosed in the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a front elevational view of an embodiment of the invention with a front cover thereof removed;

Fig. 2 is a rear elevational view of the embodiment of

Fig. 1 with a rear cover thereof removed;

Fig. 3 is a fragmentary section view from the plane 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 2 with parts in a different operated condition;

Figs. 5 and 6 are respectively front elevational, side elevational views showing separately an element of Figs. 2 and 4;

Fig. 7 is a sectional view from the plane 7—7 of Fig. 5;

Fig. 8 is a part sectional view from the plane 8—8 of Fig. 1;

Fig. 9 is a part sectional view from the plane 9—9 of Fig. 1;

Fig. 10 is a fragmentary elevational view in the direction of the arrow 10 of Fig. 9;

Fig. 11 is an elevational view in the direction of the arrow 11 of Fig. 9;

Fig. 12 is a sectional view from the plane 12—12 of Fig. 1; and

Fig. 13 is an exploded view in perspective of the embodiment of Figs. 1 and 2.

Referring to the drawing there is shown generally at 1 an elongated rectangular housing comprising a front cup form portion 2, open toward the front as viewed in Fig. 1 and a longer back cup form portion 3 open toward the rear Fig. 2; the housing being all in one piece, and preferably molded from die cast metal; the cup bottoms jointly providing an interior partition 4 and the back cup portion projecting upwardly as at 5 in Figs. 1, 8 and 13 and having on its bottom an axially thick boss 6.

Screw holes at 7—7 and 8—8 are provided by which covers for the cups, omitted from Figs. 1 and 2 but shown at 9—10 in Fig. 13 may be fastened on with screws to seal the housing as a walled enclosure.

A bushing 11, see Fig. 8, is press fitted in or molded in the boss 6 in which an oscillatable main shaft 12 has bearing.

One end of the shaft 12 has a head 13 secured thereto by a through pin 14, Fig. 8, the head having an outwardly facing annular bead 15.

An operating arm 16, Figs. 1 and 13 has an arm head 17, Figs. 8 and 13, telescoped on the shaft 12 and has an annular bead 18 held engaged with the bead 15 by a screw and washer at 19; and the arm head 17 has an outwardly facing annular bead 20 thereon. All three of the said annular beads 15—18—20 have radial corrugations 21 thereon, as shown for the bead 20 in Figs. 1 and 13 and as indicated in Fig. 8 at 21.

The operating arm 16 has a roller 22 on its outer end, Figs. 1 and 13.

By this construction, the operating arm 16 may be mounted with the roller 22 toward the front as viewed in Fig. 1, or removed and turned over and remounted with the roller toward the rear; and may be set at any desired angular position around the axis of the shaft 12; and in any such chosen position, locked to the shaft by meshing of the corrugations of the arm head 17 with those of the shaft head 13.

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In Fig. 8, on the other end of the shaft 12 is an actuator element 23 secured to the shaft by a through pin 24, and disposed between two eyes 25—26 of a swing arm 27 to be described; the eyes loosely fitting around the shaft.

The shaft 12 is fixed against longitudinal shifting by the two elements 13 and 23 pinned thereto, as will be apparent.

The said actuator 23 is shown separately in Figs. 5, 6 and 7 and besides having an annular body 28 by which it is pinned on the shaft 12 as described, has stop lugs 29 and 30 on opposite sides thereof, and a depending lug or arm 31, disposed symmetrically between the lugs 29 and 30; and the arm 31 is slotted as at 32; and the arm 31 has convexly arcuate surfaces 33 and 34 on its opposite sides.

The said swing arm 27, considered alone, is free to oscillate on the shaft 12 by means of its shaft-embracing eyes 25—26 as referred to; but is yieldably connected with the shaft 12 to oscillate therewith, upon to and from movements of the arm 16, by the following means.

The swing arm proper 27, Fig. 3, has plates 35—36 on its opposite sides, secured thereto by welding or other suitable means, and it is in the upper ends of these plates that the said eyes 25—26 are formed; and the plates have opposite convexly arcuate edge portions 37—38 which normally are aligned with the arcuate surfaces 33—34 of the actuator 23 which is between the plates.

Arcuate washers 39—40 normally lie upon and bridge the arcuate actuator surfaces 33—34 and plate edges 37—38.

A tie bolt or rod 41 extends through washer holes in the arcuate washers 39—40 and through the slot 32 of the actuator 23, see Fig. 3, and has heads 42—43 on its opposite ends; and pre-loaded compression springs 44—45 are disposed between the rod heads 42—43 and the arcuate washers respectively, and normally hold the arcuate edges 37—38 of the plates 35—36 and the arcuate edges 33—34 of the actuator 23 in alignment, and the actuator arm 31 radially parallel with the swing arm 27, as shown in Fig. 2.

Upon movement of the operating arm 16 and shaft 12 through an angle say in the counterclockwise direction as viewed in Fig. 2, the actuator arm 31 transmits the movement through the arcuate washer 40 to the spring 45; the spring 45 transmits the movement through the rod 41 to the other spring 44; the other spring 44 transmits it through the other arcuate washer 39 to the swing arm 27 and the swing arm is thereby swung in a corresponding counterclockwise direction. The mechanism propels the swing arm 27 in the clockwise direction upon clockwise movement of the arm 16 by similar spring action. The swing of the arm 27 is limited in alternate directions by stops 76—77 to be described. Between these stops the resistance to movement of the swing arm 27 is small as will appear and the pre-load of the spring is sufficient to effect such movement without being further compressed so that the actuator 23 and swing arm 27 move in unison. It is impracticable to always adjust the position of the operating arm 16 with respect to the machine part which operates it so that its throw, by the machine part, will exactly correspond to the limited throw of the swing arm.

The operating arm is therefore constructed so that it can over travel, for example, in Fig. 4, going from the position 16 at which the swing arm 27 has moved to its limit, to the position 16A. When this occurs the actuator 23 continues to be rotated after the swing arm 27 has stopped at the stop 77 to be described.

The arcuate washer 39 remains in contact with the surface 37 of the swing arm; the arcuate washer 40 is moved away from the swing arm surface 38 by the actuator arm 31, causing the spring 45 to yield and become more compressed and the rod 41 is moved lon-

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gitudinally thereby, causing the other spring 44 to yield and become more compressed.

Over travel of the operating arm 16 is thus provided for and is yieldingly opposed by the springs, and the springs exert force in the direction to hold the swing arm in its stopped position. Upon termination of the over travel the springs react and return the operating arm and the actuator to normal position again.

The swing arm 27 is shown in Fig. 2 in a counterclockwise position as having been moved to that position by counterclockwise movement of the operating arm 16 by a machine part. It will be understood that it may be moved to a clockwise position by clockwise movement of the arm 16. After the machine part has passed the roller 22 or is retracted, the swing arm may be swung in the other direction by a compression spring 114, reacting between the arm and the housing wall. The two positions of the swing arm are shown in Fig. 2 in solid and broken line respectively.

It will be noted that on overtravel as described, various parts of the rod 41 will have transverse bodily movement toward and from the shaft 12. The slot 32 in the actuator permits this movement to occur freely. Since the rod goes through holes in the arcuate washers 39—40 the washers will be moved by the transverse movements of the rod.

The washers 39—40 being inwardly concave and at all times being held by spring force in contact with corresponding convex surfaces 33—34 on the actuator or convex surfaces 37—38 on the swing arm, or on both, the washers 39—40 and therewith the rod 41 are prevented from drifting downwardly along the swing arm from a preselected position, without the addition of drift-preventing parts. To further insure against such drifting, notches 47—48 may be provided on the swing arm in which one or the other, or both, of the arcuate washers are seated at their lower edges.

Excessive over travel is to be avoided, to avoid damage, as will be obvious; and to prevent it the stops 29—30 are provided on the actuator 23 in position to engage the inner housing wall, at the maximum permissible over travel; and the operating arm in practice is adjusted so that the over travel will be safely less than that, as signaled by a small clearance between the stop 30 and the wall as shown at 51, Fig. 4.

In the front cup 2 of the housing and on the front side of the partition 4 is a boss 52 in which is molded or press fitted a bearing bushing 53. A switch shaft 54 has oscillatory bearing in the bushing, Figs. 9 and 2, and on its rearward end has a rocker 55 connected thereto.

The rocker 55 is made from sheet metal parts, and is of generally channel form and connected to the shaft 54 by a channel flange, as by welding or other suitable means; and the channel web 65 faces upwardly and provides a planar surface 56 extending laterally in opposite directions from the switch shaft 54.

The switch shaft 54, Fig. 9, beyond the opposite end of the bushing has a clutch pin 57 extending transversely therethrough, and the shaft extends beyond the pin; and a bored hub 58 of a switch arm 59 is telescoped over the end of the shaft, and has a transverse clutch groove 60 embracing the clutch pin 57 and is held on the shaft with the clutch pin and groove engaged, see Fig. 10, by a washer 61, and a screw 62 going through the washer and threaded into the end of the shaft.

The said swing arm 27 is bored out as at 63, Fig. 4, at its lower end and has a ball 64 preferably of molded plastic material, in the bore but projecting therefrom and resting upon the planar face 56 of the web 65 of the channel form rocker 55, and held thereon by a spring in the bore with a metal washer 67 between the spring and the ball.

The switch shaft 54 is directly under the main shaft 12 and as the swing arm 27 is swung in alternate direc-

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tions as referred to, the ball 64 is moved on the planar surface 56, to one side or the other of the switch shaft 54 that supports it, and this rocks the rocker in one direction or the other, to throw the switch arm 59 in one direction or the other.

The throw of the switch arm 59 in each direction opens one set of switch contacts and closes another set and is caused to occur with a snap action as follows.

A pair of latches 68—69, Figs. 2 and 4, at opposite sides of the rocker 55 are pivotally mounted at 70—71 on the housing partition below the rocker and extend upwardly beyond it, and are constrained by springs 72—73 reacting thereon and on the housing walls to tend to move toward the rocker.

The latches respectively have opposite latch shoulders 74—75; and at their upper end have fingers 76—77 extending inwardly toward the swing arm 27.

When the swing arm 27 is swung counter clockwise as above described, the side of the arm engages the end of finger 77 and rocks the latch 69 clockwise until the back side of the latch abuts upon the inner housing wall as at 78. This stops further movement of the swing arm 27 and is the stop means for limiting its movement, referred to hereinbefore; and the solid line position of the arm in Figs. 2 and 4 is this position.

At this time the rocker 55 is in the rocked position of Figs. 2 and 4, and its left end is elevated as shown.

The other latch 68 is at this time rocked clockwise by its spring 72 and its said latch shoulder 74 is engaged under the adjacent end of the web 65 of the rocker 55.

When the swing arm is swung clockwise as described, the ball 64 is moved by it on over to the other side of the shaft 54, and the spring 66 acting through the ball 64 begins to exert increasing torque, tending to rock the rocker 55 and switch shaft 54 counter clockwise, but this is prevented by the latch shoulder 74.

When the swing arm has moved the ball 64 far enough so that the spring 66 is capable of exerting great torque on the rocker, the side of the swing arm, engages the end of latch finger 76 and a slight further movement removes the latch shoulder 74 from under the end 65 of the rocker, and the rocker is rocked counterclockwise with a snap movement under the impulsion of the spring 66; and the swing arm is ultimately stopped by the finger 76 as has been described for the finger 77.

When the swing arm 27 starts to move away from the latch 69 and out of engagement with the finger 77, the latch 69 will follow it until it rests against the adjacent end of the rocker.

When the rocker snaps in the counterclockwise direction as described, the shoulder 75 on the latch 69 will move under the adjacent end of the rocker and latch it.

When the swing arm 27 is returned counterclockwise, it will trip the latch 69 and cause snap operation of the rocker 55 in the clockwise direction as described for the latch 68.

The throw of the rocker 55 in each direction is stopped by means which stops the throw of the switch arm 59 attached to it, to be described.

It is an important part of the invention that the switch parts are in unitary assemblies separate from the above described parts for operating them.

The separate unitary assembly of the switch arm has already been referred to in connection with Fig. 9 and as described can be mounted on the switch shaft 54 and clutched thereto or removed therefrom upon manipulation of the screw 62.

The switch is a double pole, double throw switch.

On the free end of the switch arm 59, see Figs. 9 and 11, are two sheet metal bridging contact bars 79—80 each with a pair of contact tips at opposite ends, the pairs of tips facing away from each other; and the bars are held apart by two interior springs 81—81 at the ends of the bars.

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Each bar has intermediate notches 82 and 83 in its opposite edges.

A sheet metal rectangular U-shaped strap 84 straddles the contact arm 59 and its legs are secured thereto by a rivet 83.

The notches 82—82 embrace the closed end of the U and the notches 83—83 embrace a rectangular lug 85 on the end of the switch arm. The bars can be removed simply by tilting them and removing them out of the U, but are at all times held loosely on the end of the arm and prevented from rocking on the axis of the arm. The arm 59 is in one piece, molded from plastic material, including its said clutch groove 60, and on its underside has a depending post 86 adapted to strike and be stopped upon abutments to be referred to on each side of the arm to limit and stop the throw of the arm.

There is a pair of stationary contacts 87—87 one above the other on the left side of the arm as viewed in Fig. 1 and a like pair 88—88 on the right side.

The stationary contacts are mounted on a separate box like device, shown generally at 89 provided with flanges 90—90 and holes therein by which it may be mounted by screws 91—91 in the forward cup form part 2 of the housing or readily detached therefrom and removed; and is all in one piece molded from plastic insulating material.

It comprises a base wall 92 having a planar bottom resting upon the housing partition 4, and from which rises a tubular wall 93 surrounding the boss 52 that supports the switch arm shaft and downwardly within which the switch arm hub 58 is inserted into clutched position, or from which it may be withdrawn; a portion of the tubular wall being of reduced height as at 94 to make room for the switch arm 59.

The box like device has a rear wall 95 and opposite side walls 96 and 97 rising from the base wall 92.

Formed on the interior of each side wall, see Fig. 12 for the right side wall 97, are ledges 98 and 99 of different height.

The higher ledge 98 has mounted thereon a first stationary contact 88, constituting also a screw type terminal 100. On the lower ledge is mounted a bent metal piece 101 having a second stationary contact 88 directly under and spaced from the first contact 88 and having also a screw type terminal 102.

There are like ledges, and contacts 87—87 and terminals 103—104 on the interior of the left side wall 96.

The pairs of stationary contacts 88—88 and 87—87 thus provided are disposed to be in alignment with and to be engaged by the contacts of the respective bridging bars 79 and 80 of the switch arm 59 as the switch arm is snapped from side to side.

The springs 81—81 between the switch arm bridging bars, are compressed by travel of the switch arm in either direction after a pair of stationary contacts are first bridged by a bridging bar, thus providing ample arc breaking distance between the other bridging bar and the opposite stationary contacts.

The switch arm 59 has the aforesaid depending post 86 on its underside and the base wall 92 of the box-like device has, rising therefrom, a pair of abutments 105—106 spaced apart laterally and upon which the said post 86 of the switch arm abuts to stop its throw in each direction.

The lower end of the said box device 89, the right end as viewed in Fig. 13, is not closed by a wall; and circuit wires (not shown) connected to the said switch screw terminals 100—102—103—104 may be led around the said tubular wall 93 and out of the box device and through an opening 107, Fig. 13, in the adjacent end wall of the metal housing, to which opening also conduit connection may be made, and the said tubular wall 93 of the box device shields the switch arm hub 58 which it surrounds from contact with the wires which otherwise might foul with and interfere with the free movement of the switch arm.

In the bottom of the said molded box device 89, an

opening 103 may be provided through which, when the box is not assembled in the metal housing, access may be had to the contacts. When such opening is provided, a sheet 109, Fig. 13, of insulation is placed between the box base wall 92 and the partition 4, to close the openings.

The tops of the walls 95—96—97 of the box, are flush with the top of the side walls of the main metal housing; and the cover 9 for the front of the main metal housing may conveniently be made of metal and in such case a sheet of insulation 110 is placed between the cover and the housing.

These two sheets 110 and 109 of insulation, together with the walls of the box device molded from insulation, provide an insulated arc chamber in which the contacts operate.

Referring again to the back side of the limit switch, and as viewed in Fig. 2, the pivots 70—71 for the latches 68—69 are in the form of posts, with retaining cotter pins 111—111 or the like, to hold the latches on the posts, and to permit their ready removal.

In the absence of countervailing provision, if a latch, say the latch 69 were removed, removing the finger 77 as a stop for the swing arm 27, and if at this time the switch arm 59 were removed, the spring 66 in the arm would rock the rocker 55, so far clockwise as to be substantially vertical and there would be nothing to prevent the spring 66 from firing the ball 64 and washer 67 like projectiles out of the assembly, with liability of losing them.

To prevent this and other abnormal operations, posts 112 and 113 are provided extending from the opposite walls of the main metal housing toward the swing arm 27 into close proximity to it, so that when the arm 27 is not normally stopped by the latch fingers 76—77 as described, it will be stopped by these posts.

A return spring 114 for the swing arm is shown mounted on one side thereof; but it may be mounted on the opposite side; or it may be omitted; depending upon the characteristics of movement given to the operating arm 16.

We claim:

1. In an electric switch construction, a main frame, a bearing on the frame; a main shaft on the bearing; an operating arm connected to the shaft to oscillate the shaft on the bearing upon alternate angular movements of the arm; a swing arm having oscillatory bearing on the shaft, and extending radially therefrom; mechanism transmitting oscillatory movements of the shaft to the swing arm to swing it in alternate directions; switch contacts operated by swing movements of the swing arm; stop means to limit and stop swing movements of the swing arm in each direction; the transmitting mechanism providing for overtravel of the operating arm after stopping of swing movement in either direction and comprising; an actuating arm secured to the shaft and oscillatable therewith and extending therefrom radially parallel with the swing arm; a pair of springs mounted to exert forces on opposite sides of both the swing arm and actuating arm, to normally hold them parallel and to cause the swing arm to swing in unison with oscillations of the actuating arm; and the springs being yieldable to allow the actuating arm to continue to move in either oscillatory direction relative to the swing arm, after stopping of swing movement of the swing arm.

2. In an electric switch construction, a main frame, a bearing on the frame; a main shaft on the bearing; an operating arm connected to the shaft to oscillate the shaft on the bearing upon alternate angular movements of the arm; a swing arm having oscillatory bearing on the shaft, and extending radially therefrom; mechanism transmitting oscillatory movements of the shaft to the swing arm to swing it in alternate directions; switch contacts operated by swing movements of the swing arm; stop means to limit and stop swing movements of the swing arm in each direction; the transmitting mechanism providing for over travel of the operating arm after stopping of swing move-

ment in either direction and comprising: an actuating arm secured to the shaft and oscillatable therewith and extending therefrom radially parallel with the swing arm; a transverse element extending normally at right angles to the swing arm and actuating arm; a pair of axially aligned compression springs; the outer ends of the springs reacting upon the transverse element and their inner ends exerting forces on the opposite sides of the parallel swing arm and actuating arm; and normally holding them parallel to cause the swing arm to swing in unison with oscillations of the actuating arm.

3. In a limit switch, a main frame; a bearing on the frame; a switch shaft supported at an intermediate portion thereof on the bearing; a rocker on one end of the switch shaft; an operating arm oscillatably supported on the main frame; mechanisms operable by alternate movements of the operating arm to cause the rocker to rock in alternate directions with snap movements and correspondingly oscillate the switch shaft; a switch arm mounted on the other end of the switch shaft, connected thereto to oscillate therewith and having switch contacts carried on its free end to be moved to-and-fro thereby; spaced apart stationary contacts carried by the main frame engageable alternately by the arm-carried contacts; a pair of stationary abutments carried by the main frame; the switch arm having a portion engageable with the respective abutments to positively limit and stop the to-and-fro movement of the switch arm.

4. In a limit switch, a main frame; a bearing on the frame; a switch shaft supported at an intermediate portion thereof on the bearing; a rocker on one end of the switch shaft; an operating arm oscillatably supported on the main frame; mechanisms operable by alternate movements of the operating arm to cause the rocker to rock in alternate directions with snap movements and correspondingly oscillate the switch shaft; a switch arm mounted on the other end of the switch shaft, connected thereto to oscillate therewith and having switch contacts carried on its free end to be moved to-and-fro thereby; spaced apart stationary contacts carried by the main frame engageable alternately by the arm-carried contacts; a pair of stationary abutments carried by the main frame; the switch arm having a portion engageable with the respective abutments to positively limit and stop the to-and-fro movement of the switch arm, and accordingly, limit and stop the rocking of the rocker in alternate directions.

5. The switch described in claim 3 and in which the switch arm is detachably clutched to the switch shaft by a clutch pin projected through the said other end of the shaft, a bored hub on the switch arm telescoped over the shaft end and provided with a diametrical groove embracing the pin, and a screw, threaded into the end of the shaft, and holding the hub axially toward the pin.

6. The switch described in claim 3 and in which the said portion of the switch arm engageable with the abutments is in the form of a pin thereon projecting therefrom between the abutments.

7. In an electric switch construction, a main frame, a bearing on the frame; a main shaft on the bearing; an operating arm connected to the shaft to oscillate the shaft on the bearing upon alternate angular movements of the arm; a swing arm having oscillatory bearing on the shaft, and extending radially therefrom; mechanism transmitting oscillatory movements of the shaft to the swing arm to swing it in alternate directions; switch contacts operated by swing movements of the swing arm; stop means to limit and stop swing movements of the swing arm in each direction; the transmitting mechanism providing for over travel of the operating arm after stopping of swing movement in either direction and comprising; an actuating arm secured to the shaft and oscillatable therewith and extending therefrom radially parallel with the swing arm; a rod extending normally at right angles to the swing arm and actuating arm, and an intermediate portion thereof passing through respective openings in the arms; heads

on opposite ends of the rod; washers on opposite sides of the swing arm and actuating arm and overlapping both in contact therewith, and the rod going through the washer holes; a pair of preloaded coil compression springs surrounding the rod and each abutting at opposite ends upon one of the washers and one of the rod heads; the washers, subjected to the spring force, normally holding the swing arm and actuating arm radially parallel, to cause the swing arm to swing in unison with oscillations of the actuating arm; and, upon stopping of the swing arm by said stop means, continued over travel movement of the actuating arm then carrying a washer with it, causing the washer-abutting spring to be further compressed and to move the rod longitudinally and further compress the other spring causing the latter to act through the other washer and hold the swing arm firmly against said stop means.

8. The switch described in claim 1 and in which the oscillatory bearing of the swing arm on the shaft is provided by a fork on the swing arm having spaced legs, and eyes formed in the legs of the fork encircling the shaft; and the said actuating arm is secured to the shaft between the said eyes.

9. In an electric switch, a main metal base comprising a partition wall and side walls rising therefrom forming a cup-form housing; a one piece contact carrier device in the housing molded from insulating material and having a base wall supported on the partition wall; and ledges rising from opposite sides of the base wall; electric terminals mounted on the ledges and carrying a first pair of contact tips; shoulders rising from opposite sides of the base wall lower than the ledges; electric terminals mounted on the shoulders and continuing in conducting portions carrying a second pair of contact tips under the first pair; an oscillatable switch shaft extending through the parti-

tion wall; a switch arm having one end mounted on the shaft and extending therefrom between the opposite ledges and shoulders and carrying on its end bridging contacts for bridging the contacts of the respective pairs upon lateral movements of the switch arm.

10. The switch described in claim 9 and in which the shaft extends through an opening in the device base wall and the shaft and said switch arm end are embraced within the concave side of a concavo-convex barrier adjacent thereto, rising from the base wall.

11. The switch described in claim 10 and in which the convex side of the barrier is spaced from a wall of the housing and the housing wall has an opening opposite the barrier whereby conductors may be passed through the opening, around the sides of the barrier and connected to the terminals on the ledges and shoulders.

12. The switch described in claim 9 and in which confronting spaced abutments are formed on the carrier adjacent to the ledges and shoulders, and the switch arm has a pin thereon between the abutments engageable therewith to stop its lateral movements.

13. The switch as described in claim 9 and in which the mounting of the switch arm on the shaft comprises a bore in the end of the arm telescoped over the shaft end, and the head has an open groove embracing a transverse pin in the shaft, and is held to clutchingly and detachably engage the groove and pin by a screw in the end of the shaft.

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