Feb. 5, 1957 C. A. LANDIN 2,780,691

ELECTRIC SWITCH

Filed Feb. 9, 1955

FIG.1

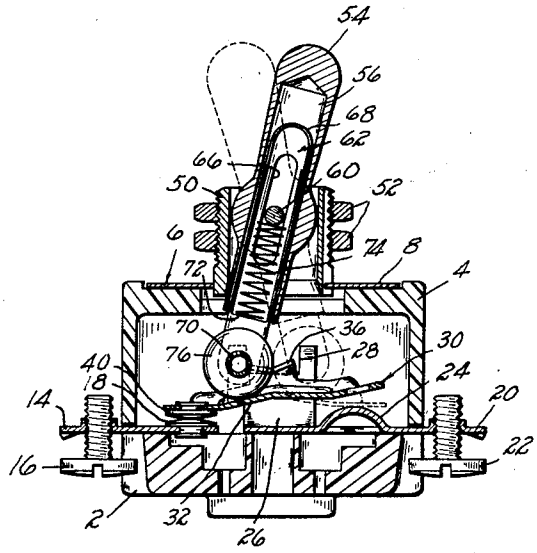
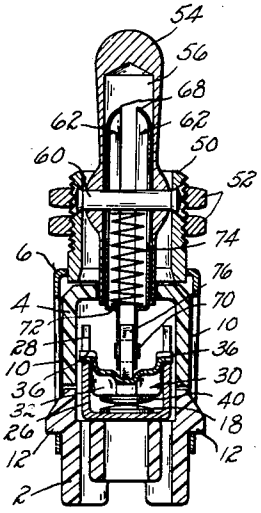


FIG.2



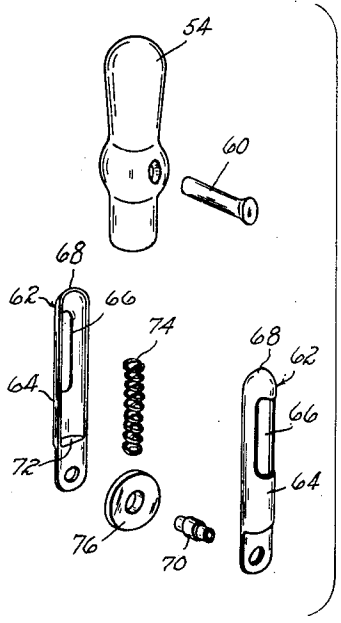


FIG.4

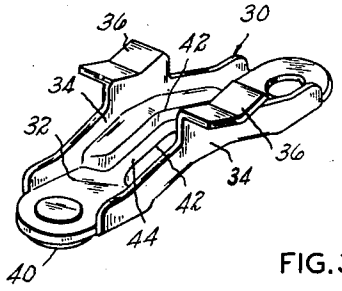


FIG.3

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ELECTRIC SWITCH

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7 Claims. (Cl. 200—67)

This invention relates to electrical toggle switches of the type having a movable contactor mounted for tilting or rocking movement between various switching positions.

One object of the invention is to provide such a toggle switch having an improved driving connection between the manual operating member and the tilting contactor which requires reduced operating force and operates with decreased friction and attendant reduction in wear.

Another object is to provide in such a toggle switch an operating mechanism of simplified construction which can be fabricated economically and is particularly suited for easy and rapid assembly.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set fortuh and the scope of the application of which will be indicated in the appended claims.

In the drawing:

Figure 1 is a longitudinal sectional view of an assembled toggle switch constructed in accordance with the present invention;

Figure 2 is a transverse sectional view of the toggle switch of Figure 1;

Figure 3 is an enlarged perspective view of the movable contactor element of the switch shown in Figure 1; and

Figure 4 is an exploded perspective view of the contactor-operating mechanism of the switch.

Referring to the drawing, and particularly Figure 1, a toggle switch constructed in accordance with the invention includes an insulating housing having a base 2 of molded plastic or the like, and a separate cover 4 of similar material which is fastened to the base by a clamp 6. The clamp has a central web 8 which seats in a recess in the top of the cover and has depending arms 10 which resiliently engage the undersides of projecting bosses 12 on the base so as to hold the cover and base securely together. Mounted on the upper surface of the base at one end thereof is an electrical terminal 14, one end of which projects from the housing and carries a binding screw 16, and the other end of which carries a switch contact 18. Secured at the other end of the base is another terminal member 20 which carries a binding screw 22 and has an upwardly struck portion forming a stop 24. Centrally disposed on the base is a channel-shaped support 26 having upsanding transversely spaced sides provided with rectangular notches 28 at their upper ends. While the channel-shaped support shown in the drawing is integral with the terminal member 20, the switch thus being arranged for single-throw operation, it will be understood by those skilled in the art that the support may be electrically separated from the terminal member 20 and a second switch contact provided on the terminal member for double-throw operation of the switch.

The contactor 30 is of sheet metal construction and includes a generally elongate body 32 having reinforcing side flanges 34 provided with centrally located outwardly bent wings or trunnions 36 which cradle the contactor in the notches 28 of the support for tilting movement about a transverse axis. Each trunnion is formed with two inclined flats intersecting in a shallow V-shape, the apices of the V's being transversely aligned and engaging the bottoms of the notches with line contact in the manner of a knife edge so as to afford the contactor two positions of stability in the support and permit the contactor to be tilted abruptly from one position to the other. As will be understood, the trunnions may be provided with a third flat stabilizing the contactor at an intermediate position for three-position operation of the switch. On one end of the contactor is a contact member 40 which in one of the stable positions of the contactor engages the fixed contact 18. The other end of the contactor engages stop 24 in the other stable position of the contactor, and may of course be provided with a second contact member when the switch is arranged for double-throw or three-position operation. The contactor body 32 has a slight hump midway between its ends and is formed with longitudinally extending spaced shoulders 42 between which is defined a longitudinally extending groove or track 44.

The top of the cover has a central opening in registry with which is mounted an upstanding sleeve or bushing 50 carried by the clamp 6. The sleeve is threaded on its outer surface to permit convenient attachment of the switch in an opening in a panel or the like, as by means of nuts 52. Extending through the bushing is an operating lever 54 having a longitudinal bore 56 opening opposite the contactor, and having a somewhat enlarged spherical portion intermediate its ends forming a thickened wall section through which extends a transverse pivot pin 60 on which the operating lever is mounted for pivotal movement. The pivot pin is disposed parallel to the axis of movement of the tilting contactor 30 and is secured at its ends in the sleeve, as by staking.

Slidably mounted in the bore 56 of the operating lever is a spring guide or casing consisting of a pair of transversely spaced longitudinally extending sheet metal arms 62 having opposed parti-cylindrical surfaces 64 provided with opposed longitudinal slots 66 through which the pivot pin extends. At their inner ends the arms have somewhat rounded portions 68 which curve toward each other and partially close the space between the arms. The outer ends of the arms project from the end of the bore opposite contactor 30 and are connected by a pin or stud 70 disposed with its axis parallel to the axis of movement of the contactor. At the outer ends of the parti-cylindrical surfaces the arms are formed with opposed transverse shoulders 72 facing into the bore. A coil compression spring 74 is disposed betwen the parti-cylindrical surfaces, and confined at one end by the shoulders 72 and at the other end by the pivot pin 60 so as to urge the spring guide in a direction outwardly of the bore 56 and toward the contactor. The free length of the spring 74 is such that the pivot pin 60 may be freely inserted through the slots at their inner ends without compressing the spring. Disposed between the outer ends of the arms and rotatable on the stud is an insulated cam roller or wheel 76 which makes rolling contact with the contactor body in groove 44.

In the operation of the switch, when the operating lever 54 is thrown from one of its extreme positions to the other the wheel 76 rolls along the groove 44. As the operating lever approaches its dead center position the spring guide is pushed further into bore 56, relative movement between the spring guide and pivot pin being afforded by slots 66. The pressure of the wheel against

the contactor produced by the compression spring 74 keeps the contactor stationary until the operating lever reaches dead center, and then as the wheel rolls over the crest of the hump on the contactor, the spring toggles the contactor abruptly to its next switching position, thereby minimizing arcing.

A switch constructed in accordance with the invention has many advantages. From an operational standpoint, the rolling engagement of the wheel 76 with the contactor permits the switch to be actuated with reduced friction or wear on the operating parts, and with the exercise of a minimum operating force. Moreover, with the arrangement described the spring guide may extend upwardly into the operating lever well beyond the pivot pin, the substantial length thereby afforded the spring guide providing a long bearing surface having a minimum of sliding friction and insuring against binding or sticking of the spring guide, even after protracted use of the switch. Furthermore, the engagement of the pivot pin 60 with the sides of the slots 66 prevents twisting of the upper end of the spring guide, while the complementary groove 44 in the contactor assists in maintaining the wheel 76 in proper alignment longitudinally of the contactor and prevents twisting of the wheel, thus minimizing friction and wear of the operating parts.

The switch also has several advantages from the standpoint of ease of assembly. The assembly may be conveniently accomplished by assembling the parts carried by the cover, separately assembling the parts carried by the base, and then joining the cover and base sections together. This procedure is facilitated by the fact that the two arms 62, the spring 74, the rotatable wheel 76, and the stud 70 can be conveniently put together as a subassembly, and when once joined by the stud, the arms will provide a cage for the spring and prevent it from falling out or becoming displaced during subsequent stages of the switch assembly. Since the pivot pin 60 may be freely accommodated at the inner ends of the slots 66 without placing the spring under compression, this sub-assembly may then be inserted in the operating lever bore 56 and the operating lever mounted in the sleeve 50 and secured by the pivot pin 60 without the inconvenience of compressing the spring. Moreover, when the pivot pin 60 is once inserted through the operating lever and the slots 66 in the spring guide and secured to the sleeve, it thereby serves to secure the spring guide within the operating lever and prevents it from inadvertently falling out when the assembled cover section is placed on top of the rest of the switch. It will thus be apparent that the assembly of a switch is substantially simplified and may be accomplished with attendant savings in time and expense and with reduced fatigue of personnel.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. In an electric switch having a housing, a contactor supported in the housing for rocking movement between a plurality of switching positions, and a lever for operating the contactor mounted on the housing for pivoting movement about an axis parallel to the axis of movement of the contactor, said lever having a longitudinal bore facing the contactor, a hollow tubular casing longitudinally slidable in said bore, a wheel rotatably mounted on the outer end of said casing for engaging the contactor, a track in the contactor perpendicular to the axis of movement thereof for receiving said wheel, a longitudinal coil compression spring urging said casing in one direction to move said wheel into engagement with said track, and means extending into the bore of the lever engageable with the casing to limit movement of the casing relative to the lever in said one direction.

2. In an electric switch having a housing, a contactor supported in the housing for rocking movement between a plurality of switching positions, and a lever for operating the contactor mounted on the housing for pivoting movement about an axis parallel to the axis of movement of the contactor, said lever having a longitudinal bore opening opposite said contactor, a spring guide slidable in said bore having transversely spaced longitudinal sides provided with opposed longitudinal slots, a transverse pin in said lever extending across said bore through said slots, a longitudinal coil compression spring disposed between the sides of the spring guide and engageable at one end with said transverse pin and at the other end with a portion of said spring guide for urging said spring guide outwardly of said bore, and a bearing member on the outer end of said spring guide engageable with the contactor.

3. In an electric switch, a housing having a support, a contactor mounted on the support for rocking movement between a plurality of switching positions, a pivot pin mounted on the housing spaced from the contactor and parallel to the axis of movement of the contactor, an operating lever pivotally mounted on the pivot pin and having a longitudinal bore traversed by said pivot pin and opening opposite said contactor, a spring guide slidable in said bore having transversely spaced side walls provided with opposed longitudinal slots through which said pivot pin extends, a longitudinal coil compression spring disposed between said side walls and engageable at one end with said pivot pin and at the other end with a portion of said spring guide for urging said spring guide outwardly of said bore, and a bearing member on the outer end of said spring guide engageable with the contactor.

4. In an electric switch having a housing provided with a support, a contactor mounted on the support for rocking movement between a plurality of switching positions, and an operating lever mounted on the housing for pivoting movement about an axis parallel to the axis of movement of the contactor, said lever having a longitudinal bore opening opposite said contactor, a spring guide slidable in said bore having transversely spaced longitudinal sides provided with opposed longitudinal slots, a transverse pin in said lever extending across said bore through said slots, a longitudinal coil compression spring disposed between the sides of the spring guide and engageable at one end with said transverse pin and at the other end with a portion of said spring guide for urging said spring guide outwardly of said bore, and a rotatable wheel on the outer end of said spring guide engageable with said contactor.

5. In an electric switch, a housing having a support, a contactor mounted on the support for rocking movement between a plurality of switching positions, a pivot pin mounted on the housing spaced from the contactor and parallel to the axis of movement of the contactor, an operating lever pivotally mounted on the pivot pin and having a longitudinal bore traversed by said pivot pin and opening opposite said contactor, a spring guide slidable in said bore having transversely spaced side walls provided with opposed longitudinal slots through which said pivot pin extends, a longitudinal coil compression spring disposed between said side walls and engageable at one end with said pivot pin and at the other end with a portion of said spring guide for urging said spring guide outwardly of said bore, a rotatable wheel on the outer end of said spring guide, and means forming a groove in the contactor perpendicular to the axis of movement thereof for receiving said wheel.

6. In an electric switch having a housing provided with a support, a contactor mounted on the support for rocking movement between a plurality of switching positions, and an operating lever mounted on the housing for pivoting movement about an axis spaced from the contactor and parallel to the axis of movement of the contactor, means forming a longitudinal bore in the operating lever, a spring guide slidably mounted in said longitudinal bore and extending from the end thereof, transversely spaced opposed parti-cylindrical surfaces on said spring guide having opposed longitudinal slots, a transverse pin in said lever extending across said bore through said slots, inwardly facing transverse shoulders on the spring guide spaced from said openings, a coil compression spring disposed between said parti-cylindrical surfaces and engageable at one end with said transverse pin and at the other end with said shoulders for urging said arms outwardly of said bore, and a rotatable wheel on the outer end of the spring guide engageable with the contactor.

7. In an electric switch, a housing, a contactor supported in the housing for tilting movement between a plurality of switching positions, means forming an elongate groove in said contactor perpendicular to the tilt

axis thereof, a pivot pin mounted on the housing spaced from the contactor and parallel to the axis of movement of the contactor, an operating lever pivotally mounted on said pin, said operating lever having a longitudinal bore opening opposite said contactor and traversed by said pivot pin, a pair of arms slidably mounted in said longitudinal bore and extending from the end thereof, opposed parti-cylindrical surfaces on said arms having longitudinal slots through which said pivot pin extends, transverse shoulders on said arms at the outer ends of said parti-cylindrical surfaces and facing into said bore, a coil compression spring disposed between said parti-cylindrical surfaces and engageable at one end with said pivot pin and at the other end with said shoulders for urging said arms outwardly of said bore, a stud parallel to said pivot pin extending between the outer ends of said arms, and a rotatable cam wheel on the stud in rolling engagement with the bottom of said groove in the contactor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,027,538	Krieger	Jan. 14, 1936
2,267,203	Krieger	Dec. 23, 1941