United States Patent [19]

Sorenson

[11] **3,711,663**

[45] **Jan. 16, 1973**

[54] **CENTER-OFF FLOATING CONTACT FOR ELECTRIC SWITCHES**

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[73] Assignee: **Carling Electric, Inc.,** West Hartford, Conn.

[22] Filed: **Aug. 13, 1971**

[21] Appl. No.: **171,558**

[52] **U.S. Cl.** ..... **200/67 G**

[51] **Int. Cl.** **H01h 13/28**

[58] **Field of Search** ..... 200/67 G, 68

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A free-floating contact lever for an electric switch wherein the switch actuator and the lever cooperate to stabilize said lever in a center-off position on the upper edge of a flat, vertical terminal yoke.

5 Claims, 13 Drawing Figures

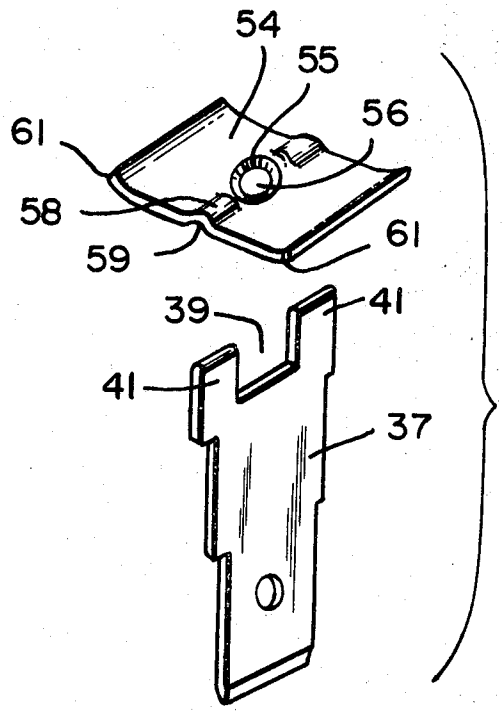


FIG. 4

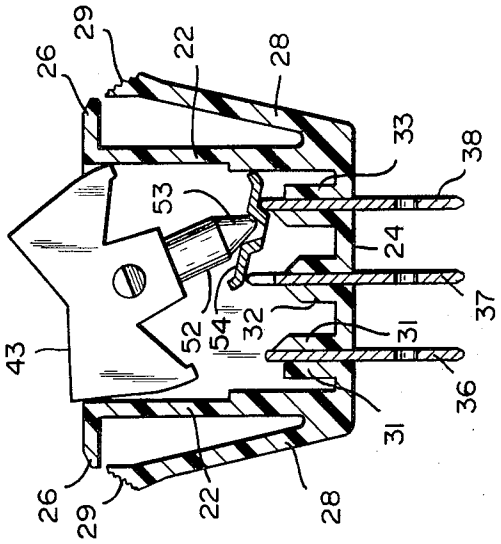


FIG. 2

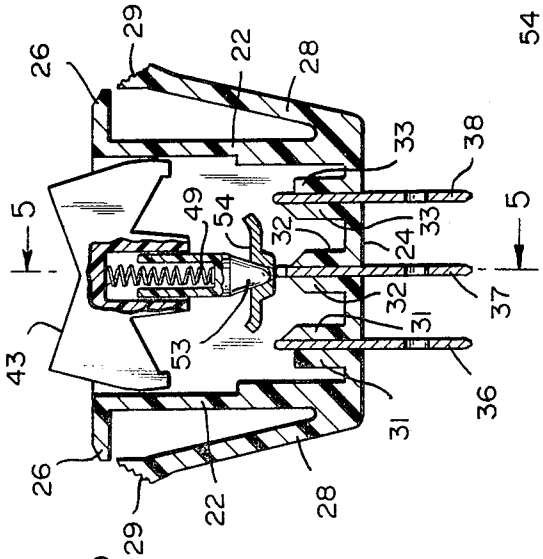


FIG. 3

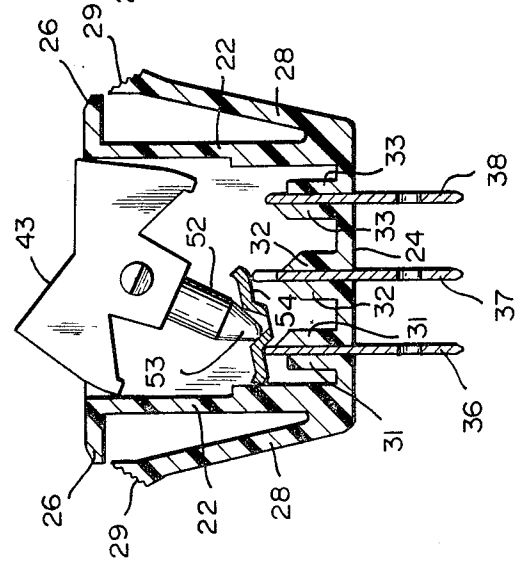


FIG. 6

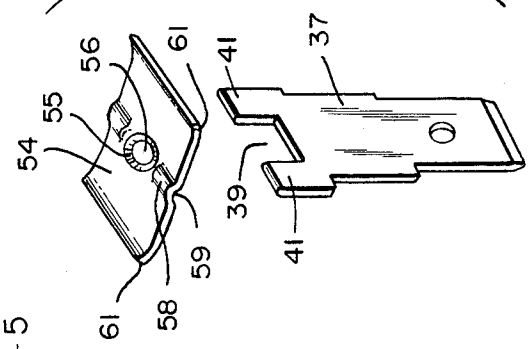
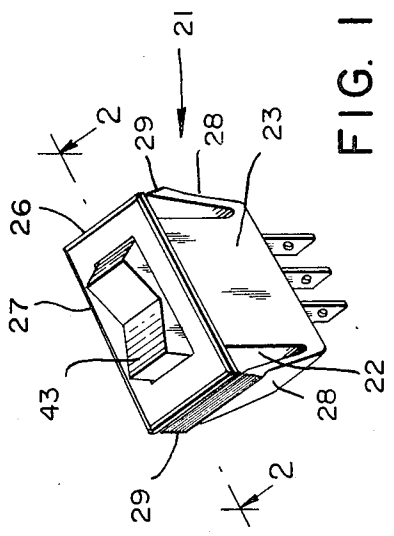


FIG. 1



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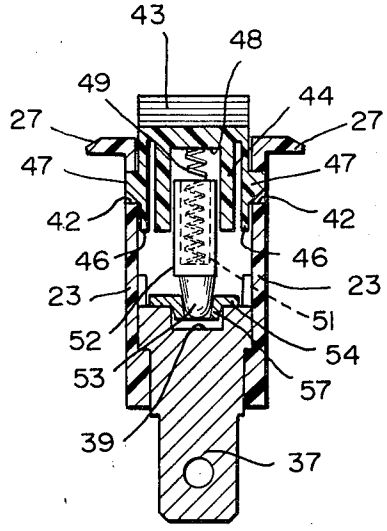
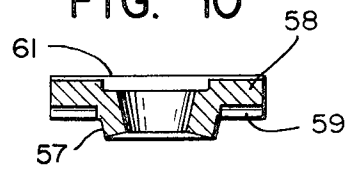


FIG. 5

FIG. 10



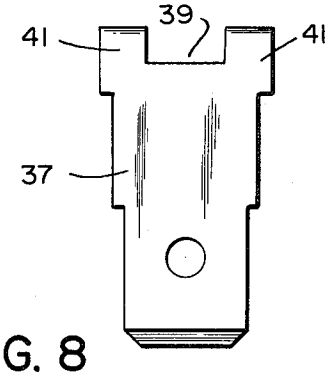


FIG. 8

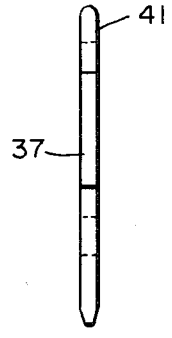


FIG. 9

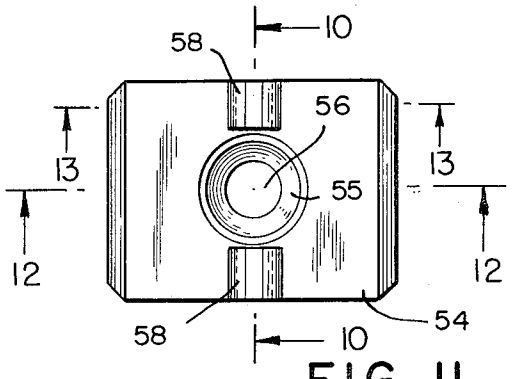


FIG. 11

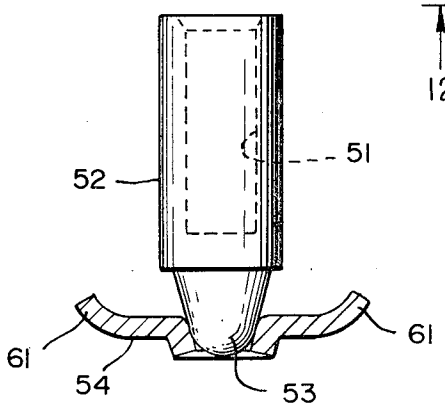


FIG. 7

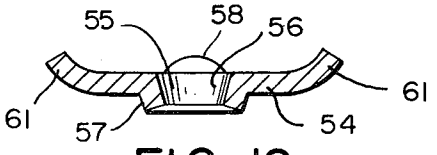


FIG. 12

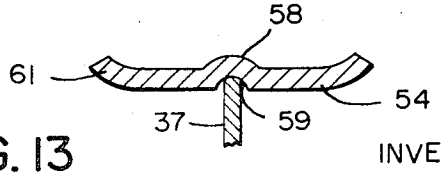


FIG. 13

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CENTER-OFF FLOATING CONTACT FOR ELECTRIC SWITCHES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electric switches and, more particularly, to an improved center-off toggle switch which comprises a free-floating contact lever which can be maintained in a center-off position on the upper edge of a flat vertical terminal yoke relative to which said lever is pivotally and slidably mounted.

2. Description of the Prior Art

The prior art comprises U.S. Pat. No. 3,158,704, in which a contact lever can be maintained in a center-off position in respect of an especially shaped yoke which has complete mating contours with the contoured lever so as to maintain it in the center-off position.

Although the structure disclosed in said United States patent performs fairly satisfactorily, it is less than optimally desirable when it is intended to produce electric switches on a mass production basis where material, fabrication, and assembly costs must be pared down to the lowest possible level. The yoke of said patent requires several fabricating steps, occupies considerable space within the switch case, and must be secured to the case by means of a rivet. It is well known in the simple switch industry that even fractional penny savings in various components are important in trying to capture sales in the market place.

SUMMARY OF THE INVENTION

The present invention comprises an improvement over said prior art patent whereby the contact terminals and the yoke terminal are made of substantially identical flat electrically conductive stock such as brass, or the like. Said contact terminals and yoke terminal fit into spaced slots in a molded switch case. The present invention was made in order to meet the unique problem of providing means for maintaining the sliding contact lever in a horizontal center-off position notwithstanding the fact that the upper part of the yoke terminal was simply the edge of a flat metallic piece of stock. The present invention comprises, therefore, a generally central aperture in the contact lever having an annular tapered wall which mates suitably with the tapered conical portion of the actuator nib whereby the cooperation therebetween the cooperation of suitable arcuate recesses in the lever with the upper edge of the yoke terminal, serve to maintain the contact lever in the horizontal center-off or open-circuit position when that function of the switch is desired or necessary

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the switch of the present invention;

FIG. 2 is an enlarged vertical central section view of the switch taken on line 2—2 of FIG. 1, some parts being in elevation, and some parts being omitted, said switch being shown in the open circuit position;

FIGS. 3 and 4 are similar to FIG. 2 showing the switch in two respective opposite closed circuit positions;

FIG. 5 is a vertical section view taken on line 5—5 of FIG. 2;

FIG. 6 is a greatly enlarged exploded perspective view of the central yoke terminal and contact lever that cooperates therewith;

FIG. 7 is a still further greatly enlarged view of a portion of the switch shown in FIG. 5, partly in section and partly in elevation;

FIG. 8 is an enlarged side view of the yoke terminal shown in FIG. 6;

FIG. 9 is an edge view of the yoke terminal shown in FIG. 8;

FIG. 10 is a section view taken on line 10—10 of FIG. 11;

FIG. 11 is a greatly enlarged plan view of the contact lever shown in FIGS. 2 – 7;

FIG. 12 is a section view taken on line 12—12 of FIG. 11; and

FIG. 13 is a section view taken on line 13—13 of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in detail, the switch of the present invention comprises a rectangular box-like case generally designated 21, having substantially parallel spaced apart end walls 22 and substantially parallel spaced apart side walls 23, said side walls and end walls joined integrally by means of a floor 24. Said floor and walls are molded integrally or otherwise made of a suitable insulating material such as nylon, Bakelite, or the like.

Adjacent the open top of case 21, end walls 22 have integrally formed, outwardly extending flanges 26 while side walls 23 have integrally formed, outwardly extending flanges 27, said flanges 26 and 27 forming a unitary structure which abuts a mounting plate or the like, not shown. Integrally formed at the lower end of each end wall 22 is an upwardly and outwardly extending flexible and resilient wing 28, the upper end portions of which are ridged at 29 to engage the rear surface of the aforementioned mounting plate to lock said switch case in position. It is understood that the rectangular aperture in the mounting plate which accommodates the switch case would be slightly larger than the bottom of said case whereby said wings would be urged inwardly during the mounting process until the point is reached where said wings snap into position beneath said mounting plate to lock the switch securely thereon. The ridges 29 serve adjustably to accommodate the assembly to the particular thickness of the mounting plate.

Integrally formed with floor 24 and extending upwardly into the interior of switch case 21 are space bosses 31, 32 and 33, each of said bosses having vertical slots respectively accommodating and securing therein electrically conductive contact terminal elements 36, 37 and 38. Those portions of terminals 36 and 38 extending below floor 24 are connectible to respective separate circuits that are to be controlled and operated by the switch. Central terminal 37 is connectible to a suitable source of electric power. While the top edges of respective terminals 36 and 38 may be horizontally flat on top, the top portion of terminal 37 is shaped in the form of a yoke having a central recess 39 bounded on both sides by upwardly extending shoulders 41.

At the upper central portion of each side wall 23 of case 21 is an aperture 42, both of said apertures being axially aligned with each other. See FIG. 5. Located within the open top of case 21 is a rocker switch button 43 made of insulating material such as nylon, Bakelite, or the like, said button having a central integrally formed, downwardly extending leg 44. Also integrally formed on button 43, on opposite sides thereof, are downwardly extending resilient wings 46, each of which has an outwardly extending, integrally formed pivot element 47 which is rotatably nested within a respective aperture 42 to retain button 43 in position and to permit its pivoting action relative to case 21.

Leg 44 has a central aperture 48 against the inner end of which one end of a spring 49 bears, the other end portion of said spring being maintained captive within recess 51 of a telescoping element 52, made of insulating material such as nylon, Bakelite, or the like. Element 52 is movable longitudinally against the action of spring 49 into recess 48 which normally urges element 52 downwardly. The lower end portion of element 52 has the shape of a round end conical nib 53 which cooperates with an electrically conductive contact lever 54 in a manner as will be described in detail hereinafter.

Contact lever 54, made of electrically conductive material such as brass or the like, may be generally rectangular in shape, and has a central circular aperture 55 whose annular wall 56 is tapered from a larger top diameter to a smaller bottom diameter. Nib 53 is urged by spring 49 into cooperation with aperture 55 whereby the pivoting action of button 43 and of nib 53 cause the actuation of contact lever 54. Should aperture 55 be formed by a punching tool or otherwise to cause the bottom portion of contact lever 54 surrounding said aperture to protrude downwardly in the form of a circular lip 57, said lip is freely movable through recess 39 of terminal element 37, said recess being sufficiently wide and deep to permit such action.

Contact lever 54 also has a pair of integrally formed, upwardly extending aligned arcuate bosses 58 on each side of aperture 56, the bottom surfaces of said bosses each forming aligned upwardly extending arcuate recesses 59 which cooperate with a top edge of a respective shoulder 41 on yoke terminal 37 when contact lever 54 is in a horizontal position, as illustrated in FIGS. 2 and 5, where the switch is in the center-off open circuit condition and where neither of the separate circuits connected to terminals 36 and 38 is electrically energized.

When contact lever 54 is in the open circuit center-off position as shown in FIGS. 2 and 5, the respective ends thereof are maintained spaced apart from the upper ends of contact terminals 36 and 38.

In some embodiments, where contact lever is sufficiently short, the top edges of terminals 36, 37 and 38, may be substantially at the same level and the ends of contact lever 54 will be spaced apart from respective terminals 36 and 38 when in the longitudinal open circuit position. It may be desirable, however, to provide that the upper edge of yoke terminal 37 be arrayed at a level slightly higher than that of the upper edges of terminals 36 and 38 when the length of contact lever 54 might be such as otherwise to impinge upon the upper edges of said contact terminals.

When actuator button 43 is pivotally tipped either to the left or to the right, as shown in FIGS. 3 and 4, nib 53 yieldably moves against a side portion of annular wall 55 to cause contact lever recesses 59 to become disengaged from the top edges of shoulders 41 of yoke terminal 37 whereby contact lever 54 is moved slidably into a position where it establishes an electrically conductive bridge between yoke terminal 37 and either contact terminal 36 (FIG. 3) or contact terminal 38 (FIG. 4).

In order to ensure that contact lever 54 will smoothly cooperate with the top edges of contact terminals 36 and 38, the ends of said lever are provided with integrally formed, upwardly curved respective lips 61, the bottom surfaces of which are readily able slidably to engage and make a desirable wiping contact with the respective upper edges of said contact terminals. Furthermore, since the top edges of contact terminals 36 and 38 are flat across without any recess, said contact terminals may also act as limiting devices for the abutment of lip 57 against said contact terminals whereby they serve as appropriate stop limits for the toggle action of actuator button 43. The flat yoke terminal 37 is arrayed perpendicularly or transverse to the longitudinal path of motion of contact lever 54. When switch button 43 is returned pivotally from either direction to its central position, as shown in FIG. 2, and contact lever 54 is moved thereby to the center of the switch case, yieldable pressure is exerted by nib 53 upon the moving contact lever whereby the tapered wall 55 of recess 56 is forced into mating relationship with the conical end of said nib. By this action, lever 54 becomes stabilized in a horizontal position on yoke terminal 37 whose upper edge becomes simultaneously nested within recesses 59. These recesses 59, mating with the yoke shoulders 41, provide a detent or stop action for the switch when actuated from either of the two on positions to the center-off position.

The annular wall 55 of recess 56 is tapered, generally, to conform with the conical slope of nib 53 whereby said nib fits snugly into and mates intimately with said aperture as shown in FIGS. 2, 5 and 7, when contact lever 54 is in the horizontal center-off position. The cooperation between nib 53 and wall 55 effectively maintains contact lever 54 in the horizontal position in conjunction with the cooperation between the upper edges of yoke terminal shoulders 41 with respective contact lever recesses 59. Thus, inexpensive fabrication of the switch is made possible by providing similar, as well as possibly identical, terminals 36, 37 and 38, thereby eliminating the fabrication of a complex riveted center yoke as was necessary in the prior art. By providing flat, metallic and substantially identical contact terminals 36, 37 and 38, the switch assembly is more easily and cheaply fabricated as can be seen from a visual inspection of FIGS. 2, 3 and 4.

Although the present invention has been described with reference to particular embodiments and examples, it will be apparent to those skilled in the art that variations and modifications can be substituted therefor without departing from the principles and true spirit of the invention. The "Abstract" given above is for the convenience of technical searchers and is not to be used for interpreting the scope of the invention or claims.

I claim:

1. An electric switch comprising a case, a pair of spaced contact terminals in said case, a yoke terminal located intermediate said contact terminals, said yoke terminal being made of a unitary, flat conductive metal, an electrically conductive movable contact lever cooperating with the top edge of said yoke terminal, said yoke terminal being arrayed transversely to the path of said lever, said contact lever being slidable relative to said yoke terminal in either direction for closing the circuit alternatively between either of said contact terminals and said yoke terminal, a generally central conical aperture in said contact lever, said aperture having an annular tapered wall, a downwardly extending recess in the top edge of said yoke terminal in the area of said lever aperture, a pair of laterally aligned arcuate recesses on the bottom of said contact lever, said arcuate recesses being arrayed on opposite sides of said central aperture and cooperating with the top edges of said yoke terminal bounding the recess therein, a pivotable actuator on said case, a spring biased conical nib on said actuator, the conical end of said nib being urged to mate intimately with said conical aperture and yieldably to maintain said lever in the horizontal open circuit center-off position relative to said yoke terminal when said arcuate recesses releasably engage the top edges of said yoke terminal.

2. A switch according to claim 1 wherein the top edge of said yoke terminal is at a level higher than the top edges of both of said contact terminals.

3. A switch according to claim 1 wherein said recess aperture is bounded by a downwardly extending annular lip.

4. A switch according to claim 3 and further comprising a recess in the top of said yoke terminal, said lip being movable freely through said recess when said contact lever is moved from one switching condition into another switching condition.

5. A switch according to claim 4 wherein said contact terminals are made of unitary flat conductive metal, each arrayed transversely to the path of motion of said contact lever, the top portion of either of said respective contact terminals being abutted by said lip when said lever establishes a closed circuit bridge therewith, said abutment serving as a limiting stop for said lever.

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