

United States Patent

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[54] CAN OPENER SWITCH

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 D, 166 BH, 52 R

[56]

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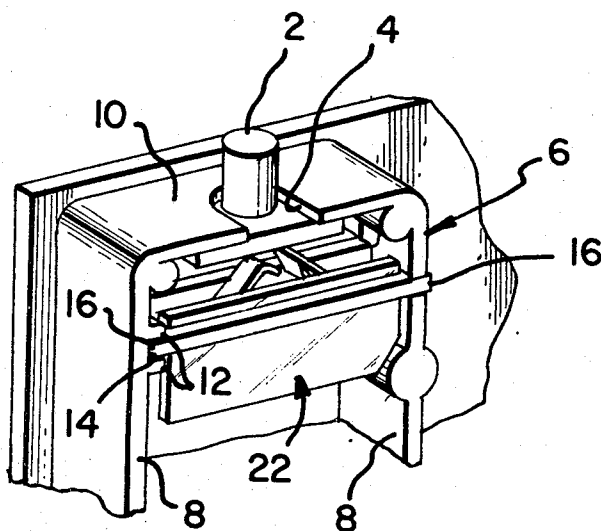
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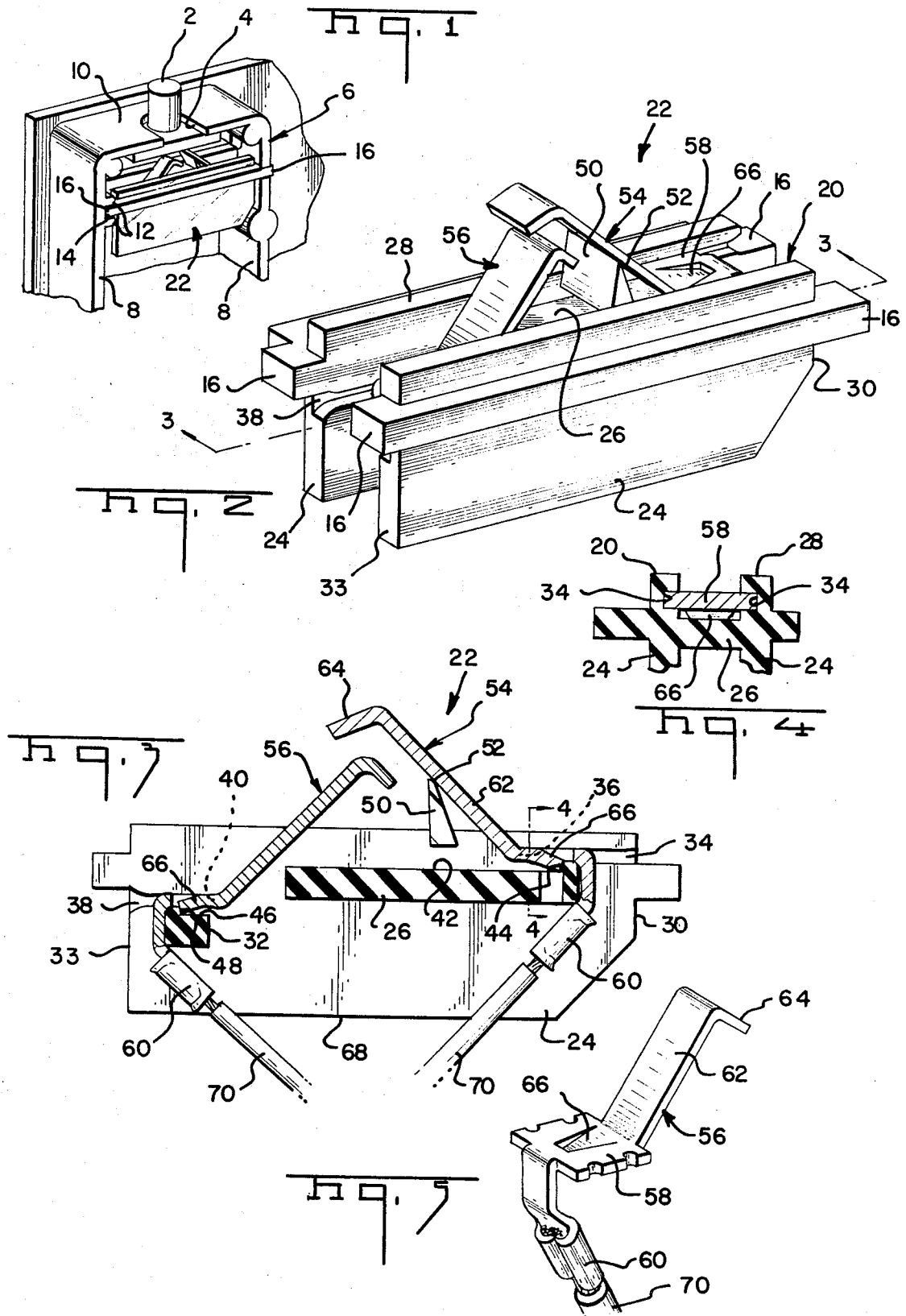
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ABSTRACT

A metal can opener switch housing has slotted, spaced apart side walls for slidably receiving a unitary switch frame of insulating material which, in turn, employs parallel, spaced apart walls. Offset switch terminal supports extend transversely between the walls and adjacent respective ends of the switch frame. First and second similarly configured switch terminals formed of flat strip stock have web portions on the supports and portions extending obliquely beyond one side of the frame and away from respective ends, defining contact ends which extend in opposite directions and are spaced apart due to the spacing of the supports. A leaf spring integral with the housing is engageable by the overlapping or outer terminal upon flexure towards the other side of the frame to provide a high force tending to open the switch.

11 Claims, 5 Drawing Figures





CAN OPENER SWITCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to normally open switches adapted for use under circumstances where a high closing force is present, and a high force within the switch tending to open the switch is required and more particularly to such a switch employed in an electrically operated can opener.

2. Description of the Prior Art

Electrically operated can openers, such as that illustrated in U. S. Pat. No. 3,315,352 to Scott issuing Apr. 25, 1967, may utilize a can to be opened or a lever to depress a plunger associated with a normally open switch, and to thereby initiate the electric motor drive action. The plunger formed of insulative material contacts the outermost of a pair of overlapping contact arms which are obliquely directed towards each other and overlap in the area of the center line of the axis of the moving plunger. The plunger is normally held in extended position, with the contacts open, due to the resiliency of the outermost contact arm. In turn, the ends of the arms opposite the contact ends are affixed to an insulative support member by rivets or the like with the electrical leads to the motor and power source being welded or soldered to respective arms.

The switch structure as just described, while operating satisfactorily, involves both constructional and operational difficulties. During assembly of the power operated can opener, difficulty is experienced in welding or soldering the leads to the can opener switch terminals. Additionally, the use of the inherent resiliency of one of the contact arms or terminals to maintain the switch contacts open and the plunger in extended position, permits overstress of the contact arm providing the necessary spring bias for the normally open switch and does not insure that the switch automatically opens subsequent to shearing the can lid from the can body. In order to insure opening of the switch, the switch itself must have a relatively high built-in opening force.

SUMMARY OF THE INVENTION

The present invention is directed to a relatively simple switch assembly consisting of three parts which employs a relatively high built-in opening force insuring automatic opening of the switch once the can lid is sheared from the can body where the switch is used in an electric can opener. In particular, the switch is adapted to be slid into a metallic housing with the exposed switch contacts maintaining an insulative push button pressed against a can or operating handle when the can is clamped between the cutting edge and the feed wheel in position for severing of the lid from the can body.

In particular, a unitary switch frame is formed of insulative material and incorporates parallel, spaced apart walls. Switch terminal support means cooperates with a pair of slots extending partially inwardly between the walls, from respective ends of the frame. First and second switch terminals formed of flat strip stock are provided with web portions whose edges are positioned within the slots with the inner ends of the slots acting as abutments limiting further insertion of the terminal web portions. The terminals have contact ends extending in opposite directions obliquely toward the center of the frame, and away from the ends and beyond one side of the frame, with the contact end of one of the terminals lying beyond the contact end of the other terminal and spaced therefrom. A leaf spring integral with the housing underlies the overlying terminal between the web portion and the contact end and upon flexure of the overlying terminal toward the other side of the frame provides a high force tending to open the switch.

Preferably, the surfaces of the switch terminal supports facing the contact ends of the terminals carry recesses defining abutment surfaces or shoulders facing the ends of the slots and a lance struck from the web portion in the direction of the terminal support snaps over the shoulder during slidable insertion of the terminal web portions within the slots to lock the terminals in place with their contact ends in spaced over-

lapping fashion. The inboard ends of the terminals preferably carry a wire crimp barrel portion allowing easy coupling to wire leads.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of an electrically powered can opener illustrating the improved, normally open switch of the present invention and its method of assembling the same relative to a metal can opener switch housing.

FIG. 2 is an enlarged, perspective view of the switch illustrated in FIG. 1.

FIG. 3 is a sectional, elevational view of the switch shown in FIG. 2 taken about line 3—3.

FIG. 4 is a sectional view of a portion of the switch of FIG. 3 taken about line 4—4.

FIG. 5 is a perspective view of one of the similarly configured, identically sized terminals of the switch illustrated in FIGS. 1-4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to the drawings, FIG. 1 illustrates a portion of an otherwise conventional electrically power-operated can opener which may utilize a can (not shown) pivoted about a feed wheel (not shown) to depress the plunger 2 which projects through an opening 4 within a rectangular metal can opener housing section 6; the housing section 6 being provided with spaced apart side walls 8 and an end wall 10. Projections 12 on the inside of the side walls 8 define oppositely facing slots 14 for receiving projected edges 16 from the ends of a switch frame 20 forming one of the three components of the normally open switch assembly 22. The switch frame 20 is formed of electrically insulating material and may be conventionally molded of plastic or the like to form a pair of longitudinally extending, laterally spaced side walls 24. Extending between the side walls 24 and integrally formed therewith is a first rectangular terminal support 26 which is proximate to one side 28 of the switch frame and adjacent to one end 30 of the frame while a second, vertically offset terminal support 32 is relatively remote from the one side 28 of the frame and proximate to the other end 32 of the frame. A first pair of parallel, oppositely facing slots or grooves 34 extend inwardly from the right hand end 30 of each of the frame walls 20 on the inner surfaces of the same, slots 34 extending being positioned just above the first terminal support 26 and extending some distance beyond the outboard end of the same. The inner end 36 of slot 34 defines a first stop, shoulder or abutment. On the opposite end 32 of the switch frame, both of the frame sides are further provided with slots 38 which extend some distance inwardly toward slots 34 and terminate beyond the outboard end of the second terminal support 32 to define a stop abutment or shoulder 40.

The first terminal support carries a recess 42 within the side of the same facing side 28 of switch frame wall 24, the recess 42 defining a second stop, abutment or shoulder 44 outboard of stop 36 and below the same. In like respect, the surface of the second terminal support 32 facing side 28 of the switch frame walls 24 is also recessed at 46 from its inboard end outwardly to form or define a second shoulder, abutment or stop 48 which faces abutment 40 of slot 38 and lies slightly below the same.

In addition to the first and second terminal supports which extend laterally between the spaced parallel walls 24 of the switch frame 20 and couple the same, an integral, flexible leaf spring 50, which is triangular in cross section and has a projecting tip 52, extends beyond the one side 28 of each switch frame wall 24, the leaf spring 50 being inclined slightly and positioned intermediate the ends of the first terminal support 26.

A principal aspect of the invention is directed to the identical similarly configured first and second switch terminals 54 and 56 respectively, which form the two additional elements to the three part switch assembly 22 of the present invention

to the unitary switch frame 20. In this respect, each of the terminals is formed of flat metal strip stock and is best seen in FIGS. 3 and 5, consists of a central web portion 58, a wire barrel crimp portion 60 and a flexible contact arm 62 terminating in a reverse right angle bent contact end 64. The web portion 58 is essentially rectangular in configuration, is flat and is of a width in excess of the lateral spacing between the walls 24 of the switch frame and on the order of the distance between the opposed pairs of grooves 34 and 38 within the side walls as best seen in FIG. 4. Thus, the web portion 58 is slid into the opposed grooves when the terminals 54 and 56 are assembled to the switch frame until one end of the web portion contacts the abutment defined by the ends 36 and 40, respectively of slots 34 and 38. The contact arms 62 for each of the terminals extend obliquely from the web portion in a direction away from the wire barrel crimp portion 60 which, during insertion, may in fact be in line with the web portion 58. Each of the terminals has a lance 66 struck from the web portion and in a direction away from the contact arm 62, such that the tip of the lance snaps over the respective second shoulder or abutment 44 and 48 respectively, for the first and second terminal supports 26 and 32, thus locking the terminals in position and preventing withdrawal from their respective slots after full insertion of the same to positions shown in FIG. 3.

It is noted in FIG. 3 that the oblique or inclined contact arm 62 for the first terminal 54 abuts edge 52 of the integral leaf spring 50 and further that the contact ends 64 of respective terminals 54 and 56 overlap each other but are spaced apart a distance determined by the vertical off-setting, in the illustrated embodiment, of the first and second terminal supports 26 and 32. The configuration and sizing of the terminals 54 and 56 may be identical, although in the illustrated embodiment, the contact end 64 of the outermost terminal 54 is not bent to the same degree as the innermost terminal 56. In all other respects, the terminals are identical and may, in fact, be so.

In the illustrated embodiment, it is therefore seen that each of the terminals is formed from flat strip stock and each terminal has a web portion in contact with the support with contact ends extending in opposite directions and obliquely towards the center of the frame and beyond the one side 28 of the frame side walls 24. After insertion of the terminals in terms of the web portions 58 within the opposed slots 34 and 38, the barrel crimp portions 60 may be bent to the position shown so as to extend obliquely in a direction toward the other side 68 of the switch frame, giving the terminal the general V-shaped configuration seen best in FIG. 3 subsequent to assembly. Crimping of the wire barrel crimp portions 60 to the lead wires 70 may be made prior to or subsequent to bending of the wire barrel crimp portion 58 to the inclined positions illustrated. Of course, depending upon the environment of use, the wire barrel crimp portions may extend parallel to, at right angles to, or in an inclined position to the right or left with respect to the web portions 58 which act, in conjunction with lance 66, shoulders or abutments 36, 40, 44 and 48 and slots 34 and 38 to properly locate and maintain the terminals immovable with respect to the switch frame, with the exception of the flexing contact arm 62 of each terminal. The integral, flexible plastic leaf spring 50 provides a relatively high built-in opening force tending to maintain the contacts open for respective switch terminals and insures that the switch is automatically opened in response to movement of the can or of a pivoted actuating arm or other means (not shown) acting on the push button 2 to effect initial closing of the switch contacts. The presence of the integral leaf spring insures a high opening force without reliance on the resiliency of the contact arms 62 without compromising the number of parts required to form the switch assembly of the present invention. Importantly, terminals 54 and 56 are almost identical to each other in the illustrated embodiment and, in fact, may be, but regardless, both terminals can be produced from the same die and only a final stage forming tool change is necessary to produce the slight variance in configurations for the contact

ends 64 of the respective terminals. Integral wire barrel crimp portions 60 permit crimping of one of the contacts to the motor lead and the second contact to a power cord lead in a simplified manner, while the snap-in feature of mounting the contacts to the insulating switch frame further reduces time in the assembly of the switch in the completion of the switch assembly. The crimp snap-in of the contacts eliminates the time-consuming welding of the prior art, with the locking lance 66 providing positive locking of the contacts into the housing and prevent inadvertent removal of the same. Contact anti-overstress is inherent due to the high restoring force of the integral leaf spring 50 and the fact that the position that it occupies prevents oversteering of either switch contact arm 62. Insulating of the crimp contacts is not required in the present assembly because of the nature of the lock-in coupling of the terminals to the insulating housing and manual bending of the wire barrel crimp area after insertion to positions within the cavity defined by the lower side walls 24 of the insulated frame provide the required insulation of the barrel wire crimp portions. The switch assembly is self-mounted since the projection 16 permits sliding of this unit within the metal frame housing 6 of the power-operated can opener or in a similar housing employed in other environmental uses.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein, are intended as merely illustrative and not as restrictive of the invention.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

What is claimed is:

1. A normally open switch adapted for use under circumstances where a high closing force is present and a high force within the switch tending to open the switch is required, said switch comprising:

a switch frame of insulating material having parallel, spaced apart walls,

switch terminal support means extending transversely between said walls and adjacent respective ends of said frame,

first and second terminals, each of said terminals being formed from flat strip stock, each terminal having a web portion in contact with said support means and having contact arms extending in opposite oblique directions toward the center of said frame with the contact end of one of said terminals lying normally beyond the contact end of the other terminal in a direction away from said one side of said frame, and

spring means in the form of a leaf spring integral with said housing, said spring means being engageable by said terminal whose contact end lies beyond the contact end of said other terminal upon flexure thereof toward the other side of said frame to thereby provide a high force tending to open said switch.

2. The switch as claimed in claim 1, wherein the spaced apart walls carry opposed, parallel, longitudinal grooves adjacent said support means and said web portions of said switch terminals are wider than the distance between said spaced apart walls such that the edges of said terminal web portions are received within said grooves, to locate the same and prevent displacement of said terminals in the direction of the applied spring force.

3. The switch as claimed in claim 1, wherein said support means constitute first and second switch terminal supports, said first support being proximate to said one side of said frame and adjacent to one end thereof, and said second support being relatively remote from said one side of said frame and proximate to the other end thereof, and said terminals are

generally identical in size and configuration such that the contact end of said first terminal extends beyond the contact end of said second terminal a distance determined principally by the spacing between the offset longitudinal axes of said terminal supports.

4. The switch as claimed in claim 2, wherein said support means constitute first and second switch terminal supports, said first support being proximate to said one side of said frame and adjacent to one end thereof, and said second support being relatively remote from said one side of said frame and proximate to the other end thereof, and said terminals are generally identical in size and configuration such that the contact end of said first terminal extends beyond the contact end of said second terminal a distance determined principally by the spacing between the offset longitudinal axes of said terminal supports.

5. The switch as claimed in claim 3, wherein inboard ends of said terminal supports proximate to the ends of said switch frame and the ends of said grooves define shoulders limiting longitudinal movement of said terminal web portions with said grooves, and said web portions further include lances struck from the same and extending obliquely therefrom to contact said terminal support shoulders.

6. The switch as claimed in claim 4, wherein inboard ends of said terminal supports proximate to the ends of said switch frame and the ends of said grooves define shoulders limiting longitudinal movement of said terminal web portions with said grooves, and said web portions further include lances struck from the same and extending obliquely therefrom to contact said terminal support shoulders.

7. The switch as claimed in claim 5, wherein said first and second switch terminal supports have recessed surfaces facing said contact ends of said switch terminals carried thereby to form said respective shoulders.

8. The switch as claimed in claim 6, wherein said first and second switch terminal supports have recessed surfaces facing said contact ends of said switch terminals carried thereby to form said respective shoulders.

9. The switch as claimed in claim 5, wherein each switch terminal further includes an integral wire barrel crimp portion

which extends away from its terminal support, obliquely toward the other side of said switch frame and within said spaced apart walls and inboard of said other side of said frame walls to insure insulation of the exposed wires crimped thereto.

10. The switch as claimed in claim 6, wherein each switch terminal further includes an integral wire barrel crimp portion which extends away from its terminal support, obliquely toward the other side of said switch frame and within said spaced apart walls and inboard of said other side of said frame walls to insure insulation of the exposed wires crimped thereto.

11. A normally open switch adapted for use under circumstances where a high closing force is present and a high force in the switch tending to open the switch is required, said switch comprising:

a switch frame of insulating material having parallel spaced apart walls,

first and second switch terminal supports extending between said walls, said first support being proximate to one side of said frame and adjacent to one end thereof, said second support being relatively remote from said one side of said frame and proximate to the other end thereof, first and second switch terminals, each of said terminals being formed from flat strip stock, said first terminal having a web portion on said first support and extending obliquely beyond said one side and away from said one end, said second terminal having a web on said second support and extending beyond said one side and away from said other end of said frame,

said terminals having contact ends extending in opposite directions, said contact end of said first terminal being normally positioned laterally beyond said contact end of said second terminal, and
spring means in the form of a leaf spring integral with said housing, said spring means being engageable by said first terminal upon flexure thereof towards said other side thereby to provide a high force tending to open said switch.

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