

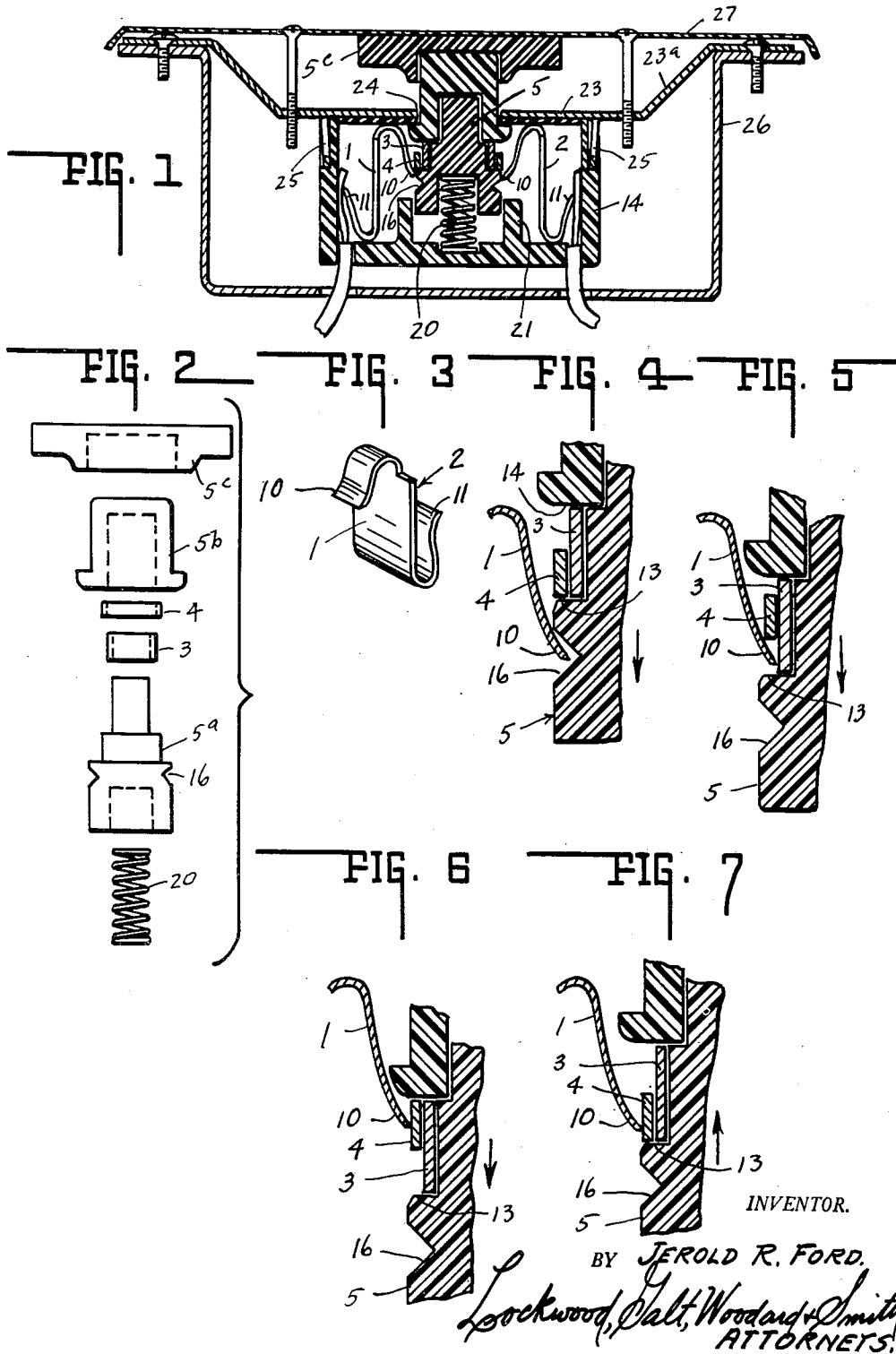
July 2, 1957

J. R. FORD

2,798,128

ELECTRIC SWITCH

Filed July 29, 1955



1

2,798,128

ELECTRIC SWITCH

Jerrold R. Ford, Indianapolis, Ind.

Application July 29, 1955, Serial No. 525,274

2 Claims. (Cl. 200—77)

This invention relates to electrical switches and is particularly directed to the mechanism of a push-button for alternately opening and closing an electrical circuit.

In lighter weight switches for household use as well as for motor starters it is common to employ spring actuated over-center devices to obtain the desired snap action. The wall mounted toggle switch, which is a well known example, requires movement of a lever to either of two positions to effect the on-and-off circuit operations. There are advantages to the push type over the lever operated toggle, but unfortunately the commercially available push button operated switch is elaborate in construction and expensive to manufacture and are usually limited to heavy current or industrial installations.

The object of this invention is an inexpensive push-button switch.

More specifically, the object of this invention is a switch which will both open and close an electrical circuit by the single motion of a depressible spring-return button. That is, the switch of this invention will alternately open and close in response to successive pressures on the button of the switch.

Other objects and features of this invention will become apparent by referring to the physical embodiment described in the following specification and shown in the accompanying drawings in which:

Fig. 1 is a longitudinal sectional view of said one embodiment,

Fig. 2 is an exploded view of the push button mechanism of Fig. 1,

Fig. 3 is a perspective view of one spring contact adapted to the switch of Fig. 1; and

Figs. 4, 5, 6 and 7 are diagrams of successive operating positions of the contacts and push button mechanism of the switch of Fig. 1.

The switch in Figure 1 is adapted to make and break galvanic electrical contact between metal elements 1 and 2 through metal elements 3 and/or 4 of the plunger 5 disposed therebetween and reciprocable up and down between the elements 1 and 2. Contact elements 1 and 2, according to an important feature of this invention, are leaf springs of phosphor bronze or other springy metal having good electrical conductivity. The leaves are formed into a Z-shape and are stressed during assembly so that the ends or tips 10 and 11 of the Z resiliently press outwardly. The tip 11 bears against the end wall of box 14, the other tip 10 bearing against the plunger 5. The sheet metal stock of the Z-contactors are of such width as to slide easily between the side walls of the box 14 to thus hold the contactors in upstanding position.

The plunger 5 is shown to be round in cross section in the specific embodiment illustrated although it could be rectangular, if desired. A sleeve 21 is provided at the bottom of the box to guide the plunger, the sleeve conveniently being cast integrally with the box. The outer surface of the plunger has a detent or groove 16 into which spring tip 10 is pressed to yieldably hold the plunger in its upper position shown.

2

When the plunger is pushed downwardly against spring 20, spring tips 10 drag upwardly out of the detent 16 and snap into contact with metal plate 3. In the case where the plunger is round in cross section, metal plate 3 assumes the form of a short band or cylinder. Thus, the circuit may be closed between the tips 10 of leaves 1 and 2 through cylinder 3. If desired, the area of contact between the tips and the cylinder 3 may be increased by shaping the tips to wrap around the cylinder.

According to an important feature of this invention, the surfaces of plate 3 is offset inwardly from the surface of the plunger so that a square cornered step 13 is present between the two surfaces. This means that the spring tip will snap over the edge of the step against plate 3 and will latch the plunger against movement in one direction. At the opposite or upper end of the plate 3 is a square shouldered stop 14, and slidably between said step and stop on the cylinder 3 is the ring 4. Ring 4 is of light-weight metal, has no spring load and will slide freely on cylinder 3 ahead of the spring tip 10. When, however, the ring moves against the stop 14 further relative travel between the spring tip and cylinder will stop and will force the spring tip outwardly and onto the outer surface of the ring. If, now, the direction of travel reverses, as when the push button is released, the ring is carried along by the spring tip until the ring engages the offset step at the other end of the cylinder, whereupon the spring tip slides from the ring over the plunger and hence into the detent. It is contemplated that the outside diameter of the ring is equal to or slightly greater than the diameter of the plunger. The plunger may be tapered or relieved slightly at the edge of the step so that the tip will not catch on the step as the tip moves downwardly and off from the ring.

The four principal positions of the switch mechanism of this invention are shown in Figures 4, 5, 6 and 7. In Figure 4 the spring tip stands in the detent and the circuit is open. When the push button is first depressed and released, the spring tip rides out of the detent and into latching engagement with the plunger above the offset, as shown in Fig. 5, pushing the ring 4 ahead of the tip. The circuit is now closed and remains closed until the button is pressed the second time. When the button is pressed the second time, the spring rides up and onto the ring as shown in Figure 6, so that when the button is released the plunger travels upwardly, Fig. 7, and the spring tip slides from the ring onto the plunger and hence into the detent. It follows that one round trip of the button is required to close the circuit and that a second round trip of the button is required to open the circuit.

The insulating parts of the switch of this invention are conveniently fabricated from thermoplastic-type materials. All of the moving parts may be round as suggested in Figure 2 so that the dies for molding the parts are quite inexpensive to manufacture. The box containing the switch assembly may likewise be molded of thermoplastic materials and is preferably integrally cast with an upstanding sleeve collar 21 for guiding the plunger mechanism. The plunger assembly may advantageously comprise a series of round castings 5a, 5b, and 5c progressively decreasing drafts as shown in Figure 2a for easy casting. The cylinder 3 and ring 4 may be dropped over the small end of part 5a and parts 5a and 5b then cemented or welded together. This assembly with spring 20 is lowered into the collar 21 and pushed down to tension the spring 20. The assembly is finally locked in place by lowering the metal cover plate 23 on the box. The central opening 24 in the cover plate, stamped out to receive the button, is aligned with sleeve 21. The cover plate is clamped to the box as by knock-out ears 25 from the metal of the plate. From the cover plate stamping may

3

be formed extensions as shown for attachment to commercial-type receptacle boxes 26. Preferably, these extensions have offset bends as at 23a to place the top of push button 5c substantially flush with the top of the receptacle box.

A diaphragm 27 of the plastic or thin sheet metal may be laid across the box to seal the box and to clear the top of the button. If desired, the upper end piece 5c of the button may be broadened to underlay a large proportion of the diaphragm. Light pressure anywhere in the central area of the diaphragm is sufficient to actuate the push button mechanism just described. The diaphragm comprises an effective dust seal for the entire box and switch assembly inasmuch as the usual hole for a toggle has been eliminated.

It is to be noted that the Z-shaped spring clips 1 and 2 provide easy connection to the stripped end of wire conductors to the switch. It is merely necessary to pass the stripped end forcibly through holes in the bottom corners of the box and under the tips of the springs. The pressure of the clip on the conductor causes the clip to dig into the wire and prevent its withdrawal. It will appear that a large number of conductors may, if desired, be hooked side-by-side under the tip 11 of the spring. A series of holes may be provided in the bottom corner of the box beneath the tip 11.

The switch of this invention will both open and close an electrical circuit by the single motion of a depressible button so that the switch will alternately open and close in response to successive pressures on the button of the

4

switch. Modifications may be made in the details of construction of the switch of this invention without departing from the spirit of the invention as defined in the following claims.

5 What is claimed is:

1. An electrical switch comprising a reciprocable carrier of insulating material, a metal plate offset into the carrier to provide a step of predetermined height, a metal leaf inclined at an angle to the metal plate and adapted to catch upon said step in one direction of relative travel of the leaf and carrier; and means to release the leaf in said one direction of travel comprising a metal slide member on the plate of the approximate height of said step and adapted to ride under and lift said leaf and to discharge said leaf onto the insulated portion of the carrier as the carrier reciprocates.

2. An off-on electrical switch comprising a reciprocable plunger, a metal leaf with an end edge in spring biased contact with the plunger and inclined at an acute angle to the direction of travel of the plunger, an offset in the surface of the plunger to catch said end edge of the leaf and prevent travel in one direction; and means to unlatch the leaf and plunger comprising a metal member freely slidable on the plunger and adapted to ride under the leaf and lift said edge above said offset.

References Cited in the file of this patent

UNITED STATES PATENTS

30 2,526,061	Batcheller	Oct. 17, 1950
2,626,334	Koenig	Jan. 20, 1953