

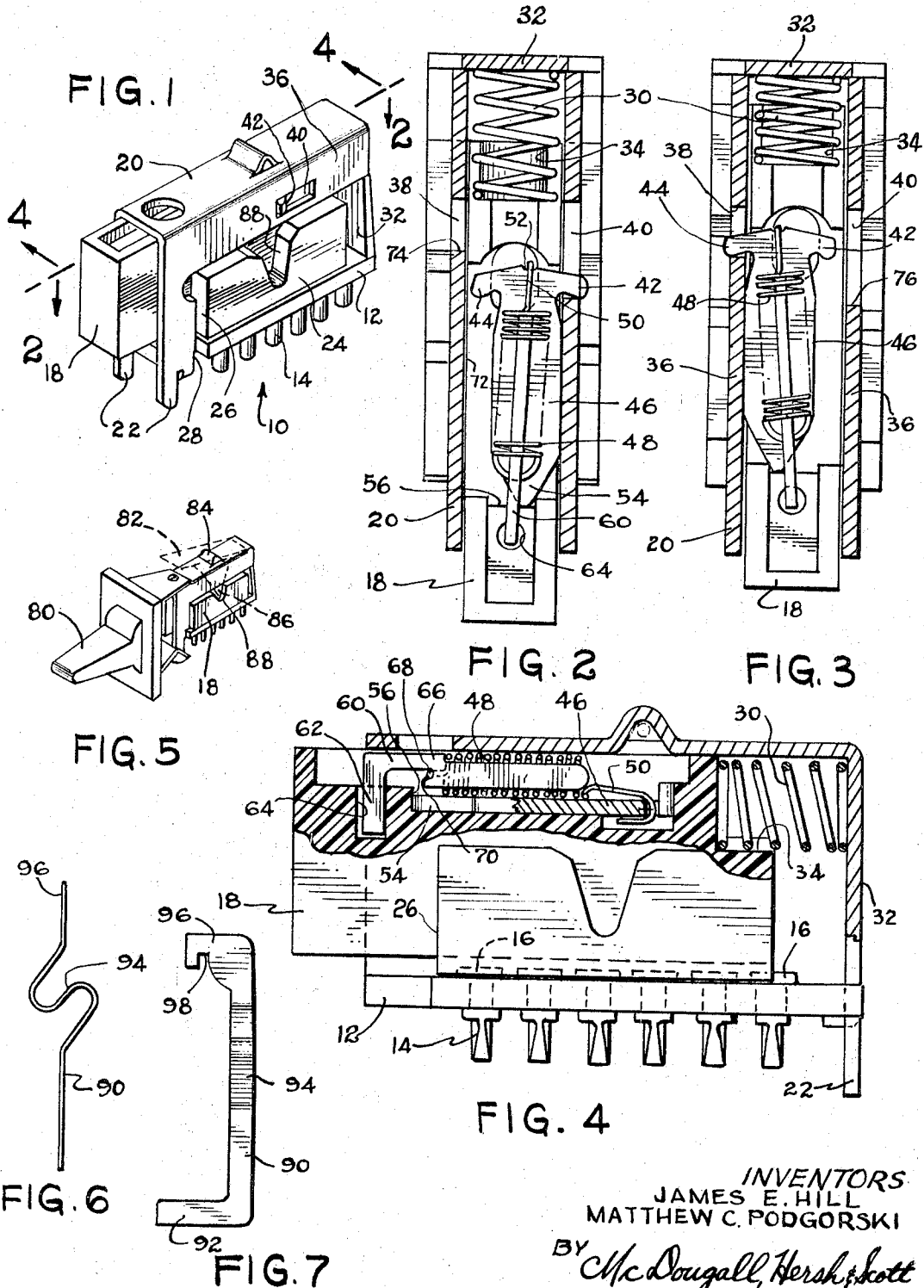
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SPRING OPERATED SWITCH HAVING LATCHING MEANS

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SPRING OPERATED SWITCH HAVING LATCHING MEANS

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This invention relates to a switch construction which is characterized by an improved operating structure. The invention is particularly concerned with a miniature switch construction which is adapted to be operated by a spring mechanism whereby an extremely reliable operation including a minimum of parts can be provided.

A wide variety of switch construction designs have been proposed in recent years. Such designs have resulted from the desire for smaller and smaller switches whereby the constructions in which the switches are employed can be maintained within certain size limits. The rapid increase in the use of electrical systems in all fields has greatly increased the number of switches which must be utilized in various constructions thereby providing a further reason for making switches as small as possible.

When extremely small switches are employed, many problems arise with regard to the durability of the switching mechanisms. The small size of the components employed results in a decrease in the strength of the components, and such components are more susceptible to damage by reason of mechanical and electrical conditions to which the components are subjected. Durability of switches is often most important because of the necessity for replacing switches which have failed. Thus, individual switches are usually not particularly expensive in relation to the cost of units with which they are associated. However, the cost of replacement can be extremely high because of labor charges, particularly where the nature of the switches and their associated constructions is such that time consuming dismantling operations are required.

Durability of switches is also quite important from the standpoint of the operational reliability of equipment with which the switches are associated. If switches must be replaced at a relatively high rate, it follows that downtime for the equipment involved will be relatively great. Again, the costs involved are not directly related to the costs of the individual switches.

It is an object of the instant invention to provide an improved switch construction which includes a novel operating arrangement whereby the construction is characterized by highly satisfactory durability.

It is a more particular object of this invention to provide an improved switch construction which includes operating mechanisms of a relatively simple character whereby the switches can be economically produced to maintain the cost of individual switches at a relatively low level.

It is a still further object of this invention to provide switch constructions of the type described which are extremely compact in size whereby the switches can be readily employed in equipment which necessitates the use of miniature components.

It is an additional object of this invention to provide a switch construction of the type described which can be easily associated with virtually all types of equipment, which is characterized by operating elements which permit a variety of methods for actuation of the switches, and which can ordinarily be replaced at the end of their useful life without undue costs.

These and other objects of this invention will appear hereinafter and for purposes of illustration, but not of limitation, specific embodiments of this invention are shown in the accompanying drawing in which:

FIGURE 1 comprises a perspective view of a switch construction characterized by the features of this invention;

FIGURE 2 is an enlarged horizontal sectional view taken about the line 2-2 of FIGURE 1 and illustrating the switch in one position;

FIGURE 3 is a horizontal sectional view of the switch construction illustrating the switch in a second position;

FIGURE 4 is an enlarged vertical sectional view of the switch construction taken about the line 4-4 of FIGURE 1;

FIGURE 5 is a perspective view of the switch construction illustrating alternative means for operation thereof;

FIGURE 6 is a plan view of an alternative spring member adapted to be employed in the construction of this invention; and,

FIGURE 7 is a side elevation of the spring member of FIGURE 6.

The instant invention generally relates to a switch construction which comprises a plurality of stationary contacts formed in an insulating base and including a holder for supporting sliding contacts. The holder operates in response to actuating mechanisms which serve to move the holder over the base for disposing the sliding contacts in at least first and second positions with respect to the stationary contacts.

The invention is particularly directed to improved means for releasably retaining the holder in position with respect to the stationary contacts. The mechanism employed comprises a locking means including a latch member carrying latching fingers. Means are provided in the switch constructions for engagement by the fingers with the operation involving alternative engagement of the fingers depending upon the switch position desired. A highly important feature of the invention involves the use of an over center spring means which is attached to the latch member, and which moves the latch member back and forth between alternative positions in alternating fashion.

The switch construction 10 shown in FIGURES 1 through 4 comprises an insulating base member 12 carrying a plurality of pins 14 serving as stationary contacts. It will be noted that the pins 14 include heads 16 disposed on the top of the insulating base for contact by sliding contacts (not shown) carried by the holder 18. Reference is made to applicants' copending application Ser. No. 439,009, filed Mar. 11, 1965, and entitled, "Switch Constructions," for a more detailed representation of a suitable sliding contact arrangement.

The holder 18 is slideably disposed within a casing 20. This casing includes downwardly extending legs 22 which are adapted to be bent over for securing the casing in place. The holder 18 includes outwardly extending side portions 24, and these side portions define shoulders 26 which engage 28 of the casing 20. This engagement limits the outward movement of the holder 18 with respect to the casing. A spring 30 is provided with one end engaging the back wall 32 of the casing, with the other end being seated in a recess 34 defined by the holder 18. The spring 30 normally urges the holder into engagement with the edges 28 of the casing.

The side walls 36 of the casing define slots 38 and 40, respectively. These slots are adapted to receive fingers 42 and 44 which are formed in one end of a latch member 46. As shown in FIGURE 2, the finger 42 is received in the slot 40 when the holder 18 is in one position relative to the casing 20. The finger 44 is received by the slot 38 in a second position of the holder.

The latch member 46 is held on the top surface of the holder 18 by means of a spring 48. The loop 50 defined

3

by this spring is fitted over the end of the latch member, and a groove 52 is defined in this end to retain the loop 50 in a constant position relative thereto. The other end 54 of the latch member is pointed, and this end bears against a shoulder 56 defined by the holder 18.

An L-shaped element 60 is also positioned on the holder 18. A leg 62 of this element is received within a bore 64 defined by the holder. The other leg 66 of the element serves as a supporting member for the spring 48. It will be noted that the end 68 of the spring is received within a groove 70 defined by the element 60 to hold the spring in position relative thereto.

In one method for operating the switch 10, the operator pushes on the exposed end of the holder 18. As will become apparent, the described switch construction is of the push-push variety in the sense that it can be moved to each of its positions by pushing in the same direction, the respective positions switching after each push.

When the switch is in the condition shown in FIGURE 2, the finger 42 is held in the slot 40. The end 54 of the latch member 46 is located at one side of the shoulder 56, this end being displaced from the central axis of the spring 48. When the holder is pushed forward, the finger 42 is released and the finger 44 will shift and ride on the surface 72 until reaching the slot 38. At this point, the action of the spring 48 will cause the latch member 46 to pivot about the point of contact of the end 54 with the shoulder 56. Accordingly, the finger 44 will move into the slot 38.

When the pushing pressure is released, force will be applied to the finger 44 by the edge 74 of the slot 38. A lever action is thus imparted to the latch member 46 whereby the latch member is shifted to the position shown in FIGURE 3. The latch axis is now on the opposite side of the spring axis and, therefore, the tendency of the spring is to pivot the latch member in the opposite direction. However, since the finger 44 is held by the slot 38, such pivoting action will not occur.

A second push on the holder 18 will move the latch member forward thereby releasing the finger 44 with respect to the slot 38. The spring action then causes the end 54 of the latch member to pivot about its point of contact with the shoulder 56 whereby the finger 42 will move into the slot 40. When pressure is released, the action of spring 30 will force the holder rearwardly whereby the finger 42 will engage the edge 76 of the slot 40. This engagement pivots the latch member 46 back to the position shown in FIGURE 2. Obviously the described cycle can be repeated indefinitely whereby continuous switching between the positions shown in FIGURES 2 and 3 can be accomplished.

The combination of the latch member 46, spring 48 and element 60 provides an extremely reliable operation for switching purposes. It has been found that the mechanical durability of a switch of the type described is extremely satisfactory to the extent that a properly assembled switch will last through at least 5,000,000 operations without mechanical failure.

Another highly important consideration relates to the ease of assembly of the design illustrated. The combination of the elements 46, 48 and 60 can be set into place on a holder 18 by merely inserting the leg 62 in the bore 64. There are no fastening operations of any kind required. In addition, the assembly of the elements 46, 48 and 60 into the construction is greatly facilitated due to the fact that these three elements inherently tend to hold together once they have been assembled.

It will be noted that the construction described involves an application of an over center spring principle. Thus, the alternating pivotal action of the latch member 46 results due to the fact that the pivot point of the latch member shifts from side to side of the axis of the spring 48.

As indicated, the switch 10 can be operated by pushing on the holder 18 and, in this connection, it is contemplated

4

that an extension could be attached to the holder 18 to facilitate engagement with the finger. FIGURE 5 illustrates two other alternatives for actuation of the switch including an actuating member 80 which can be thrown up and down in a manner similar to a conventional wall switch. The member 80 is molded to define a cam element at its hidden end whereby the element can ride over the surface 18 to impart sliding movement thereto.

A still further alternative involves the use of a rocker 82 pivotally mounted by means of member 84 formed on the top of the casting 20. The rocker includes downwardly extending arms 86 which are received in grooves 88 defined by the holder 18. A more detailed description of this operation can be formed in the aforementioned copending application. It will also be appreciated that ganged switch arrangements can easily be designed while incorporating the concepts of this invention.

FIGURES 6 and 7 illustrate an element 90 which can be used as an alternative to the combination of the spring 48 and the element 60. This member includes a leg 92 which can be received in a bore 64 of a holder 18. An intermediate section 94 of the element 90 provides for extension of the element in a manner similar to that of the spring 48. The other end 96 of the element defines a groove 98 adapted to be fitted into the groove 52 of latch member 46. This arrangement is considered to comprise an important aspect of the instant invention in that its use eliminates one part and one assembly operation.

The construction of this invention can be employed in combination with stationary contacts which provide eyelets for soldering of electrical wire thereto. The switch constructions are, however, ideally suited for use in combination with printed circuits since the assembly illustrated can be placed on a printed circuit board and secured thereto by conventional techniques such as dip or wave soldering.

It will be understood that various changes and modifications may be made in the above described switch constructions which provide the characteristics of this invention without departing from the spirit thereof particularly as defined in the following claims.

That which is claimed is:

1. In a switch construction comprising a plurality of stationary contacts formed in an insulating base and including a holder for supporting sliding contacts, said holder being movable over said base for disposing said sliding contacts in at least first and second positions with respect to said stationary contacts, the improvement comprising locking means releasably retaining said holder in at least first and second positions with respect to said stationary contacts, said locking means including means including a latch member carrying latching fingers, finger receiving means associated with said construction for locking engagement with said fingers, and an over center spring means attached to said latch member, said spring means alternately urging said latch member to said first and second positions.

2. A construction in accordance with claim 1 wherein said spring means and said latch member are carried by said holder for movement therewith.

3. A construction in accordance with claim 2 comprising an outer casing within which said holder is movably received, and openings defined by said casing for alternately receiving said fingers.

4. A construction in accordance with claim 1 wherein said holder is adapted to be moved by imparting pushing action to one end thereof.

5. A construction in accordance with claim 1 wherein said holder is adapted to be moved by means of a rocker associated with the construction.

6. A construction in accordance with claim 1 wherein said holder is adapted to be moved by means of a cam member engaging one end of the holder, and including a switch actuating member associated with said cam mem-

5

ber for moving the cam member relative to said end of the holder.

7. In a switch construction comprising a plurality of stationary contacts formed in an insulating base and including a holder supporting sliding contacts, said holder movable over said base for disposing said sliding contacts in at least first and second positions with respect to said stationary contacts, said construction including an outer casing secured to said insulating base with said holder confined within said casing, the improvement comprising locking means releasably retaining said holder in at least first and second positions with respect to said stationary contacts, said locking means including a latch member carrying latching fingers, finger receiving means associated with said construction for locking engagement with said fingers, and an over center spring means attached to said latch member, said spring means alternately urging said latch member to said first and second positions.

8. A construction in accordance with claim 7 wherein said latch member comprises a member freely movable over the top of said holder, said fingers extending outwardly on opposite sides of said latch member, and openings defined by the side walls of said casing by opposite side walls of said casing for alternately receiving said fingers.

9. A construction in accordance with claim 8 including a spring retaining member pivotally mounted on said holder, said over center spring attached at one end to said retaining member and at the other end to said latch member.

10. A construction in accordance with claim 9 wherein said latch member comprises an elongated member having said fingers at one end thereof with the other end thereof abutting against a shoulder defined by said holder, said other end being adapted to pivot with respect to said shoulder, engagement of a finger with said casing at one of said openings causing said other end to shift positions relative to said shoulder, said shifting being from one side to the other of the axis of said over center spring

6

whereby said over center spring is adapted to pivot said latch member in different directions depending upon the position of said other end with respect to said shoulder.

11. A construction in accordance with claim 10 including a second spring normally urging said holder out of said casing, and including stop members limiting the outward movement of said holder.

12. A construction in accordance with claim 7 wherein said stationary contacts comprise pins extending downwardly from said insulating base adapted to be associated with a printed circuit board.

13. A construction in accordance with claim 8 wherein said over center spring means comprises an integral member mounted on said holder having one end attached to said latch member and the other end attached to said holder.

14. A construction in accordance with claim 13 wherein said latch member comprises an elongated member having said fingers at one end thereof with the other end thereof abutting against a shoulder defined by said holder, said other end being adapted to pivot with respect to said shoulder, engagement of a finger with said casing at one of said openings causing said other end to shift positions relative to said shoulder, said shifting being from one side to the other of the axis of said over center spring whereby said over center spring is adapted to pivot said latch member in different directions depending upon the position of said other end with respect to said shoulder.

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