

June 27, 1967

F. A. ZODA ET AL
MINIATURE SLIDE SWITCH HAVING MOVABLE CONTACT OF THE
FOLDED FLAT SPRING TYPE
Filed Feb. 9, 1966

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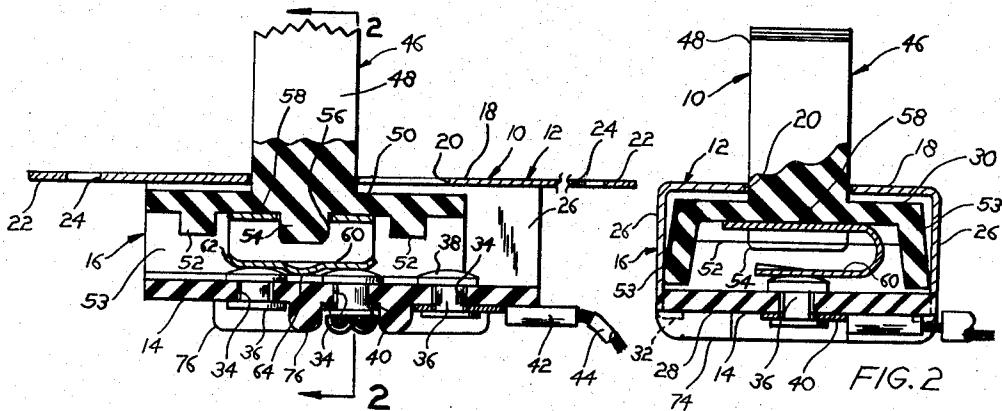


FIG. 1

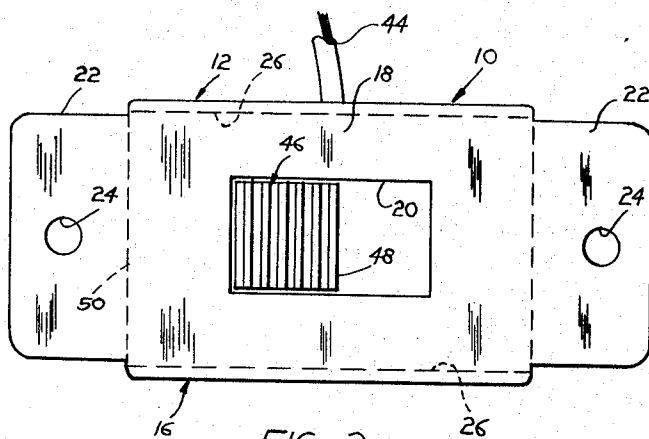


FIG. 3

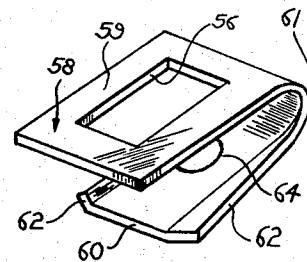


FIG. 5

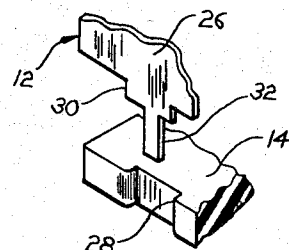


FIG. 6

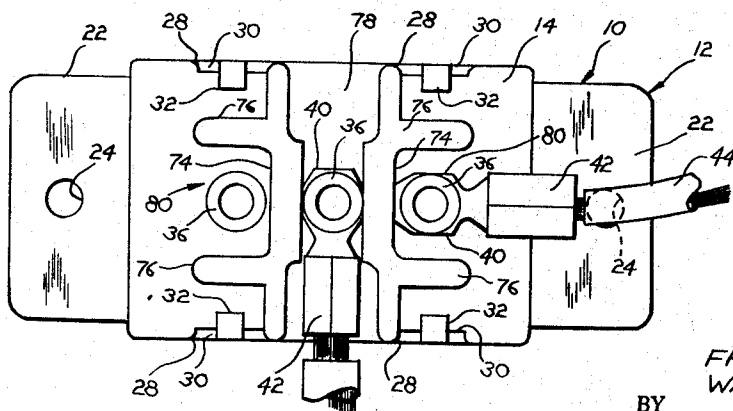


FIG. 4

INVENTORS:
FREDERICK A. ZODA
WALTER H. ANTHONY
BY
SPERRY AND ZODA
ATTORNEYS

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MINIATURE SLIDE SWITCH HAVING MOVABLE CONTACT OF THE FOLDED FLAT SPRING TYPE

Frederick A. Zoda, Trenton, N.J., and Walter H. Anthony, Levittown, Pa., assignors to Circle F Industries, Inc., Trenton, N.J., a corporation of New Jersey
Filed Feb. 9, 1966, Ser. No. 526,298
4 Claims. (Cl. 200—16)

This invention relates generally to relatively small control switches, designed primarily for use in controlling the flow of electrical current within such devices as record players, radios, electric shavers and tooth brushes, etc.

More particularly, the invention relates to a slide switch falling within the category generally described above.

By way of background, it may be observed that the manufacture of lamps, small radios, etc., is exceedingly competitive. Accordingly, it is essential that the cost of the components of such devices be kept to an absolute minimum. At the same time, however, the manufacturers of switches of the type stated are called upon by their customers to supply switches of improved quality as compared to switches used in the past. By "improved quality" is meant the capability of a switch to pass longer endurance tests, carry higher electrical ratings, withstand more rugged voltage breakdown tests than previously required, etc.

To provide a switch at minimum cost so as to meet strong competition in the switch manufacture field, while at the same time increasing the overall quality thereof, represents a difficult challenge, as will be appreciated, and considerable efforts have been expended in the art to which the invention relates, for the purpose of meeting this challenge.

The main object of the present invention is to provide a slide switch as described which will be capable of manufacture at a very low cost, but which will at the same time incorporate design features that will meet the several testing requirements described briefly above.

Among more specific objects of the invention are the following:

First, to provide a switch as described which will be compact, shallow and otherwise designed for use in relatively small areas, in devices having prescribed, standardized, mounting hole spacings;

Second, to provide a switch of the character stated, which, in order to meet the requirement for manufacture at low cost, will have a minimum of parts, so designed as to be swiftly and easily assembled in mass production operations;

Third, to provide a switch of the character described that will be designed to be assembled in a plurality of switch configurations, that is, either as a single-pole, single-throw switch, or as a single-pole, double-throw switch, utilizing the same basic parts for both switch types;

Fourth, to provide a switch of the type stated which, in each configuration in which it is assembled, can have different types of terminal connections, as for example, attached leads, quick-connect male terminals, solder tabs, etc.; and

Fifth, to provide a switch of the type stated that will have a smooth, soft "feel," while still having positive indexing between its respective positions.

Summarized briefly, the invention comprises a slide switch incorporating a frame which is so designed as to be attachable to the associated electrical appliance or other device, interchangeably with other switches of the

same general type. The slide switch is so designed as to include a face, to which can be attached stationary contact and terminal means of various types, according to the requirement of the particular customer. Movably mounted within the frame is a slide, having a handle integral with a body, the slide being operable between opposite extreme positions within the frame. The invention further includes a movable contact which is novelly designed as a folded, approximately C-shaped flat spring having the desired properties of electrical conductivity and springiness, such as Phosphor bronze or some other suitable copper alloy. The movable contact is specially designed to be swiftly and easily assembled with the slide and with the other components of the switch, and extends and resiliently flexes along lines normal to the path of movement of the slide.

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawings, in which like reference characters designate like parts throughout the several views, and wherein:

FIG. 1 is a longitudinal sectional view through a slide according to the present invention;

FIG. 2 is a transverse section, taken substantially on line 2—2 of FIG. 1;

FIG. 3 is a top plan view;

FIG. 4 is a bottom plan view;

FIG. 5 is an enlarged perspective view of the movable contact per se; and

FIG. 6 is a fragmentary, enlarged perspective view showing the details of the connection between the frame and the base of the switch.

Referring to the drawing in detail, the switch comprising the invention has been generally designated 10, and includes a frame that has been generally designated by the reference numeral 12. A base 14 of electrically insulative material is formed as a flat, rectangular member and is fixedly connected to the channel-shaped frame to cooperate therewith in defining a housing generally designated 16. The housing 16, and specifically the base 14 thereof, carries the stationary contacts of the switch, and the terminal connections provided in the switch, and mounted within the housing, for straight line, reciprocating motion, are the movable portions of the device, namely the slide and the movable contact carried thereby.

Referring more particularly to the frame 12, in the preferred, illustrated embodiment of the invention this is a single piece of sheet steel having a rectangular, wide, planiform cover 18 provided centrally with a rectangular handle-receiving opening 20 and integral at its ends with end portions 22 each of which has a mounting hole 24.

Integral with and depending from the opposite side edges of the cover 18 are side walls 26, the end portions 22 projecting beyond the respective ends of the side walls. Each side wall 26 is integrally formed at its bottom edge with a pair of spaced, depending tabs 30 (see FIGURE 6), and midway between the ends of each tab there is provided a tongue 32.

Base 14 is formed, in the illustrated embodiment of the invention, as a one-piece, molded, rectangular member having a completely flat top surface facing the cover 18. In the opposite side edges of the base 14 there are provided shallow notches 28 (see FIGURE 6) adapted to receive the tabs 30. The bottom edges of the side walls 26 otherwise rest upon the side edge portions of the flat top surface of the base 14. Tongues 32 extend downward and below the bottom surface of the base 14, and are crimped inwardly as shown in FIGURES 2 and 4 into engagement with the bottom surface of the base, so as to assemble the base and frame and thereby form the open-ended housing 16.

Base 14 can be of any suitable electrically insulative material having the necessary characteristics of rigidity and strength, resistance to tracking, etc. In the illustrated example, wherein the base has ribs on its underside, it would be of a molded plastic, preferably a thermosetting plastic having good dielectric properties, and high resistance to tracking or breakdown in the presence of high voltages. In any event, in the illustrated example the base is formed, longitudinally and centrally thereof, with uniformly spaced apertures 34. Three apertures are provided, one at the center point of the base, and the other two equally spaced from the center aperture.

The apertures provide for the mounting of small rivets 36. These have rounded heads 38, comprising contact surfaces on the top or inside face of the base 14. Rivets 36 constitute combination contacts and terminal connectors, and would be formed of any suitable copper alloy, in a preferred embodiment, found to possess optimum characteristics as regards electrical and thermal conductivity, minimum tendency toward arcing, etc.

Rivets 36, at their other ends, pass through openings formed in tongues 40 of conventional wire connectors 42 crimped to leads 44.

As will be noted, the several rivets comprise, together, a stationary contact means. In the illustrated example, the switch configuration is that of a single pole, single throw switch. As a result, the middle rivet 36, and only one of the end rivets, are connected to leads 44. The remaining rivet is without connection to any circuit, and is used only to provide proper indexing. In the absence of such "dummy" contact, the movable contact of the switch might be inclined to tilt, when it is in its position of FIGURE 1. Since the illustrated "dummy" rivet shown at the left in FIGURE 1 involves an assembly labor cost, as well as a parts cost, it may be desired to mold base 14 with an integral rounded bump on its top surface at the location shown for the "dummy" rivet in FIGURE 1, thus permitting proper indexing without danger of tilting the movable contact, while at the same time reducing the overall cost of the switch when it is to be made in a single pole, single throw configuration.

When the switch is to be assembled in a single pole, double throw configuration, the rivet 36 shown at the left in FIGURE 1 would be connected to a lead 44 in the same manner as the other rivet.

Generally designated 46 is a molded plastic slide, including an upwardly projecting handle 48 extending through opening 20 of the cover, centered upon a rectangular body 50 formed as an open-ended channel faced toward the stationary contact means.

Within the channel of the body 50, a pair of transverse reinforcing ribs 52 are provided, integral with the web portion of the body, and extending between the side walls 53 of the body. Side walls 53, as shown in FIGURE 2, may diverge slightly in the direction of the base 14, so as to reduce to a minimum the contact of said side walls with the side walls 26 of the frame, thereby to improve the feel of the switch during operation and also assure proper assembly of the parts without interference with one another.

Midway between the ends of the channel, and centered between the side walls 53, there is integrally molded a boss 54 of non-circular shape. Boss 54 in the illustrated example is elongated in a direction transversely of the body, imparting thereto a generally rectangular shape. Boss 54 extends through a complementary opening 56 formed in a movable contact generally designated 58. Contact 58 may be Phosphor bronze or the like, since it is desirable that the contact have a good electrical conductivity, as well as substantial spring tension characteristics.

The movable contact has been illustrated per se in FIGURE 5, and is formed from a single piece of relatively wide, springy sheet stock. In its final form, the movable contact may be appropriately described as be-

ing generally C-shaped, with a wide, flat mounting arm 59 in which the opening 56 is formed, and a correspondingly widened contact arm 60. Arms 59, 60 are connected by a rounded elbow or bight portion 61, integral with and extending between the proximal ends of the arms 59, 60. Along the opposite side edges of the contact arm 60 there are provided stiffening and guide flanges 62, 62. These are bent out of the general plane of the contact arm 60, in a direction toward the mounting arm 59. Flanges 62 extend fully from the distal end of the contact arm 60, to the merger of said contact arm with the bight portion 61, and are progressively reduced in width in a direction toward the bight portion.

Adjacent the distal extremity of the contact arm 60, there is formed in said arm a spherically rounded bump 64, projecting toward the stationary contact means and disposed in line with said stationary contact means. Bump 64 provides for indexing of the slide, in that in each position of the slide, the bump will be disposed between a pair of the contact surfaces, with the side edge portions of the contact arm 60 resting upon said contact surfaces. Flanges 62, as will be understood, serve to guide the movable contact onto the contact surfaces, during the indexing of the switch, without the possibility of the side edges of the movable contact digging into the stationary contacts.

It will be understood that various types of terminals can be used on the switch, including solder tabs, male quick-connect fasteners, etc.

Referring to FIGURE 4, to provide insulation between the adjacent wire connectors 42, and to insure against their accidentally turning into positions in which they might contact one another, integral barriers 74 are molded upon the bottom surface of the base 14, in the form of transverse ribs extending from side to side of said bottom surfaces. Branch ribs 76 extend longitudinally of the switch from each barrier, in a direction toward the opposite ends of the base, with the barriers being equidistantly spaced from the center of the base. In this way, pockets are provided, there being a center pocket 38 for the wire connector that is connected to the middle rivet, and in the pocket 80 one or both of which will receive connectors similar to that confined in the center pocket or recess. The pockets limit pivotal movement of the wire connectors, and provide positive insulation barriers therebetween.

It is important to note that the movable contact is so arranged as to extend transversely of the line of movement of the slide. In the invention, arms 59, 60 have their lengths arranged normally to the path of movement of the slide, with the bight portion 61 being disposed laterally to one side of the stationary contact means. By reason of this arrangement, a highly effective feel is imparted to the switch, promoting ease of operation, with minimum effort to overcome inertia when the switch handle is to be moved from one position to another. Heretofore, the practice has been, when movable contacts formed from flat spring material are employed, to arrange the same longitudinally of the switch, and this has been found to have the undesirable characteristic of causing bodily rocking of the movable contact, during operation of the switch. In the invention, the resilient flexing of the movable contact arm is in a plane normal to the path of movement of the slide when the switch is being operated. Arm 60 flexes, of course, by reason of the fact that the bump 64 must ride over the contact head lying in the path thereof. It should be observed, in this regard, that prior to assembly of the switch, the arms 59, 60 are spread, in such a way that when the switch is fully assembled, they are moved toward each other, that is, closed against the inherent spring tension of the bight portion 61, thus to cause the arm 60 to be in resilient, yielding engagement with the stationary contact means.

The disposition of the C-shaped movable contact transversely of the body, that is, of the line of movement of

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the slide, has the further desirable result of providing for maximum spring action, in a minimum spaced, considering the space in the sense of the length of the switch. The switch length is very important, since the switch must be confined in a relatively small area. When the movable contact is arranged longitudinally of the line of movement of the switch, it assumes excessive length, thereby adding to the overall length of the switch. Further, a switch contact extending lengthwise of the switch is normally required to be bent or turned inwardly at both of its ends, thus adding to the cost thereof, in order to provide proper balance during the movement of the slide in opposite direction. In the illustrated example, there is only one bend in the movable contact, and yet there is an identical feel regardless of the direction in which the slide is shifted.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles of operation and the means presently devised to carry out said principles, it being considered that the invention comprehends any changes in construction that may be permitted within the scope of the appended claims.

We claim:

1. In a slide switch of the type intended as a control device for small appliances and the like, and including a stationary housing having a generally flat base, a slide mounted in said housing for back-and-forth rectilinear movement above said base, and at least two stationary contacts mounted upon the base and spaced apart along the line of movement of the slide, the improvement comprising a movable contact that is in the form of an electrically conductive, generally flat spring, is tensioned between the slide and base and deflects in the direction of its length, lies flatwise to and is generally in parallelism with the

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plane of the base in resilient, yielding engagement with the stationary contacts,

is of a width sufficient to span both stationary contacts unbrokenly and symmetrically in respect thereto in one position to which the slide is moved, and has its length and hence its path of deflection extending transversely to the line of movement of the slide.

2. In a slide switch as in claim 1, the formation of the spring with a rounded bump disposed medially between the opposite side edges thereof and projecting toward the stationary contacts, the stationary contacts projecting above the plane of the base and lying in the path of said bump during the movement of the slide, to cooperate with the bump in indexing the slide between different positions thereof, said bump lying between said stationary contacts in said one position of the slide.

3. In a slide switch as in claim 2, the formation of said spring with a width greater than the distance between centers of the stationary contacts, for disposition of flat side edge portions of the spring in engagement with the respective stationary contacts in said one position of the slide.

4. In a slide switch as in claim 1, the formation of said spring as a one-piece, C-shaped member having superposed arms connected by a rounded elbow portion, one of said arms comprising the portion of the contact bearing against the stationary contacts, the other arm comprising a second portion of the movable contact interengaged with and lying flatwise against the underside of the slide.

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ROBERT K. SCHAEFER, *Primary Examiner.*

J. R. SCOTT, *Assistant Examiner.*