Feb. 29, 1944. C. L. VAN INWAGEN, JR 2,343,100

PANEL SELECTOR CONTACT-SHOE

Filed Oct. 16, 1942

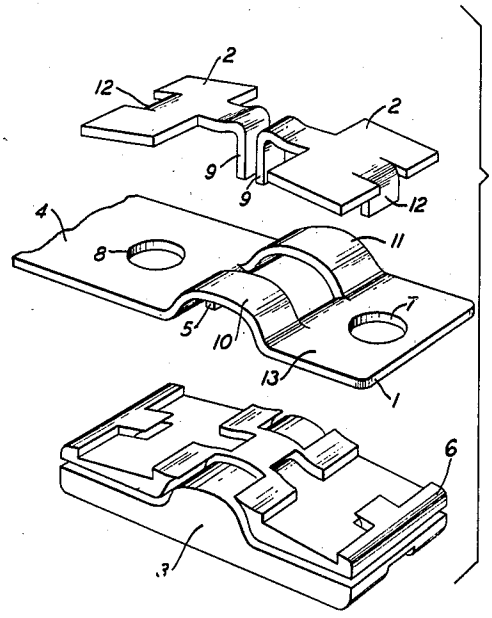
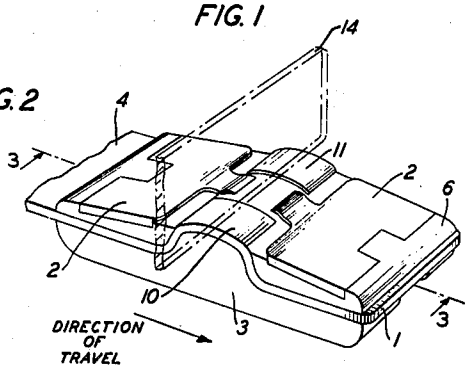


FIG. 2

FIG. 1



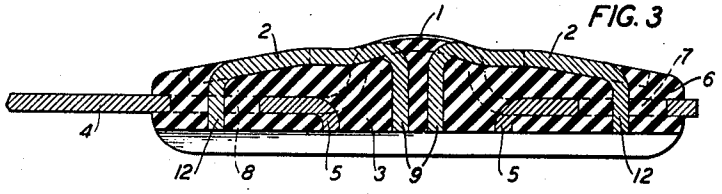


FIG. 3

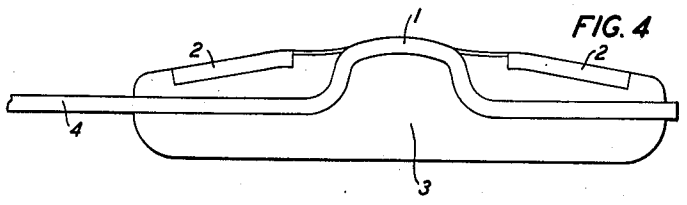


FIG. 4

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PANEL SELECTOR CONTACT SHOE

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Application October 16, 1942, Serial No. 462,234

4 Claims. (Cl. 200—171)

This invention relates to selector brushes for automatic switches and more particularly to a contact-shoe adapted for use with a brush carriage of the kind shown and described in Patent 2,285,657, issued to C. N. Hickman on June 9, 1942, said brush carriage being part of the so-called high speed panel type of selector switch shown and described in Patent 2,240,039, issued to C. N. Hickman on April 29, 1941.

A contact-shoe for this type of switch generally comprises a non-conducting support suitably secured to a spring mounted upon the brush carriage, and a central metallic element embedded in the support for engaging the terminals of a bank over which the brush moves during a selection operation, the metallic element of the shoe being conductively connected to the spring to provide circuit-completing facilities between the terminal engaged by the shoe and external control apparatus. Since the spring of a brush is pretensioned for electrical contact with an engaged terminal on the bank, and since the terminals are equally spaced by a distance slightly greater than the length of the metallic element, the shoulders of the non-conducting support are made sufficiently long for each of them to bridge two terminals at the same time to insure non-bridging of two adjacent terminals by said element when the latter becomes momentarily positioned therebetween during a selection operation. The shoulders slope away from the contact element and are adapted to engage the inner edges of the oppositely disposed terminals between which the contact element is positioned so as to provide an inclined surface for the shoe whereby the brush, as it moves over the terminals, is caused to spread out again until the contact element of the shoe becomes centered upon the terminal.

It has been found, however, that, in many instances, the edges of the terminals engaging the shoe "dig" into the shoulders of the support and cause the latter, during a selection movement of the brush, to "snag" against the terminals of the bank and thereby impair operation of the "selector"; that is, the brush carriage thereof.

It has also been determined that, over long periods of operation, the constant rubbing of the non-conducting support of the shoe with the terminals over which the shoe rides causes the support to be worn down or chipped off and the substance thereof deposited upon the terminal edge, causing thereby the deterioration of the support and the contamination of the terminal, the latter to the detriment of the circuit to be established over the terminal and the contacting element of the shoe.

It is the object of the present invention to provide a contact shoe which, having a suitable slightly underflush non-conducting support, presents an "all-metal" surface to each of the terminals to be engaged by the shoe during a selection operation, which will preserve the present sliding approach of the shoe to the terminals and yet be "non-bridging" therebetween. Thus the terminals, prevented from coming into contact with the non-conducting support, cause the latter to be preserved against the formation of snagging pockets while the terminals themselves are kept free from contamination.

Referring to the drawing:

Fig. 1 shows a perspective view of the contact-shoe of my invention with a bank terminal indicated in the contacting position thereof, the spring portion of the shoe which is attached to the brush carriage not being shown.

Fig. 2 is an exploded view of the contact-shoe, the component metallic elements of which have been displaced somewhat with respect to the support therefor in order to show more clearly their relationship to the latter and to each other;

Fig. 3 shows a cross section of the contact-shoe taken along the section line 3—3 of Fig. 1; while

Fig. 4 shows a front elevation of the contact-shoe.

Referring to the figures of the drawing in which identical designations refer to identical parts, the contact-shoe comprises a metallic element 1 formed at the end of the brush spring 4 which is attached to the brush carrier in the manner shown in the above-mentioned patent to Hickman, the guide pieces 2 which are supported on the top of element 1 as explained below, and a support 3 into which are embedded the element 1 and the tongues 9 and 12 of the guides 2, said support 3 being made of any suitable insulating compound such as, for example, shellac, mica, hard rubber, glass, etc.

The contact element 1 is, as before stated, formed at the end of brush spring 4, the remaining portion of the latter (not shown) being, in form and construction, identical with the "tip" and "ring" brush springs of the panel selector brush shown in the above-mentioned patent to which reference is made for a description of the spring, the component parts of the entire brush assembly and the mode of its operation.

The contact element 1 is punched out of a desired spring stock in the form indicated in Fig. 2, said element having two spaced but aligned arcu-

ate bands 10 and 11 between the outer rectangular portion 13 and the body portion of spring 4. In between the bands 10 and 11, are oppositely disposed downwardly bent tongues 5 which are provided to insure lateral rigidity for the element 1 when the same is embedded in the support 3 as explained below. Circular apertures 7 and 8, the former punched in the center of the outer rectangular portion of spring 4 and the latter punched to the left of the bands in the body of said spring coaxially with aperture 7 and equidistant from the nearest tongue 5, have diameters slightly larger than the width of tongue 12 of guide piece 2 and serve as non-contacting slots for the passage therethrough of said outer tongues 12 when the two guide pieces 2 are superimposedly fitted upon the element 1 on either side of the bands 10 and 11. These apertures 7 and 8, however, need not be circular as, indeed, they may be, if desired, of rectangular configuration. The space between the two bands 10 and 11 shall be sufficiently wide not only to permit the free passage therethrough of tongue 9 of the guide piece 2 but, when the guide piece is fitted over the element 1, shall also be wide enough to keep the edges of the tongue out of contact with the inner edges of the bands 10 and 11.

The guide pieces 2, which are symmetrical and formed into the shape indicated in Fig. 2, may be produced, if desired, from the same spring stock as contact element 1. These guide pieces, however, need not have the same electrical properties as element 1 since they function merely as insulated metal guides for the brush spring 4 as it approaches a terminal to be engaged, in contrast with element 1 which is to be used for the passage of current between itself and that terminal. For this reason, the guides may be of any other suitable metallic substance capable of taking a smooth finish, which is desirable to reduce friction with the terminals of the bank.

Each guide piece 2 has inner tongue 9 sufficiently narrow to clear through the aperture between the two bands 10 and 11 and is bent downwardly with a slight convexity at a distance from the edge contiguous thereto such that when the outer tongue 12 of the guide piece is passed through the hole 7 of the contact element 1, the convex surface of tongue 9 will be flush with the near edges of the bands, to provide continuous metallic contact to a terminal moving over the surface of either guide piece 2 into engagement with the crests of the bands. The perpendicular portions of tongues 9 and 12 are dimensioned to insure that when the lower edges of both tongues rest on the same horizontal plane at the bottom of the support 3, the part of the convex surface of tongue 9 which is in alignment with the near edges of the bands shall be flush with said edges and the rest of the guide piece shall assume an inclined position away from the bands that will provide a terminal to be engaged with a gradual up-hill surface from the edge 6 of the support, when the shoe is between terminals, to the crest of the bands when the latter engage the terminals for proper contact closure.

In producing the contact-shoe, the contact element 1 formed at the end of spring 4 is inserted into a fixture (not shown) with each of the guide pieces 2 fitted to the top thereof on either side of the bands 10 and 11 by inserting tongue 12 in hole 7 (or 8) and tongue 9 in the space intermediate the bands. The depth of the fixture to the base of which the bottom edges of tongues 9 and 12 of each guide piece come to rest is such that that portion of the convex surface of tongue 9 looking toward tongue 12 comes flush with the lower edges of bands 10 and 11, and since the length of the bent portion of tongue 12 is less than that of tongue 9 by an amount that will give each guide piece the required angularity with respect to the crest of the bands 10 and 11, each of said guide pieces assumes a sloping position outwardly from the place where the convex portion of tongue 9 is nearest to the edges of bands 10 and 11. This leaves a wedge-shaped space between the under surface of each guide piece and the upper surface of contact element 1 lying on either side of the bands which is filled with insulating compound.

The fixture includes a suitable mold of support 3 into which is poured, in melted form, the non-conducting compound of which said support is made, said compound filling all the interstices between the guides and the element. In cooling and solidifying, the compound adheres to the under surfaces of guide pieces 2 and both surfaces of the bands 10 and 11 except the upper exposed parts thereof, the tongues 9 and 12 forming a rigid structure with the exposed surfaces of bands 10 and 11 flanked by the upper surfaces of the guide pieces 2 to form shoulders sloping away from said central element. The exposed insulated support 3 is slightly underflush with the top metallic exposed parts of the shoe which are then buffed and polished. The insulated support, when solidified, assumes the shape and structure 3 indicated in Fig. 2.

When the appropriate number of contact-shoes are assembled as a brush structure of the type shown in the above-mentioned Patent 2,285,657 to Hickman, and said brush is mounted on the brush carrier with the latter positioned with respect to a row of terminals as indicated in said patent, a contact-shoe, if properly adjusted with respect to the terminals of the bank it will engage, will have the crests of bands 10 and 11 in substantial alignment with the edge of the terminal, say terminal 14. When the brush carrier is moved for the selection of a terminal in the bank, the springs 4 of the brush selected for operation are tensioned against the terminals so that, between terminals, the exposed surfaces of bands 10 and 11 of the shoe will have a tendency to lodge between them, but the length of the shoe between the two extremes of the support 3, is not sufficient to cause it to engage the higher and lower terminal when the shoe is in the mentioned position so that, at any time, the exposed band surfaces will engage the one terminal only. When the brush moves to the right or left depending upon the direction of travel (assume that the brush is traveling towards the right as indicated in Fig. 1), the terminal on the right of the brush will, in effect, follow the surface of the right guide piece 2 until the center portion of the terminal reaches the lower edges of the bands 10 and 11. The terminal will then be lifted (cammed up) on to the crests of the bands 10 and 11 without snagging.

What is claimed is:

1. A multiple brush contact-shoe for a panel bank selector comprising a formed insulating support, a metallic contacting element embedded therein, and a metallic guide on either side thereof to provide a continuous metallic surface to an external body moving thereacross to engage said metallic element.

2. A multiple brush contact-shoe for a panel

bank selector comprising two metallic guides, a contact element disposed thereunder with an exposed surface therebetween, and a formed insulating support for said guides and said contact element, whereby a bank terminal of the selector will continuously engage a metallic surface as said contact-shoe is caused to move transversely with respect to said terminal.

3. A multiple brush contact-shoe for a panel bank selector comprising a formed insulating support, two metallic converging elements embedded in said support to provide an inclined runway to the center of said support, and two raised contact portions one embedded on each side on the longitudinal axis of said support to provide an arcuate approach to the center of said contact portion from the inner end of each of said two metallic elements.

4. A multiple brush contact-shoe for a panel bank selector comprising a contact element having two spaced arcuate bands terminating in supporting portions, each of said portions having an aperture therein, a metallic guide fitted over each of said portions having a first member passable through the space intermediate said bands and a second member passable through one of said apertures, the lengths of said first and second members being determined by the degree of inclination between the upper surfaces of said bands and said guide, and a non-conducting support molded beneath said element and adhering to the supported guides through contact with said first and second members thereof, said elements and said guides being so disposed relative to one another upon said support as to be insulated from each other and to present a continuous metal surface to a body moving over the surface of either guide to engage said contact element.

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