

[54] **PROCESS FOR MOUNTING TERMINAL MEANS**

[75] Inventor: **Lee O. Woods, Morrison, Ill.**

[73] Assignee: **General Electric Company, Fort Wayne, Ind.**

[22] Filed: **Oct. 23, 1973**

[21] Appl. No.: **408,868**

Related U.S. Application Data

[62] Division of Ser. No. 290,574, Sept. 20, 1972.

[52] U.S. Cl. **156/293**, 29/630 R, 156/295, 339/218 M

[51] Int. Cl. **B32b 31/00**, H01r 9/16

[58] Field of Search 156/291, 293, 295, 306, 156/320; 337/347; 338/329; 339/217, 218 R, 218 L, 218 C, 218 M; 29/577, 589, 591, 630 R

References Cited

UNITED STATES PATENTS

3,311,425 3/1967 Schraub 308/3

3,397,102	8/1968	Schraub	156/257
3,711,347	1/1973	Wagner et al.	156/91
3,737,355	6/1973	Epstein et al.	156/293
3,780,433	12/1973	Lynch	29/628

Primary Examiner—William A. Powell

Assistant Examiner—Brian J. Leitten

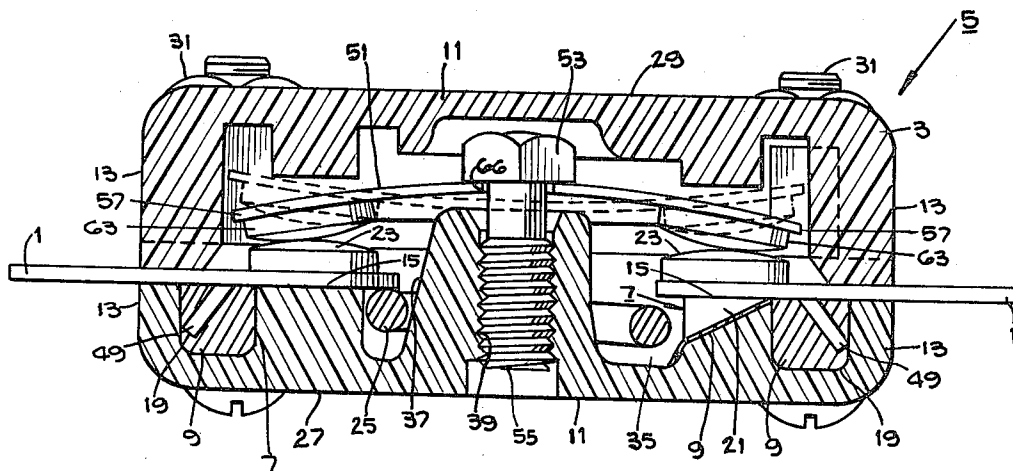
Attorney, Agent, or Firm—Joseph E. Papin

[57]

ABSTRACT

A process for mounting terminal means in a housing of an electrical device. At least a portion of at least one of the terminal means and a means within the housing for supporting the terminal means is coated with an adhesive means. The terminal means and the supporting means are then engaged so that the adhesive means may adhere them, and flow of the adhesive means in excess of that for adhering the terminal means and supporting means is predeterminedately directed from the supporting means to a means for collecting the excess adhesive means within the housing.

12 Claims, 4 Drawing Figures



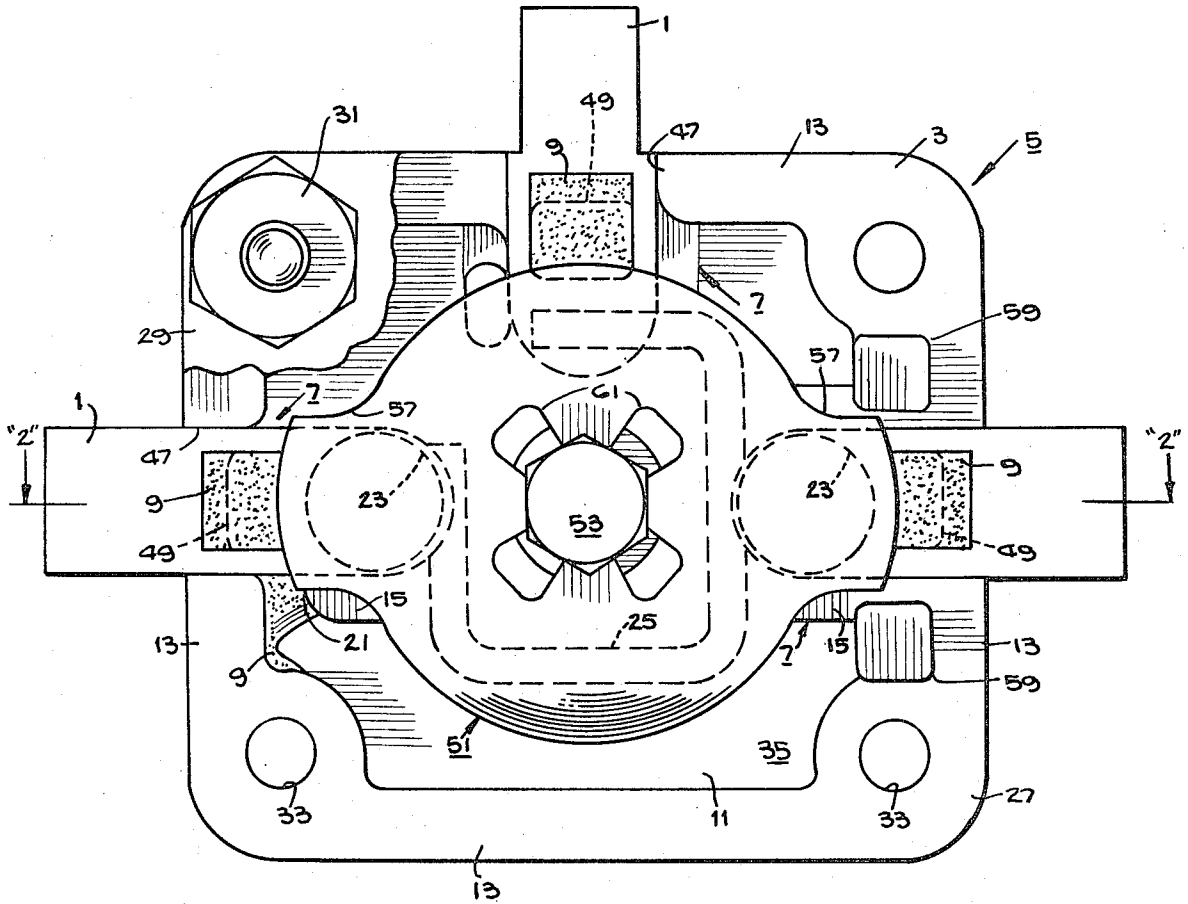


FIG. 1

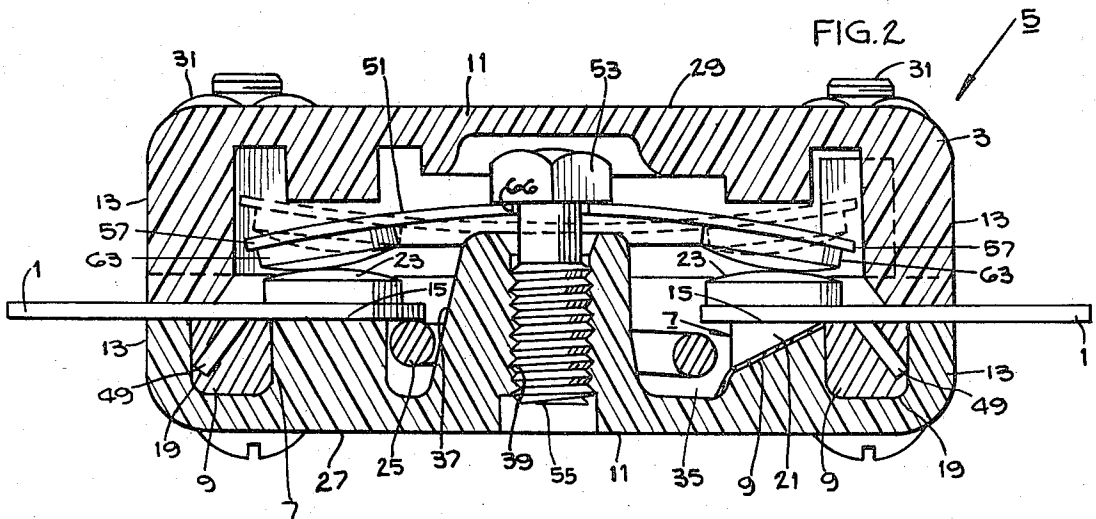


FIG. 2

SHEET 2 OF 2

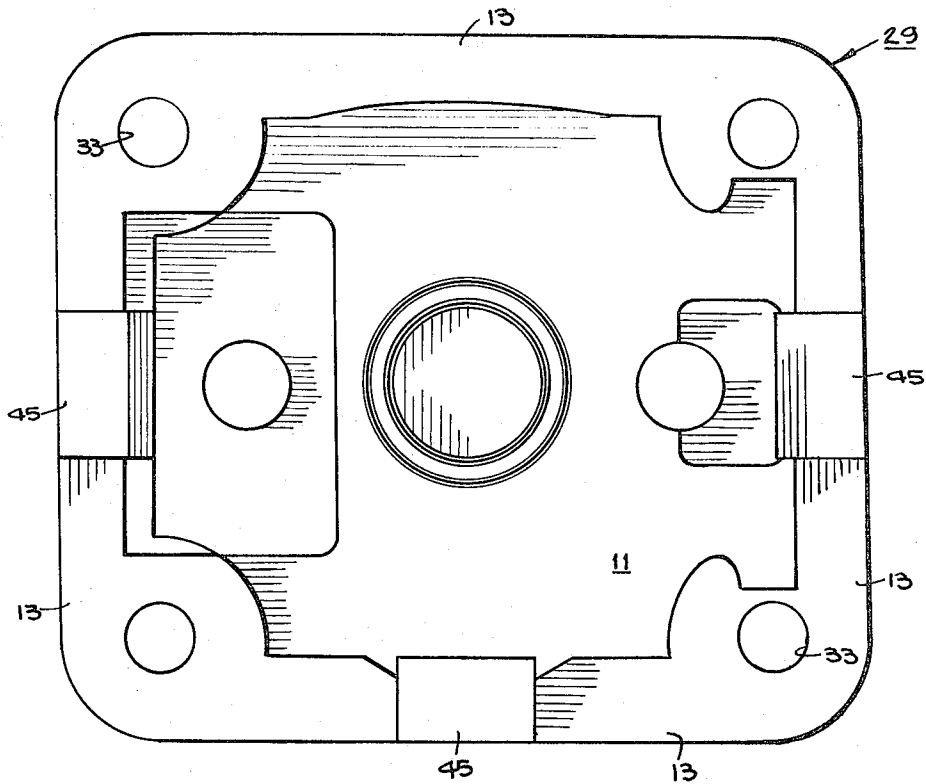
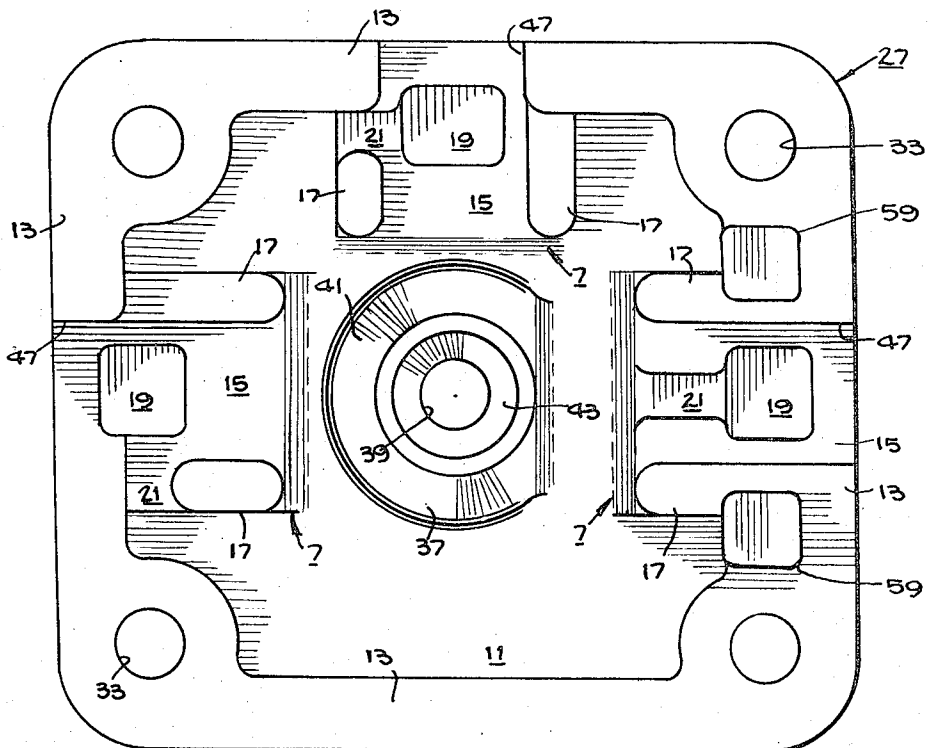


FIG. 3

FIG. 4



PROCESS FOR MOUNTING TERMINAL MEANS

CROSS-REFERENCE TO RELATED APPLICATION AND PATENT

This application is a division of copending parent application Ser. No. 290,574 filed Sept. 20, 1972, and is related to U.S. Pat. No. 3,753,195 issued Aug. 14, 1973, now abandoned, and assigned to the assignee of the abovementioned patent application.

BACKGROUND OF THE INVENTION

This invention relates to processes utilizing a flowable adhesive for mounting a terminal to an electrical device and in particular process for predeterminately directing flow of the adhesive in excess of that for adhering the terminal and the electrical device to a collecting means for the excess adhesive in the electrical device.

In the past, the operative components of many electrical devices were positioned within dielectric housings formed of moldable plastics or the like or other dielectric materials, and these operative components were electrically connected to electrical apparatus and circuits externally of the electrical device through electrically conductive, metallic terminals which were secured to supports formed integrally or unitarily with dielectric housings. The past terminals were secured to the dielectric housings by various well-known adhesives, such as thermosetting epoxy resins or the like, and typically, these adhesives were viscous at room temperatures while being highly fluid at elevated temperatures. During manufacture, either the terminal, its support in the housing, or both were coated with a layer of the adhesive, and the terminal was then placed upon the support with the combined terminal and support structure being thereafter heated. Upon cooling, the adhesive adhered the terminal rigidly to the support.

As previously stated, the thermosetting adhesives, such as epoxy resins or the like, become highly fluid at elevated temperatures, and one of the disadvantageous or undesirable features of the past constructions for mounting terminals to dielectric housings was that it was quite difficult to control the flow of the adhesives while securing terminals to dielectric housings in the manner described above. Another disadvantageous feature of the past constructions was that the adhesive became so highly fluid that in addition to seeking lower levels through gravitational forces it frequently also tends to flow both without the dielectric housing and also upwardly within close, confined spaces within the dielectric housing through the forces of capillary action and surface adhesive attraction. Such uncontrolled flow resulted in another disadvantageous feature of the past constructions since the presence of adhesives upon the operative components of the electrical device was quite detrimental, and such uncontrolled flow of the adhesives seriously impaired the functions of the operative components. In small devices, the above discussed disadvantageous features assume significant proportions inasmuch as the operative components, such as contacts, heaters, and bi-metal elements or the like, were typically located quite closely to the terminals mounted in the electrical devices, and in some cases, some of the operative components, such as switch contacts for example, are mounted directly upon the terminal. In addition to the foregoing, another disadvantageous feature of the past constructions was that

many electrical devices, such as thermostatic switches, or the like employed heating elements and the thermosetting adhesive flowed, in the manner discussed above, onto the heating elements being thereby vaporized and subsequently condensing upon other operating components located a substantial distance therefrom and otherwise contaminating the interior of the dielectric housing.

SUMMARY OF THE INVENTION

Among the several objects of the present invention may be noted the provision of a novel process for mounting a terminal in an electrical device which overcomes the disadvantageous or undesirable features of past methods and constructions, as discussed hereinabove, as well as others; the provision of such a process in which adhesive in excess of that for securing the terminal to the electrical device is predeterminately channeled away for collection; the provision of such a process in which the excess adhesive is predeterminately collected thereby to prevent contamination of associated operating components within the electrical device; and the provision of such a process which is simplistic in form, economical, and which readily lends itself to production and assembly operations. Other objects and advantageous features will be in part apparent and part pointed out hereinafter.

In general, a process in one form of the present invention of mounting terminal means in a housing for an electrical device comprises coating at least a portion of at least one of the terminal means and a means within the housing for supporting the terminal means. The terminal means and the supporting means are thereafter engaged so that the adhesive means may adhere them, and flow of the adhesive means in excess of that for adhering the terminal means and supporting means is predeterminately directed from the supporting means to a means for collecting the excess adhesive means within the housing.

Also in general, a process in another form of the invention is provided for mounting a metallic terminal within an electrical device having a hollow dielectric housing. The housing has a wall with an aperture therein and a step raised from an interior floor of the housing with the top of the step extending to the wall adjacent the aperture. The step has a substantially planar terminal support surface and a recess extending into the top of the step between the support surface and the wall, and a conduit extends between the recess and housing floor. The terminal has a substantially planar surface adapted to be secured atop the substantially planar terminal support surface of the step and a tab projecting from the terminal surface. The process comprises coating at least a portion of the terminal planar surface with a thermosetting adhesive and placing the coating terminal surface upon the terminal support surface of the step. At least a portion of the thermosetting adhesive is flowed from the coated terminal surface toward the aperture into the recess onto the tab and into the conduit, and the flow of the thermosetting adhesive is terminated within the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of an electrical device in which principles of a process in one form of the invention may be utilized in one form, most of the upper housing cover being broken away;

FIG. 2 is a sectional View taken along line 2—2 of FIG. 1;

FIG. 3 is a bottom plan view of the cover for the electrical device of FIG. 2 showing the interior thereof as disassociated from the base of the electrical device; and

FIG. 4 is a top plan view of the base for the electrical device of FIG. 2 showing the interior thereof as disassociated from the cover.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

The following examples illustrate the invention and are not to be construed as limiting.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings (FIGS. 1-4) in general, a process in one form of the invention for mounting a plurality of terminal means 1 in a housing 3 of an electrical device 5 is illustrated wherein at least a portion of at least one of the terminal means and means, such as a plurality of steps or supports 7 or the like, for supporting the terminal means is coated with an adhesive means or material 9. Terminal means 1 and supporting means 7 are then engaged so that adhesive means 9 may adhere them, and flow of the adhesive means in excess of that for adhering the terminal means and supporting means is predeterminedly directed from the supporting means to a means, such as a sump defined by base wall or floor 11 and interconnecting side walls 13 of housing 3, for collecting the excess adhesive means within the housing. Adhesive means 9 as hereinafter referred to and discussed may be a thermosetting adhesive material, such as an epoxy or the like, but it is believed that many other adhesive materials well-known to the art will also work; therefore, the particular type of the adhesive material discussed herein is not intended to be limiting and should not be construed as such.

More particularly, adhesive material 9 is coated to that portion of the adjacent surface of terminal 1 which is received in seating or abutting engagement with cooperating seating or upper surfaces 15 atop steps 7, and the terminals are then placed upon the step surfaces between locating shoulders 17 with a portion of the terminals extending exteriorly of electrical device 5. Adhesive material 9 is then heated causing it to change from its rather viscous state at room temperature and become highly fluid thereby to flow towards and then down into recesses 19 provided in seating surfaces 15. Should the volumetric capacity of recesses 19 be insufficient to accommodate all of adhesive material 9, the excess thereof will overflow downwardly through means, such as a plurality of passages or groove means 21 or the like, provided in steps 7 for the passage of the excess adhesive to base wall 11 of housing 2, as shown in FIGS. 1 and 2. With this manner of controlling the excess flow of adhesive material 9, there will be little tendency for any adhesive material to flow onto contacts 23 fixedly provided on terminals 1 by surface adhesive forces, and it may also be noted that the spacing between base wall 11 and a heater 25, as discussed hereinafter, is much too great for any build up of overflowed or excess adhesive material upon the base wall to reach the heater. Some adhesive material 9 may flow onto the junction of heater 25 to terminals 1, but such ordinarily will present no problem since this portion of

the heater operates relatively coolly due to its proximity with the terminal itself which acts as a heat sink. Consequently, adhesive material 9 will not tend to vaporize.

Referring now to FIGS. 2-4, housing 3 is provided with a lower or base member 27 and an upper or cover member 29 molded or otherwise formed from a dielectric material, such as rubber or plastic or the like, and the opposite marginal edges or surfaces of the juxtaposed side walls 13 of the base and cover members are secured or mounted together by suitable means, such as a plurality of nut and bolt assemblies 31 or the like, which extend through aligned mounting holes 33 respectively provided therefor in the base and cover members. When so mounted together, opposite base walls 11 and juxtaposed side walls 13 of base and cover members 27, 29 generally define a chamber 35 in which the operating component parts of electrical device 5 are disposed, as discussed hereinafter, and it is also contemplated that other fastening or mounting means well known in the art, such as rivets or screws or the like for instance, may alternatively be used in place of nut and bolt assemblies 31 to maintain the base and cover members of housing 3 mounted together against displacement.

The interior of base member 27, as shown in FIG. 4, with side walls 13 peripherally disposed and integrally interconnected with base wall 11, is provided with supporting means or steps 7 respectively integrally formed between the base wall and three of the side walls; however, it is also contemplated that the steps could be integrally formed with only one of the base wall and side walls and spaced from the other thereof, if desired. Steps 7 rise above base wall 11 having top or seating surfaces 15 for seating engagement with terminals 1, and the top surfaces are generally co-extensive with the marginal edges of side wall 13 of base member 27. Receiving means, such as the recess or other hole 19, for holding an amount of adhesive material 9 extend into steps 7 and adjacent side walls 13 intersecting with surfaces 15; however, it is contemplated that the recesses may, if desired, be disposed entirely within the steps and spaced from the side walls adjacent thereto. Groove means 21 are each respectively disposed in steps 7 with the upper end portions of the groove means intersecting with seating surfaces 15 and recesses 19 while the lower end portions of the groove means are provided to empty or convey excess adhesive material 9 onto base wall 11 of base member 27, the generally central portion of which defines a sump 35 for the collection of the excess adhesive material. From the centrally located portion of base wall 11 of base member 27 integrally extends a generally conic projection or hub 37 having a generally vertical, threaded, central bore 39, and the hub is truncated to provide an annular, planar upper or free end or surface 41. The upper end of bore 39 is beveled or flared as shown by conic surface 43.

As shown in FIG. 3 and as previously mentioned, side walls 13 of cover member 29 are formed to mate with the opposite side walls 13 of base member 27, and when the cover and base members are assembled or mounted together, a plurality of wall extensions 45 project partially downwardly over surfaces 15 of steps 7 thereby forming slots or apertures 47 which pass through the mated side walls.

Referring now to FIGS. 1 and 2, electrical device 5 is seen to have three generally planar terminals 1 ex-

tending from the exterior of housing 3 through slots 47 into seating engagement with seating surfaces 15 of steps 7 between shoulders 17. To the exposed tops of two of terminals 1 are secured the pair of stationary or fixed switch contacts 23, and heater wire 25 is secured to the third one of the terminals and to one of the contact supporting terminals. Heater wire 25 partially encircles hub 37 in spaced relation with both it and base wall 11 of housing base member 27 in which it is disposed. Means, such as terminal tabs 49, are integral with terminals 1 being bent therefrom to project or extend downwardly into recesses 19 within steps 7. Adhesive material 9 is flowed into recesses 19, as described hereinbefore, in intimate contact or securing engagement with terminal tabs 49, and once set, the adhesive material firmly secures terminals 1 atop steps 7 and thus to the housing base member 27. During assembly, excess adhesive material 9 flows downwardly from recesses 19 through groove means 21 to base wall 11 of housing base member 27, and the quantity of the adhesive material in excess to the volumetric capacity of recess 19 is ordinarily slight and certainly insufficient to cover the base wall of the housing base member and thereby build upwardly towards heater wire 25. Being below the top surface of the terminals 1, there is also little danger of adhesive material 9 flowing onto fixed switch contacts 23.

A thermoresponsive element, such as a generally disc shaped sheet of bimetal 51, is mounted within housing 3 by means of a stud 53 or the like having a threaded shank 55. One of two unitary tail portions 57 of bimetal disc 51 are positioned between a pair of abutments or posts 59 which prevent the disc from rotating, and a unthreaded portion of stud shank 55 passes loosely through a central aperture 61 in the bimetal disc. Disc central aperture 61 is generally in the shape of a four leaf clover which serves to provide bimetal disc 51 with good snap action characteristics during actuation. Threaded shank 55 of stud 53 is threadedly received in bore 39 within hub 37 until the stud engages mobile switch contacts 63 secured beneath peripheral portions of bimetal disc 51 in engagement with fixed contacts 23, and the stud may then be adjustably threaded further into bore 39 for switch operational adjustment. As this action progresses, stud 53 forces the central portion of bimetal disc 51 towards annular surface 43 atop hub 37 whereupon a smaller increase in the temperature of the disc will cause the disc to snap to the position shown in phantom in FIG. 2, and such snap action, in turn, causes switch contacts 23, 63 to break. Subsequent cooling of bimetal disc 51 forces it to snap back to its initial or adjusted position thereby causing fixed and mobile contacts 23, 63 to remake.

From the above description, it may be noted that stud 53 limits movement of the central portion of bimetal disc 51 upwardly, as viewed in FIG. 2, while annular surface 43 atop hub 37 limits downward movement of this portion of the disc. Thus, stud 53 and annular surface 43 function as stops, and at the same time, the stud also serves as mounting and adjustment means for the bimetal disc 51.

In view of the foregoing, it is now apparent that a novel process for mounting terminal means is provided overcoming the disadvantageous features of the prior art, and changes as to the precise procedures and/or steps for carrying out the process, as well as changes in the precise configurations, shapes and details of the

constructions utilized in carrying out the process, which are set forth herein for purposes of illustration, may be made by those skilled in the art without departing from the spirit and scope of the invention which is limited only by the claims which follow.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A process of mounting a metallic terminal to a generally hollow dielectric housing of an electrical device with electrical components thereof predeterminedly disposed within the housing, the housing having a wall with a terminal receiving aperture therethrough and a step raised from an interior floor of the housing with the top of the step extending to the wall adjacent the aperture, the step having a generally planar terminal support surface and a recess in the top of the step between the support surface and the wall, a conduit in the housing between the recess and the housing floor, the terminal having a generally planar surface adapted to be secured atop the terminal support surface, and a tab projecting from the terminal surface, said process comprising the steps of:

- a. coating at least a portion of the terminal surface with a thermosetting adhesive;
- b. placing the coated terminal surface upon the support surface therefor and extending the tab into the recess;
- c. flowing at least a portion of the adhesive from the coated terminal surface toward the aperture into the recess onto the tab therein and directing excess adhesive into the conduit; and
- d. collecting the flow of excess adhesive through the conduit upon the floor of the housing at a location therein predeterminedly spaced from the electrical components.

2. A process of mounting a terminal with a flowable adhesive to a pair of separable housings of an electrical device having electrical components therein comprising the steps of:

- a. providing in at least one of the separable housing means for the predetermined passage of the adhesive in excess of that necessary for mounting the terminal to the housings toward means within the housing predeterminedly spaced from the electrical components therein for collecting the excess adhesive;
- b. coating with the adhesive at least a portion of the terminal and a means within the housing communicating with the passage means for supporting the terminal;
- c. engaging the terminal and the supporting means so that the adhesive may adhere them; and
- d. directing flow of the adhesive in excess of that for adhering the terminal and the supporting means through the passage means to the collecting means thereby to generally prevent contaminating contact of the electrical components by the excess adhesive and also flow thereof between the separable housings.

3. The process as set forth in claim 2, further comprising the additional step of hardening the adhesive for securing the terminal to the supporting means.

4. The process as set forth in claim 2, wherein the adhesive is thermosetting, and further comprising the intermediate step of heating the thermosetting adhesive thereby increasing the viscosity thereof and causing it to flow subsequent to the engaging step.

7

8

5. The process as set forth in claim 4, comprising the additional step of cooling the thermosetting adhesive and effecting hardening thereof for adhering the terminal and supporting means.

6. The process as set forth in claim 2, further comprising the intermediate step of flowing the adhesive into means for receiving it provided in the supporting means upon engaging the terminal and the supporting means.

7. The process as set forth in claim 6, wherein the engaging step includes the substantially simultaneous step of disposing a tab on the terminal within the receiving means for adhering engagement with the adhesive therein.

8. The process as set forth in claim 2, further comprising the substantially simultaneous step of flowing the adhesive into means for receiving it upon the coating of the supporting means with the adhesive.

9. The process as set forth in claim 8, wherein the engaging step further comprises inserting means on the terminal into the receiving means for adhering engagement with the adhesive therein.

10. The process as set forth in claim 2, wherein the engaging step further comprises placing the terminal in engagement with a seating surface therefor on the supporting means with the seating surface extending in predetermined spaced relation above the collecting means.

11. The process as set forth in claim 10, wherein the passage means includes a groove in the supporting means communicating between at least a portion of the seating surface and the collecting means, and wherein the directing step further comprises flowing the excess adhesive through the groove.

12. The process as set forth in claim 10, wherein means is recessed in the seating surface for containing at least a portion of the adhesive and the passage means includes a groove in the supporting means intersecting with at least a portion of the containing means and communicating with the collecting means, and wherein the directing step further comprises flowing the excess adhesive through the groove means.

* * * * *

25

30

35

40

45

50

55

60

65