A conductive metal terminal with contact making portions extending above and below a metal panel. A two-piece insulating assembly permits the terminal to be inserted into a hole in the metal panel. Then, upon application of a tool, the bottom half of the insulator assembly is forced toward the panel and locks the terminal into place. The bottom half of the insulator is retained in its locked position by barb-like annular flanges. The top half of the insulator rests against a flanged head on the metal terminal.
INSULATED ELECTRIC TERMINAL ASSEMBLY

A conductive metal terminal with contact making portions extending above and below a metal panel. A two-piece insulating assembly permits the terminal to be inserted into a hole in the metal panel. Then, upon application of a tool, the bottom half of the insulator assembly is forced toward the panel and locks the terminal into place. The bottom half of the insulator is retained in its locked position by barb-like annular flanges. The top half of the insulator rests against a flanged head on the metal terminal.

BACKGROUND OF THE INVENTION

This invention relates to an electrical terminal for installation on a metal chassis to complement the wiring of any electrical circuit including components secured to the chassis base. Many radio communication, and power supply circuits comprise circuit components mounted on both sides of a panel chassis in order to take advantage of the shielding means afforded by the conductive panel. For this reason, any terminal acting as a junction point for several circuits should be provided with extensions on both sides of the panel. Such a terminal can also be used as a support for small circuit elements such as transistors, small capacitors, and even resistors. When one or more terminals support a circuit, they must have a sturdy construction and be secured to the chassis panel in a firm, solid manner.

One of the features of the present invention is the supporting means formed by an axial clamping sleeve, forced onto the terminal and engaging the panel surface. Another feature of the invention is the plurality of barb-like annular flanges on the terminal shaft for retaining both insulator parts in their clamped position.

For a better understanding of the present invention, together with other details and features, reference is made to the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a partial cross sectional view of the terminal taken along an axial plane and showing the terminal assembly after insertion into a panel hole but before clamping.

FIG. 2 is a partial cross sectional view of the terminal shown in FIG. 1 but with the insulator sleeve forced into its clamping position.

FIG. 3 is a cross sectional view of an alternate form of the terminal assembly, having a clamp which seats firmly on the chassis surface. This figure shows the assembly before clamping.

FIG. 4 is a cross sectional view of the assembly shown in FIG. 3 after the axial clamp has been pushed into its locking position.

FIG. 5 is a partial cross sectional view of an alternate form of terminal wherein a single insulating cylinder is used instead of two. This view shows the terminal before clamping. Portions of the clamping tool are also shown.

FIG. 6 is a view similar to FIG. 5 but with the insulator in its clamped position.

FIG. 7 is a cross sectional view of a metal cylinder used in an alternate form which accepts a contact making conductive rod.

FIG. 8 is a side view of a spring member to be placed within the metal cylinder.

FIG. 9 is a partial cross sectional view of the assembled parts of the spring terminal before clamping.

FIG. 10 is a view similar to FIG. 9 but with all components clamped together on a chassis panel.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, the terminal assembly includes a shaft portion 10, terminated at its upper end by a disk shoulder 11 and a bifurcated portion 12 designed to assist in retaining one or more wires for soldering. A portion of the upper end of shaft 10 may be knurled, i.e., provided with longitudinal ridges as shown at 13. The longitudinal ridges or protuberances permit ease of assembly of the parts yet prevent rotation after being seated. Obviously, the less effective diamond or other type knurling may be used as illustrated in FIGS. 3 and 4 at 13. The lower portions of shaft 10 are formed with a plurality of barb-like annular flanges 14 for engaging two deformable insulating sleeves which may be made of Teflon (Trademark DuPont Company) or polyethylene.

The lower end of shaft 10 is formed with a knob 15 to aid in securing connecting wires (not shown) prior to being soldered. Any convenient form of knob 15 may be used as long as it can be forced through the two insulators.

An upper insulator 16 is formed with an axial hole for receiving shaft 10. It also includes a shoulder 17 for limiting engagement against the panel 18 surface. Both insulators may be formed of semi-deformable material, such as, Teflon, polyethylene, or rubber having a high shear valve. A restricted cylindrical portion 20 of the upper insulator 16 passes through the hole in panel 18 and engages one of the flanges 14. A bottom insulator 21, also acting as a clamp is first pushed onto the lower end of the shaft 10 to the position shown in FIG. 1. Then the assembly is entered into the hole in panel 10 and the lower insulator 21 is forced into the position shown in FIG. 2. It is held in this position by flanges 14. When the insulator 21 is forced into its clamping position, its upper edge rides over the tapered portion of the upper insulator and widens so that it limits against the panel surface. The upper edge 14a of the lower insulator 14 flares outwardly to some extent as indicated in FIG. 2. This is due to the internal chamfered edge 14b shown in FIG. 1. In the clamped position insulator 21 not only forms a firm shoulder for retaining the shaft in its axial position; it also compresses the lower portion of the upper insulator and forces the lesser diameter of the cylinder 20 into a pressurized contact with the sides of the hole in the panel, thus increasing its stability. The terminal is now ready for use.

Referring now to the alternate design shown in FIGS. 3 and 4, all the components are the same except for insulators 16A and 21A. The bottom portion of the upper insulator 16A is formed a tapered step 22 and a larger cylindrical portion 23. The lower insulator is made with a squared-off annular surface 24 and an annular cavity 25 adjoining the lower end of the upper cylinder.

When the above described assembly is to be secured to a panel 10, it is first positioned in the hole as shown in FIG. 3. Then the lower insulator 21A is forced into the position shown in FIG. 4, eliminating space 25, and seating edges 24 of the lower insulator firmly against the bottom surface of panel 18.

Again, the pressure exerted on cylinder 20 by the upper portion of the lower insulator causes the cylinder to expand slightly and fill the hole in panel 18 by pressure contact.

The terminal assembly shown in FIGS. 5 and 6 forms another alternate design. In these figures parts of the clamping tool are also shown. The shaft 10 is substantially the same, including a knurled portion 13, barb-like annular flanges 14, and a lower end portion 15. The upper end portion is provided with a shoulder 11 and a bifurcated terminal 12. The insulator is made in one piece, having, as before an upper portion 27 with a shoulder 28 which limits against the top of the panel 18.

The lower portion of the insulator is the same diameter as the hole in the panel and extends for a considerable distance below the surface of the panel. The insulator is formed with an axial hole which receives the shaft 10 and its retaining flanges 14.

In order to clamp this form of terminal in position, an upper tool cylinder 30 contains a hollowed portion which is placed over the top end of the terminal. A plug 31 is secured inside the cylinder 30 and engages the bifurcated end 12 and the shoulder 11. At the lower end of the terminal a similar cylindrical tool 32 fits over the lower end of the insulator 27A and a spring coupled plunger 33 surrounds a portion of the insulator. Spring 34 is a compression helix and engages a step 35 inside cylinder 32 at its upper end and a flange 36 at its lower end.
end. When the two ends of the tool are brought together by an arbor press, the spring 34 first moves cylinder 32 to limit at the underside of the panel. The upper plunger first pushes the terminal shaft 10 all the way into the insulator 27 until the flange 11 is firmly seated on the top surface of the insulator. Then the lower plunger 33 forces the intermediate section of the insulator into an expanded bulbous part 27B which is retained in the position shown in FIG. 6 by means of the barb-like flanges 14. The tool portions may now be removed, leaving the terminal firmly secured to the panel 18.

The terminal assemblies shown in FIGS. 1 through 6 include ends for soldering to conductive wires. It is also convenient to use a spring clip device which will make temporary contact with a conductive tip 37 which may be manually pushed into contact. Such a terminal is illustrated in FIGS. 7 through 10. The upper casing 38 is shown in FIG. 7 and includes a hollow cylinder having a hollow bore 40 with a smaller opening 41 at its upper end. The spring clip 42 is shown in FIG. 8 and includes a plurality of inwardly positioned spring fingers 43 for gripping the tip 37 (see FIG. 10). The fingers 43 are formed integral with a short shaft 10A having one or more barb-like flanges 14. The casing 38 is secured to the spring clip assembly by a force fit; pressing the casing over a shoulder 44 which may have knurled ridges to insure a permanent junction. Another shoulder 45 may be formed as shown to limit casing 38 and to insure a firm fit in its final insulator mounting.

The casing 38 and shaft 10A are next forced into a hole insulator 46 and the assembly is then put into a hole in a panel 18. At this stage the components occupy the relative positions as indicated in FIG. 9. The assembly is now ready for the crimping action. A tool, similar to the tool indicated in FIGS. 5 and 6, is placed over the upper and lower parts and the lower end of the deformable insulator 46 is forced upwardly to create a bulge 46A (see FIG. 10). This bulge retains the terminal assembly in its clamped position.

Experience has shown that the success or failure of any of the disclosed terminal assemblies depends upon the degree of deformation applied to the insulator. Teflon (polytetrafluoroethylene) has been used and has given excellent results. Other substances, such as polyethylene and rubber may require larger or smaller barb-like flanges than those shown in the figures.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An insulated terminal assembly for mounting within a hole in a panel comprising: a first insulator bushing formed of resilient deformable material and provided with an axial hole therethrough and an external shoulder for limiting against the panel surface; a conductive shaft positioned in the hole and having a disk shoulder making contact with the top surface of the insulator, said shaft including a plurality of barb-like flanges on the shaft; a second insulator bushing also made of a resilient deformable material positioned around the lower portion of the first insulator for forced engagement with some of said barb-like flanges and for clamping action with the bottom surface of the panel.

2. The assembly of claim 1 wherein said shaft has a knurled portion for contact with the hole surface of said insulator with a shoulder.

3. The assembly of claim 1 wherein one of the ends of said shaft is formed with a bifurcated portion to aid in securing a conductive wire.

4. The assembly of claim 1 wherein said first insulator is formed with a tapered outside surface below the panel hole, said second insulator being adapted to ride over the tapered portion when the second insulator is forced into a clamped position.

5. The assembly of claim 1 wherein the upper edge of the second insulator is formed with a reentrant chamfer.

6. The assembly of claim 1 wherein the upper edge of the second insulator is formed with a flat end, the surface of which is substantially at right angles to the outside surface of the second insulator.

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