May 28, 1963 R. A. LAMOUREAUX, JR 3,091,656

TERMINAL ASSEMBLY

Filed April 15, 1959

FIG. 1

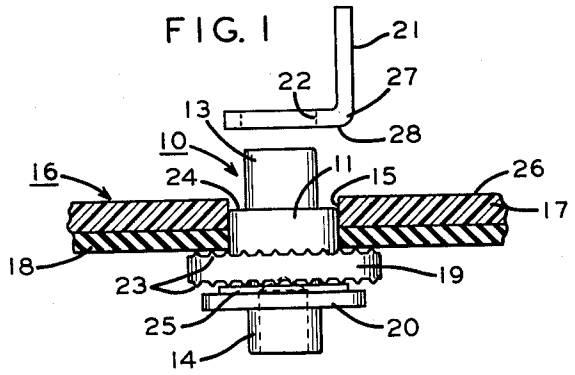


FIG. 2

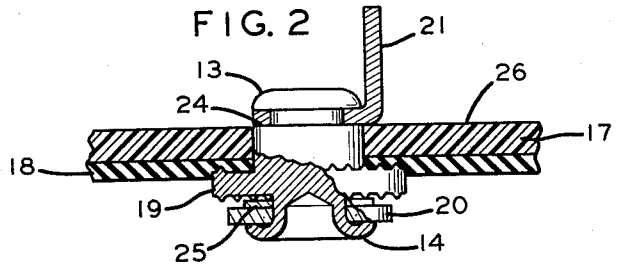


FIG. 3

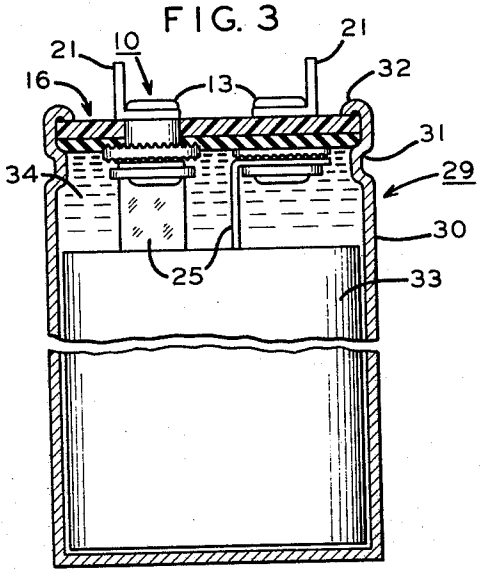
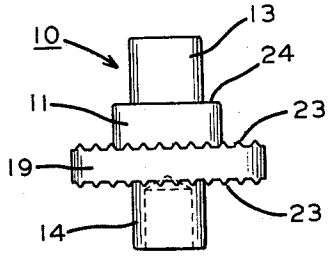


FIG. 4



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TERMINAL ASSEMBLY

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This invention relates to a terminal assembly for electrical components, and more particularly to a terminal assembly extending through a closure of an electrical component.

Electrical components such as capacitors have a construction in which part of the component is contained within an enclosure which is closed by a cover or sealing closure means. The closure means is in seal-tight relationship with the remainder of the containing enclosure. A terminal assembly for the electrical component extending through the closure means must be in combination and in attachment therewith. In those enclosures where the sealing of the component is vitally important, the breach through the closure means by the terminal assembly presents a particularly difficult problem. The passage of the stud of the terminal assembly through the closure means must not break the seal; or, after insertion in the closure means, the terminal assembly and the closure must be so recombined as to heal any breach that has been made in the closure means. Moreover, the healing of the breach must be permanent and able to withstand the vicissitudes of the usage of the component and the passage of time.

In previous constructions, the terminal assembly has been attached in an end closure simply by passing a headed rivet through the closure means. One lead from the component is retained on the terminal assembly on one side of the closure by being secured between the closure and the head of the rivet. The rivet is clinched against an external connector or terminal post on the other side of the closure means. In this way the tab, rivet and the closure means are held together, and the external connector is squeezed against the closure. This, at one time, serves to provide mechanical connection of the external connector with the rivet and the rivet and tab with the closure member and electrical contact of the tab to the external connector. In addition, such a terminal assembly serves to close the hole through the closure. Although it is in widespread use, this construction has been found to have many shortcomings. One such shortcoming is the loosening of the electrical and mechanical connections upon fracture of the closure means.

It is an object of this invention to provide a terminal assembly for electrical components in which the electrical connection is independent of the closure means.

It is another object of this invention to provide a terminal assembly for a closed electrical component which avoids arcing.

Still another object of this invention is to provide an electric terminal assembly on an electrical component having the electric leads and the closure means of the component connected together with the electric leads independent of mechanical connection to the closure means of the component.

These and other objects of this invention will become more apparent upon consideration of the following description taken together with the accompanying drawings in which:

FIG. 1 is a vertical section through the terminal assembly of this invention in relation to a closure means in partially disassembled form;

FIG. 2 is a vertical section of the assembled terminal assembly of this invention mounted in a closure means;

FIG. 3 is a vertical section of an enclosed capacitor utilizing terminal assemblies constructed according to this invention; and

FIG. 4 is an elevational view of the plural shouldered, double ended rivet-insert of this invention.

The terminal assembly of this invention is not dependent upon the closure member of the electrical component for maintaining electrical connection throughout the terminal. The terminal assembly is fastened to the closure member, and the electrical connections in the terminal assembly are held on the rivet-insert terminal independently of the closure. Layers of the closure are held together by the terminal assembly to seal the passage through the closure and to fixedly position the terminal assembly with respect to the closure means.

Referring to FIGURE 1, an electrically conductive terminal assembly according to this invention is shown in partially disassembled form. The terminal assembly includes a plural shouldered, double ended rivet-insert or body 10 having a shank 11. At the axial ends of shank 11, the rivet-insert or body 10 is provided with a solid end 13 and a tubular end 14. Rivet-insert 10 is shown positioned in a passage 15 through a closure means 16 made up of an upper layer 17 composed of a hard insulating material such as Bakelite and a lower layer 18 made up of a soft compressible material such as rubber. The shank 11 is dimensioned to fit snugly into the passage 15 and substantially fill the passage 15. The rivet-insert 10 is provided with a shoulder 19 which extends radially around said rivet-insert; so that when the rivet 10 is inserted in the passage 15, the shoulder 19 is located against the rubber lower layer 18 side of the closure means 16. The shoulder 19 is provided with serrations 23 on its upper and lower surfaces. The upper serrations 23 are of such a nature as to bite into the rubber layer 18 when the shoulder 19 is forced against and into the rubber layer 18. Positioned beneath the shoulder 19 as seen in FIG. 1 is a free washer 20. The washer 20 is independently movable with respect to the rivet 10 and is inserted around the lower tubular end 14 in position to bear against the serrations 23 on shoulder 19.

As shown in FIG. 1, the shank 11 does not extend completely through the passage 15. When the shoulder 19 is positioned against the lower layer 18 with the serrations 23 in abutment with the lower surface of the lower layer 18, the shank is still too short, as shown in the disassembled form of FIG. 1. The height of the shank 11 is less than the composite thickness of the layers 17 and 18 making up the closure means 16. The shank 11 has an upper surface or shoulder 24 formed by the differences in diameter between the diameter of the shank 11 and the lesser diameter of the upper solid end 13. This annular surface 24 lies within the passage 15 in the partially assembled condition. An external terminal connector 21 is provided for connection on the extension 13 at the upper end of the rivet 10. An inner lead or tab 25 is mounted on the extension 14 on the lower side of the closure means 16. The tab 25 is inserted between the nether surface of the shoulder 19 and the washer 20. In FIGURE 1 the external terminal connector 21 is shown separated away from the extension 13. The terminal 21 is provided with a central opening 22 which fits around the extension 13 when terminal 21 is positioned over the extension 13.

In FIG. 1 the terminal asembly of this invention is shown in partially assembly form. To complete the assembly, the terminal 21 is placed over the extension 13 and seated against an upper surface 26 of the layer 17. The terminal 21 has a corner 27 with an under surface 28. When the terminal 21 is brought against the sur-

face 26, the under surface 28 bears against the surface 26. In completing the assembly operation the extensions 13 and 14 are riveted over so that their outer ends are flanged and turn over to bear against the terminal 21 and washer 20. The riveted over headed end 13 presses the surface 28 at the corner 27 against the upper surface 26 or layer 17. Layer 17 is made up of a hard material, and in turn presses against the softer layer 18 which is seated on the upper serrations 23 of the shoulder 19. The layer 18 yields to permit serrations 23 on shoulder 19 to bite into the lower layer 18, thereby anchoring the terminal assembly against rotation. In the operation of cold heading end 13, terminal 21 becomes seated against the annular surface 24 and thereby is fixedly held in position in the terminal assembly in its seat on the annular surface 24. Thus, the terminal 21 is mechanically and electrically connected to the shank 11 by seating on the annular surface 24. At the same time, the riveted over or clinched outer end of extension 14 presses the washer 20 against tab 25, which in turn is pressed against the nether serrations 23 of the shoulder 19 to clamp the tab 25. Inasmuch as rivet 10 and tab 25 are of the same material and substantially the same temper, lower serrations 23 are needed to ensure permanent electrical contact that might otherwise be destroyed by the springiness of the parts.

The completely assembled form of the electric connection is shown in FIG. 2, wherein the riveted over extensions 13 and 14 bear against the parts, thereby serving to compact them into the completed structure. The tab 25 lying between the washer 20 and the shoulder 19 is held tightly in position against the nether serrations 23 of the shoulder 19. Similarly, the terminal 21 is clamped against the surface 24. This action holds the terminal 21 tightly on the terminal 10, and attaches the terminal 21 to the tab 25 in electrical connection without mechanically attaching either member to the closure means 16. In other words, independently of the closure means 16 with its upper and lower layers 17 and 18, the terminal 21 and tab 25 are held together mechanically on the shank 11 and in electrical connection.

The terminal 21 on the surface 24, pressing against the surface 26, forces the layer 17 downward on the shank 11. The layer 17 in turn presses against the lower layer 18 which is compressible and flows as it is forced against the upper serrations 23 of the shoulder 19 to accommodate the incursion of the serrations 23 and the shoulder 19 into the lower layer 18. When the surfaces 26 and 24 are in the same plane, the shoulder 19 must be inserted into the lower layer 18. The serrations 23 thus dig into the lower layer 18 and cause it to be tightly clamped by the shoulder 19 and, consequently, the terminal assembly is securely fixed against rotation on the closure means 16. Thus, a secure mechanical connection is made between the terminal assembly and the closure means 16. This mechanical connection, however, is independent of the mechanical connection of terminal 21 and tab 25 in the terminal assembly and, thus, leaves the electrical connection through the closure means independent of the mechanical connection to the closure means.

FIG. 3 shows a capacitor 29 adapted with this invention. The terminal assemblies provided for the capacitor are mounted on the closure means 16 by the riveting action described above. The shanks 11 penetrate through the closure means 16 and also provide the parts for conductive connection to the electrode tabs 25 from the capacitor section 33. It will be understood that any kind of lead construction can be used. The anode lead may, for example, be in the form of a longitudinally slotted wire in the slot of which the anode electrode is clamped. The other lead may be a tab to the appropriate electrode as described in application Serial No. 413,150, now U.S. Patent No. 2,869,052. The external

terminal connector 21 may merely be provided with an aperture through which it is held by one of the rivet extensions 13. The closure means 16 is shown positioned in a suitable container can 30 and retained in position by sitting on a rib 31 and held in position by a marginal lip 32 spun over against the upper layer 17 of the closure means 16. Thus, the closure means 16 is clamped in place at the mouth of the can 30. The capacitor 29 is of the electrolytic type containing a capacitance section 33 and having an electrolyte 34 which permeates through the section 33.

FIG. 4 shows rivet-insert 10 in the unassembled condition shown in FIG. 1, but apart from the other components of the terminal assembly. The ends 13 and 14 of the rivet are of substantially the same diameter. While end 13 is shown as being solid and end 14 is shown as tubular, it will be understood that both ends could be of the same construction. Shank portion 11 is shown as substantially half again as wide as ends 13 and 14, so as to provide a suitable ledge 24 for seating the external terminal connector. Flange 19 which carries serrations 23 on both shoulders is shown as being more than twice the diameter of ends 13 and 14 to effect wide angle seating against the closure member. It should be understood that while the relative dimensions set forth herein constitute the preferred embodiment of this invention, variations in dimensions may be made within the scope of the invention.

Among other advantages, this invention avoids arcing, because the terminal is not mechanically dependent on the cover. There is provided a positive contact through the closure means independent of the mechanical connection to the closure means. Thus, there is no tendency of the terminal itself to work loose from the closure means and produce the conditions leading to arcing.

It will be understood that the above-described embodiment has been set forth for the purpose of illustration only and that various modifications may be made by persons skilled in the art without departure from the spirit of this invention which is defined only by the scope of the appended claims.

What is claimed is:

1. In an electrical component, a container, a closure member for closing said container, said closure member having a relatively non-yieldable portion and a relatively yieldable portion, a passageway through said non-yieldable portion and said yieldable portion, a terminal assembly mounted in said passageway, said terminal assembly having at least a first shoulder and a second shoulder separated by a shank, said shank being shorter than the uncompressed total thickness of said non-yieldable portion and said yieldable portion, an electrical connection secured to said first shoulder, said second shoulder being seated against said closure member, a second electrical connection secured to said terminal assembly, said first electrical connection and said second shoulder being so mounted on said closure member that seating said first electrical connection against said first shoulder holds said closure member under compression between said first electrical connection and said second shoulder, whereby said terminal assembly closes said passageway and said electrical connections are attached to said terminal assembly independently of the compression of said closure member.

2. A closure assembly for an electrical component comprising a cover member having a relatively rigid layer and a relatively resilient layer, a passageway in said member through said rigid layer and said resilient layer, a terminal assembly mounted in said passageway, said terminal assembly having at least a first shoulder and a second shoulder separated by a shank, said shank being shorter than the uncompressed total thickness of said rigid layer and resilient layer, an electrical connection secured to the first shoulder, the second shoulder being seated

against said cover member, a second electrical connection secured to a third shoulder, said first electrical connection and said second shoulder being so mounted on said cover member that seating said first electrical connection against said first shoulder holds said cover member under compression between said first electrical connection and said second shoulder, whereby said terminal assembly closes said passageway and said electrical connections are attached to said terminal assembly independently of the compression of said cover member by said first electrical connection and said second shoulder.

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