Aug. 25, 1959 T. F. ARONSON ET AL 2,901,721

ELECTRICAL TERMINAL MEANS

Filed Jan. 6, 1958

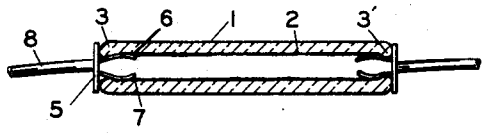


FIG. 1

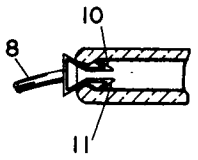


FIG. 2

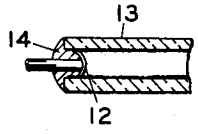


FIG. 3

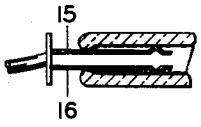


FIG. 4

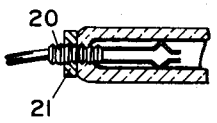


FIG. 5

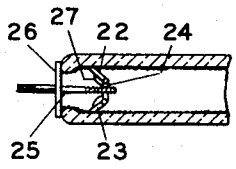


FIG. 6

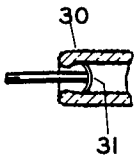


FIG. 7

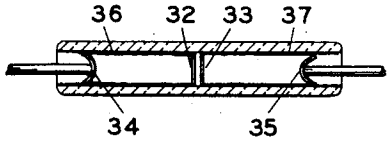


FIG. 8

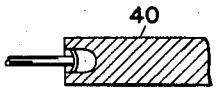


FIG. 9

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ELECTRICAL TERMINAL MEANS

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Application January 6, 1958, Serial No. 707,183

2 Claims. (Cl. 338—258)

This invention relates to electrical terminal means adapted to be inserted in electrical components and particularly for resistors of the type having a resistance material deposited on the inside of hollow tubing.

The principal problem with this type resistor is the affixing of the end terminals. Heretofore, an end cap was generally clamped or otherwise fastened to each end, the cap having an extending wire for connecting purposes. The clamping of these caps is a difficult and tedious operation which must be carefully done to avoid breakage, especially since the tubing may be of a fragile nature such as glass or ceramic. With this method it is often difficult to secure the proper electrical contact. Another prior method involved drilling holes in the tubing near the ends, which is a difficult and expensive operation, especially with glass tubing.

The present invention solves these problems by providing an end member with spring contact fingers connected thereto, which is merely slipped into the open ends of the tubing. The spring fingers provide both electrical contact and mechanical connection. For greater mechanical strength the ends of the tubing are preferably fire-polished to form a bead or internal lip around the inside edge of the end of the tubing. If the tubing is molded, the inside lip may be an integral part thereof.

Accordingly, a principal object of the invention is to provide new and improved electrical terminal means.

Another object of the invention is to provide new and improved electrical resistor and terminal means of the type having resistance material deposited on the inside of hollow tubing.

Another object of the invention is to provide new and improved electrical resistor means of the type having resistance material deposited on the inside of hollow tubing comprising end pieces having spring finger contacts which are merely inserted in the ends of the tubing.

Another object of the invention is to provide new and improved end terminals for resistors of the type utilizing hollow tubing construction.

These and other objects of the invention will become apparent from the following specification and drawings, of which:

Figures 1 to 9 are sectional views of embodiments of the invention.

Referring to Figure 1, there is shown a sectional view of a hollow tubing **1**, for instance of glass, having resistance material **2** deposited or plated on the inside surface of the tubing. The tubing is shown as having internal lips **3** and **3'** at its ends.

There is provided a terminal member which comprises a plate member **5** to which is connected a plurality of spring fingers **6** and **7** which are slightly curved and tend to bend outwardly against the inside surface of the tubing. An external wire **8** is also connected to the terminal member **5** in order to make external electrical connections. The internal lip on the tubing is not absolutely necessary, but does provide a more positive mechanical connection. The internal lip may be formed

with glass tubing by fire-polishing, that is, holding the end of the tubing in a flame hot enough to soften it and turning it at the same time. If the tubing is molded in the correct size rather than cut, the internal lip could be an integral part. The number of spring fingers is not critical. However, it is preferable to have at least three or four, the mechanical strength being proportional to the number of fingers. The spring fingers provide electrical contact with the resistance material on the inside of the tubing as well as the mechanical connection. The spring fingers may be made out of any electrically conducting spring material, for instance, Phosphor bronze. The end terminals are connected by merely inserting them in the ends of the tubing. If desired, they may also be cemented to the tubing.

Figures 2 to 9 show other embodiments of the invention. In Figure 2 the spring fingers **10** and **11** have a sharp bend and extend back towards the end. The ends of the spring fingers, therefore, tend to dig into the sides of the tubing to resist being pulled out.

Figure 3 shows another embodiment wherein the spring fingers are replaced by a spring member **12** which may be dish-shaped or shaped like a hemisphere and is preferably serrated or slit. The hemisphere **12** is pushed into the tubing and provides a spring-like contact against the inside walls thereof. The member **12** may comprise a plurality of fingers. The tubing **13** in Figure 3 does not require an internal lip. If desired, the end may be sealed with cement or other sealer **14**.

Figure 4 shows another embodiment having long spring fingers **15** and **16** which may be adjustably placed for providing a proper resistance value. The terminal may be cemented in place after adjustment.

Figure 5 is similar to Figure 4 except the end member **20** is a threaded cylinder so that a depth gauge nut **21** may be screwed down against the ends of the tubing to fix the spacing of the contacts. The end of the tubing is preferably internally threaded.

Figure 6 shows an embodiment of the invention having a toggle arrangement. A pair of wing members **22** and **23** are pivotally mounted on a tapped center piece **24**. The threaded stud **25** attached to the end member **26** is screwed into the center piece **24**. The wing members are spring loaded out by spring **27** and are drawn up under the internal lip as the stud is tightened.

Figure 7 shows an embodiment wherein the resistance material **30** is deposited on the outside and continued inside around the lip to contact with the internal terminal **31**, similar to terminal **12**.

Figure 8 shows a capacitor comprising plates **32** and **33** which are connected to internal terminals **34** and **35** by internal connections **36** and **37**. Filters and networks may be so constructed.

The internal terminals of the present invention may be used on a tubular resistor, for instance of carbon or with a solid resistor **40**, Figure 9, hollowed out at the ends. The internal terminals are preferable in many uses, for instance, where there are space limitations.

The internal electrical terminals of the invention may be used in a variety of electrical components to avoid soldering caps or other type connections. They are advantageous for miniaturization and in promoting safety, as the contacts are not exposed. However, they are not limited in size but may be used for large components also.

We claim:

1. Electrical resistor means comprising a hollow tube having an internal lip projecting inwardly at its ends, resistance material deposited on the inside surface of said hollow tube, and terminal means comprising a member having at least two spring means, said spring means being adapted to fit behind said internal lip in a positive manner

to provide electrical and mechanical contact between said member and said tube.

2. Electrical resistor means comprising a hollow tube having an internal lip projecting inwardly at its ends, resistance material deposited on the inside surface of said hollow tube, and terminal means comprising a member having spring means, said spring means being adapted to fit between said internal lip in a positive manner to provide electrical and mechanical contact between said member and said tube.

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