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2,020,289

RESISTANCE UNIT

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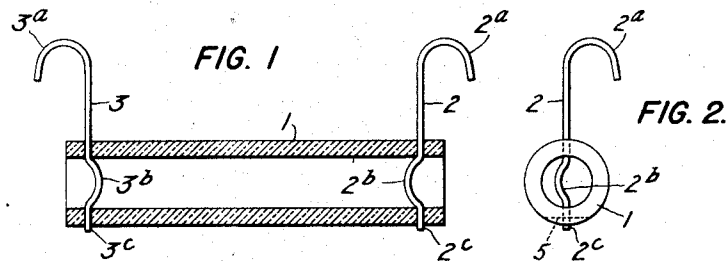
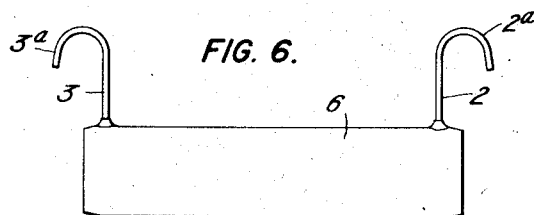
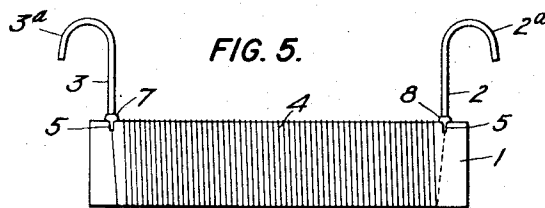
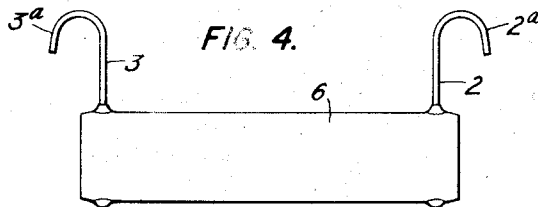
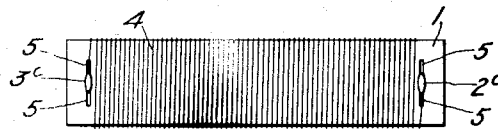


FIG. 3.



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RESISTANCE UNIT

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9 Claims. (Cl. 201-63)

This invention particularly relates to an improved tubular resistance unit and method of making the same wherein the resistive conductor is wound on a hollow insulating tube and in which the tube also serves to carry the terminals to which the resistive conductor is connected.

The main object of the invention is to produce a resistance unit of the tubular type which is adapted to be readily manufactured at comparatively low cost, while, at the same time, producing an article which is dependable in long continued use and satisfactory in various other commercial requirements. The economy in cost of production is secured not only by convenience and rapidity in making, but also by use of a form of terminal connection which permits the cost of material forming the terminal connection to be low. Another object is to provide a form of terminal connection which, although simple in character, will not be displaced or disturbed in ordinary usage and which will form a permanent good electrical connection with the resistive conductor. Another object is to avoid the use of any closed circuited coil or band around the tube in forming the terminal connection or connections, as such commonly used coils or bands are often objectionable when the resistive unit is used in connection with high frequency apparatus. Another object is to provide a resistive unit which will have a smooth and pleasing appearance without objectionable protuberances. Other objects and advantages of the invention will be understood by those skilled in the art from the following description and accompanying drawing which illustrates preferred embodiments of the invention.

Figure 1 is a longitudinal section of a unit showing the mounting of the terminals therein. Fig. 2 is an end view of the structure shown in Fig. 1. Fig. 3 is a bottom view of the structure shown in Fig. 1 and also showing the resistive conductor applied to the tube and connected to the terminals. Fig. 4 is a side view of the completed unit. Fig. 5 is a side view showing the resistive conductor on the tube and connected to a different part of the lead from that shown in Fig. 3 and Fig. 6 is a side view of the completed unit having the form of connection shown in Fig. 5.

Referring to Figs. 1 and 2, the hollow tube 1 of insulating material forms the main support for the parts. It is preferably made of porcelain, although it may be made of any other acceptable insulating material adapted for such use. At the points where the terminals are to be located, holes are drilled or formed in the tubes, each terminal having a pair of holes preferably diametrically

opposite. A bendable lead is used which passes through oppositely located holes in the tube and, in order to hold the same in place on the tube, the lead is bent at the inner surface of the tube so as to form a loop for holding the same in position. Thus a lead in Figs. 1 and 2 is shown at 2 in the form of a copper wire having an outer end 2^a for convenient connection to other devices or conductors. This copper wire is shown as passing through two oppositely located holes near the end of the tube 1 and is bent within the tube to form a loop 2^b. This bend or loop in the wire is sufficiently pronounced to insure the lead being held in place on the tube and may be formed by pushing a cone-shaped tool in the end of the tube, or otherwise. One end 2^c of the wire terminal is shown projecting a little beyond the surface of the tube for connection thereto of the resistive conductor. At the opposite end of the tube is shown another lead wire 3 having the corresponding parts 3^a, 3^b and 3^c.

Fig. 3 shows the resistive conductor 4 applied to the insulating support, being wound thereon and having its ends connected to the lead wires. In applying the resistive conductor, one end thereof is given a few turns around the end 3^c of one of the terminals and then is wound around the tube in the usual way to the end 2^c of the other terminal and is given a few turns around this end so as to be secured thereto. In order to serve as a guide for the ends of the resistive conductor, a narrow slot 5 is formed circumferentially on the insulating tube and across the openings which receive the ends 2^c and 3^c of the lead wires, these slots being cut in the tube before the lead wires are placed in position. Thus when the end of the resistive conductor is wrapped around the end 3^c, the conductor then passes through and is lodged in one portion of the slot 5 as it passes from the end 3^c around the tube. Similarly when the end of the conductor reaches the other end of the tube it will pass in and through one portion of the slot 5 and then be wrapped around the end 2^c. These guiding slots for the resistive conductor are not essential but are convenient for properly locating and directing the conductor. The slot is also utilized to hold the end of the lead in place. The ends 2^c and 3^c are preferably flattened so as to fit snugly in the slots, thereby preventing any movement of the lead which might break the resistive conductor during or after the process of manufacture. After being thus assembled, the resistive conductor is preferably soldered to the lead wires at the ends 2^c and 3^c for forming a good electrical connection. The solder used should be a solder

having a comparatively high melting point, such as a high temperature silver solder.

The unit is next covered with an insulating coating on the external surface of the tube so as to insulate and protect the resistive conductor from mechanical injury and moisture in the usual way. This coating is preferably an adhesive vitreous enamel as it firmly adheres to the parts, has high insulating qualities and is impervious to moisture. The enamel material after being applied to the unit so as to cover the small projections 2° and 3° and also the base of the lead wires where they extend outwardly from the tube, is matured in a furnace to produce the finished product, such as shown in Fig. 4. The external surface of the tube has a smooth appearance with only slight projections where the connection of the resistive conductor is made at the ends 2° and 3°.

Instead of connecting the resistive conductor to the end 2° or 3° of the lead wire, the conductor may be connected to the lead at the point where the main portion leaves the tube. Thus in Fig. 5 the resistive conductor is wrapped around the lead 3 at the point 7 and soldered thereto and similarly at the point 8 of the lead 2. Likewise, the slot 5 would be formed in the tube at the point where the main part of the lead leaves the tube, for guiding the resistive conductor and holding the flattened lead in place. In the form shown in Fig. 5, the projecting ends, such as 2° and 3° are avoided so that the tube at such points has a smooth external appearance without any material projections. This form of tube in completed form is shown in Fig. 6.

Although I have shown the leads located at the ends of the tube, it is evident that one or more may be located at intermediate points along the length of the tube and the resistive conductor connected thereto, as already described, where it is desired that the unit be supplied with taps. It will also be understood that instead of the leads, such as 2, 3, being formed of a solid copper wire, they may be of other forms or of other material; likewise the terminal instead of having outwardly extended portions for connection to an external circuit, may be connected to other forms of external terminals and serve as anchoring means or intermediate connection, therefor. Also, the leads may be bent at the outside surface of the tube, or enlarged or flattened at the outside surface of the tube to hold the same in place.

Although I have described particular improvements of my invention, it will be understood that various modifications and adaptations may be made without departing from the scope of my invention.

I claim:—

1. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said terminal extending across the interior of the tube substantially in a plane perpendicular to the axis of the tube and being bent within the tube to hold it in place, and extending outwardly from the tube to form an external terminal.

2. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of openings extending from the outside of the tube to the inside of the tube, and said terminal passing through said openings and across the interior of the tube substantially in a plane perpendicular

to the axis of the tube and being bent within the tube to hold it in place.

3. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of openings extending from the outside of the tube to the inside of the tube, and said terminal passing through said openings and across the interior of the tube substantially in a plane perpendicular to the axis of the tube and being bent within the tube to hold it in place, and extending outwardly from the tube to form an external terminal.

4. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of diametrically opposed openings extending from the outside of the tube to the inside of the tube, and said terminal passing through said openings and across the interior of the tube and being bent within the tube to hold it in place.

5. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of openings extending from the outside of the tube to the inside of the tube and located substantially in a plane perpendicular to the axis of the tube, and said terminal being in the form of a wire passing through said openings and across the interior of the tube and being bent within the tube to hold it in place.

6. A resistance unit, comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of diametrically opposed openings extending from the outside of the tube to the inside of the tube, and said terminal being in the form of a wire passing through said openings and across the interior of the tube and being bent within the tube to hold it in place and extending outwardly from the tube to form an external connection.

7. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said terminal extending through two walls of the tube and across the interior of the tube substantially in a plane perpendicular to the axis of the tube and being bent to hold the same in fixed position on the tube.

8. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of openings extending from the outside of the tube to the inside of the tube and located substantially in a plane perpendicular to the axis of the tube, and said terminal passing through said openings and across the interior of the tube and being bent to hold the same in fixed position on the tube.

9. A resistance unit comprising an insulating tube, a resistive element thereon, and a terminal to which said resistive element is electrically connected, said tube having a pair of openings extending from the outside of the tube to the inside of the tube and located substantially in a plane perpendicular to the axis of the tube, and said terminal passing through said openings and across the interior of the tube and being bent to hold the same in fixed position on the tube and extending outwardly from the tube to form an external terminal.

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