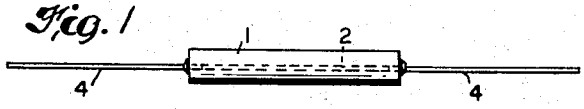
Jan. 9, 1951 W. M. KOHRING 2,537,061

RESISTANCE UNIT

Original Filed Feb. 23, 1946

Fig. 1



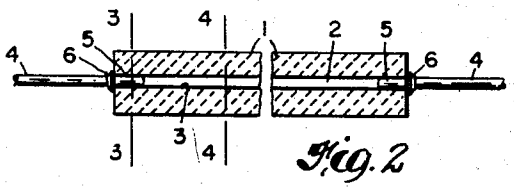


Fig. 2



Fig. 7

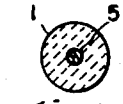


Fig. 3



Fig. 4

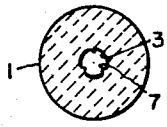


Fig. 5

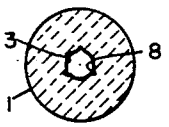


Fig. 6

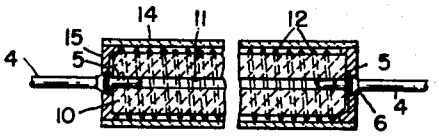


Fig. 8

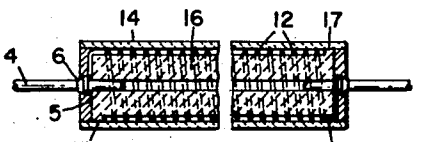


Fig. 10

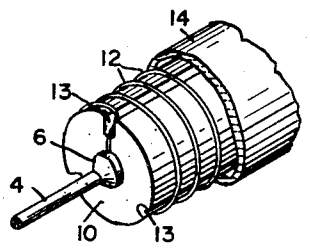


Fig. 9

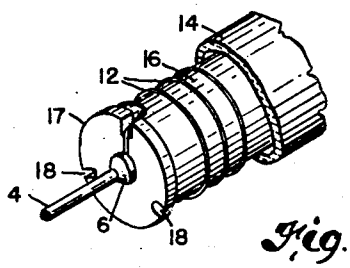


Fig. 11

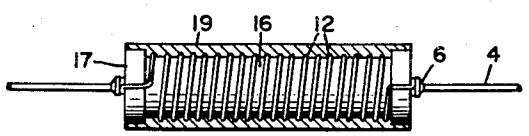


Fig. 12

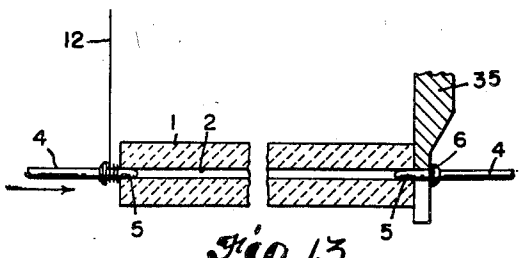


Fig. 13

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2,537,061

RESISTANCE UNIT

Wilbur M. Kohring, Lakewood, Ohio

Original application February 23, 1946, Serial No. 649,559, now Patent No. 2,487,057 dated November 8, 1949. Divided and this application February 23, 1949, Serial No. 77,713

11 Claims. (Cl. 201—63)

1

The present improvements, while relating generally to resistance units, irrespective of their application, have more particular regard to resistance units such as are utilized in communication and signalling systems, both wire and radio, in which the electric currents involved are of relatively low amperage.

Great numbers of such units are, for example, required in connection with modern radio transmitting and receiving equipment so that the cost thereof is of important consideration. At the same time it is quite essential that such resistance units should be of sturdy construction, not subject to deterioration in use, and capable of convenient installation.

Accordingly, one principal object of the present invention is to provide a unit which will be of exceedingly simple construction and yet be capable of standing up under severe conditions of use. A further object is to provide a unit which is adapted for manufacture by automatic or semi-automatic methods, thus permitting quantity production and corresponding reduction in cost.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain methods and products exemplifying the invention, such disclosed procedures and products constituting, however, but several of various applications of the principle of the invention.

In said annexed drawings:

Fig. 1 is a side elevation of one form of my improved resistance unit;

Fig. 2 is a longitudinal central section thereof on a somewhat larger scale;

Figs. 3 and 4 are transverse cross-sections thereof on the same scale as that of Fig. 2, the planes of such sections being indicated by the lines 3—3 and 4—4 respectively on said figure;

Figs. 5 and 6 are cross-sectional views both taken on the plane indicated by the line 3—3 on Fig. 2, but on a still larger scale in order to better illustrate certain modifications which may be employed in order better to secure the terminals of the unit to the body member;

Fig. 7 is partly a side elevation and partly a sectional view of a modification of the unit;

Fig. 8 is a central longitudinal section of such modified form;

Fig. 9 is a perspective view of one end of such modified unit with portions broken away in order better to illustrate the construction;

2

Fig. 10 is likewise a central longitudinal section of still another modified form of my unit;

Fig. 11, like Fig. 9, is a perspective view of one end of such unit with a portion thereof broken away;

Fig. 12 is a central longitudinal section of still another modified construction of my unit; and

Fig. 13 is a view, more or less diagrammatic in character, illustrating the assembling of parts that enter into the forms of the units shown in Figs. 7 to 12 inclusive.

Referring to the form of resistance unit illustrated in Figs. 1 to 6 inclusive, the body 1 thereof consists of a tubular member of insulating material such as molded resin, porcelain or other ceramic material, the size of said member, and more particularly the superficial area of the axial bore 2 that extends therethrough, being varied to suit the requirements for which the unit is designed. The surface in question has applied thereto (Fig. 2) a thin coating 3 of graphite, amorphous carbon, or like conducting material. The latter may be applied in various ways, for example in the form of a paste made by intermixing such graphite or the like with a suitable vehicle, such as a liquid resin, varnish or similar binder. While such coating composition may be applied in any suitable manner, as by dipping or spraying, it will be applied in a manner to insure uniformity in the coating with correspondingly close limitation of the specific resistance which such coating will provide when connected with the terminals 4, 4 of the unit.

The latter, which will consist of any suitable metal, preferably comprise short lengths of wire, the inner ends 5 whereof have a diameter slightly larger than that of bore 2 in the body of the unit. Such terminals 4 are also preferably, although not necessarily, formed with integral upset shoulders 6 spaced a short distance from the inner ends thereof so as to insure the correct location of such ends when the terminals are inserted in the body, or in other words, insure uniformity in the longitudinal extent of the coating 3 which lies between and electrically connects such ends. As a result the resistance afforded by such coating may be accurately gauged.

In order to insure a firm connection between the ends 5 of terminals 4 where they are thus fitted into the bore 2 of the body of the unit, such bore may be formed with angular longitudinally extending ribs 7, as illustrated in Fig. 5, or with similar longitudinally extending angular grooves 8, as illustrated in Fig. 6. Accordingly, remembering that the diameter of such terminal ends

is equal to or slightly greater than that of the bore, when the former are forcibly inserted into the latter the metal composing the terminals will either be cut by the ribs 7 or forced into the grooves 8 so as to provide a very firm, serrated connection between the two parts in question. It will be understood that the coating 3 as initially applied to the bore 2 extends substantially to the respective ends thereof, and the terminals when thus forced into position in the body of the unit will necessarily have good electrical contact with such coating.

In the form shown in Figs. 7, 8 and 9, a tubular body 10, similar to body 1, is employed, and terminals 4, identical with those previously described and inserted in the same manner in the bore 11 of such body, are utilized. However, instead of applying a graphite or other coating to provide the desired resistance connection between such terminals, a fine wire 12 is wound helically about the outer cylindrical surface of said body, the ends of the wire being secured to the respective terminals 4 by being wound closely therearound adjacent the shoulders 6 thereon prior to such terminals being forced into their final positions in the body. The convolutions of the wire 12 are of course spaced a sufficient distance apart to avoid any electrical connections therebetween, and in order that they will be held in place the body 11 is formed with one or more notches 13 so that the wire at the corresponding end may be engaged in one such notch (see Fig. 9). In order further to insure against displacement of the convolutions of wire 12 a cylindrical sheath 14 of insulating material is slipped over the same. Such sheath (see Fig. 8) extends a short distance beyond each end of body 10 and the space between such projecting ends and the shoulders 6 on terminals 4 is filled in with plastic insulating material 15, thus providing in effect a close fitting case for the assembled unit, in its entirety.

The form of the device illustrated in Figs. 10 and 11 differs from that just described merely in that the body 16 of the unit is formed at each end with an enlarged head or flange 17 in which notches 18 are provided to catch and hold the corresponding end of the wire 12. The construction otherwise, including the manner in which the unit as a whole is encased, is exactly the same as in the form shown in Figs. 8 and 9 and the same reference numerals are applied to corresponding parts.

Fig. 12 illustrates a further modification of the form of the device shown in Figs. 10 and 11 in that instead of fitting a sheath 14 over the unit a layer 19 of insulating plastic material is applied directly to the outer surface of the body 16 so as to completely fill the space between the heads 17 and embed the convolutions of the wire 12 that is helically wound upon such body. If desired, such plastic material may also be applied to the ends of the body so as to encase the same, together with the shoulders 6 on the respective terminals 4, in the same manner as is illustrated in Figs. 7 and 8.

In Fig. 13 there is illustrated one convenient way of effecting assembly of such units. As there shown, the terminals 4 are initially inserted only part way into the bore 2 of body 1 so as to leave the shoulders 6 on said terminals spaced a short distance from the respective ends of the body. A forked member 35 is then inserted between the shoulder on one such terminal and the adjacent body end, while the end of the wire 12 is wound around the opposite terminal adjacent the shoulder thereon. Next, such last-mentioned terminal is forced into its final position, thus firmly securing the end of the wire in place. Then the wire is wound upon the body so as to provide the requisite number of turns, and upon withdrawing member 35 it is finally wound around the second terminal adjacent the shoulder thereon, and this terminal is then forced into its final position and the assembly operation is completed.

As previously indicated, the provision of the upset shoulders 6 on the terminals 4 is desirable inasmuch as they serve as stops to limit the inward movement of the terminals when inserted in the bore of the insulating body 1 and thus determine accurately the longitudinal extent of the insertion. However, if such shoulders be omitted, the terminals may still be inserted, taking care to accurately control the extent to which they enter the respective ends of the bore.

This application is a division of my application Serial No. 649,559, filed February 23, 1946, now Patent No. 2,487,057, issued November 8, 1949.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the product and method herein disclosed, provided the features stated by any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A resistance unit comprising a body of ceramic insulating material having a bore with angular longitudinally extending serrations at each end, conducting terminals forced in scored engagement in said serrations and having upset shoulders limiting extent of insertion, a resistance wire wound on said insulating body and being anchored in notches at the ends of said body and having its ends wound closely around said terminals inside their shoulders, an insulating sheath over said resistance wire, and insulating material covering the ends of said insulating body and said terminal shoulders.

2. A resistance unit comprising a body of ceramic insulating material having a bore with angular longitudinally extending serrations in each end, conducting terminals forced in scored engagement in said serrations and having upset shoulders limiting extent of insertion, a resistance wire wound on said insulating body and having its ends wound closely around said terminals inside their shoulders, and insulation enveloping said wire.

3. In a resistance unit, a body of insulating ceramic material having a bore with angular longitudinally extending serrations in each end, conducting terminals forced in scored engagement in said serrations, and a resistance element carried by said insulating body and connected to said terminals.

4. In a resistance unit, a core of insulating ceramic material having end openings longitudinally serrate, a resistance wire carried by said core, and terminals held solely by friction grip in said openings and contacting with said resistance wire.

5. In a resistance unit, a core of insulating ceramic material having end openings longitudinally serrate, terminals force-fitted in said openings, and a resistance element carried by said core and contacting with said terminals.

6. In a resistance unit, a core of insulating ceramic material carrying a resistance element and having end openings, and terminals for the resistance element held in said openings by con-

tacting-surface deformation within said openings.

7. In the manufacture of a resistance unit with a core of ceramic insulating material having end openings and terminals to fit therein and having upset shoulders, winding hold-turns of a resistance wire on a terminal inside its shoulder, forcing the terminal into its receiving opening to the shoulder, then winding the resistance wire on the periphery of the core, and winding holding-turns of said wire inside the shoulder of the other terminal while partly in place, and securing the wire and latter terminal by surface-deformation in its receiving opening by axially forcing the terminal into its receiving opening to the shoulder.

8. In the manufacture of a resistance unit with a core of ceramic insulating material having end openings and terminals to fit therein, winding holding-turns of a resistance wire on the terminal, forcing the terminal into its receiving opening, winding the resistance wire on the periphery of the core, and then winding holding-turns of the resistance wire on the other terminal partly in place, and securing the wire and latter terminal by surface-deformation in its receiving opening by axially forcing the terminal into its receiving opening.

9. In the manufacture of a resistance unit with a core of ceramic insulating material having end openings and terminals to fit therein, said core carrying a resistance element, securing the terminals by surface-deformation in their receiving openings and attaining contact to the resistance element by axially forcing the terminals into the end openings without splitting the core.

10. In the manufacture of a resistance unit having a core of ceramic insulating material with end openings, said core carrying a resistance element, affixing terminals by surface-deformation within said end openings by driving same rectilinearly into said end openings without splitting the core.

11. In a resistance unit, a ceramic core having an end opening, a conducting terminal held therein by contacting surface-deformation within said opening, and a recess in the peripheral edge of the core end to provide a positioning point for a resistance wire when wound on said core and connected to the terminal.

WILBUR M. KOHRING.

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