April 17, 1956 W. M. KOHRING 2,742,551

PRECISION RESISTANCES

Filed July 27, 1951

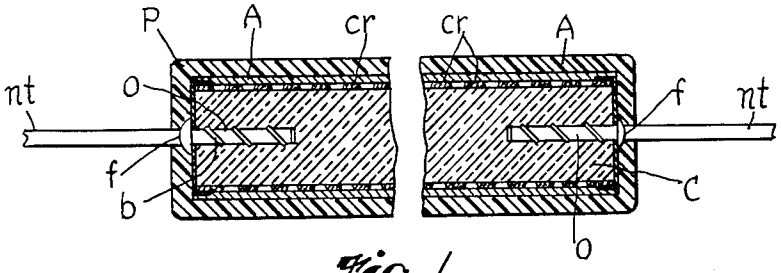


Fig. 1

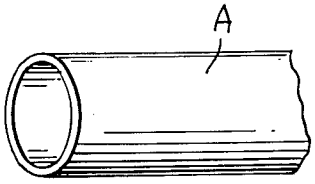


Fig. 2

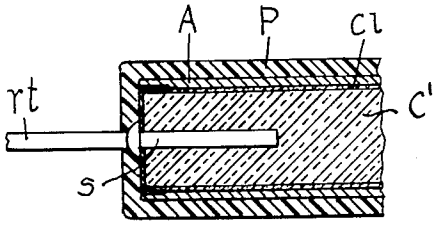


Fig. 3

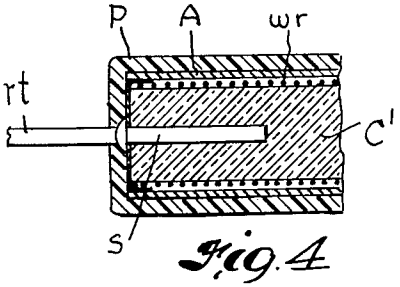


Fig. 4

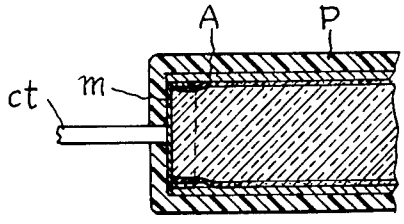


Fig. 5

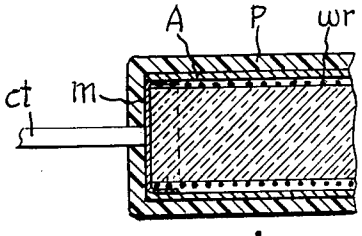


Fig. 6

INVENTOR.
WILBUR M. KOHRING
BY
Oberlin & Limbach
ATTORNEYS.

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PRECISION RESISTANCES

Wilbur M. Kohring, Lakewood, Ohio

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3 Claims. (Cl. 201—64)

In the making of electrical resistance units for radio, television, radar, electrical control instrumentation, etc., it has for some time been a practice to mold an overall cover of synthetic resin plastic onto the resistance element on its insulation core carrier. The function of this has been to exclude moisture especially. Unfortunately, resistances so encased have tended to show variances from specification, and manufacturer's rejects on final inspection have run disproportionately higher than for the same resistance units finished without the casing. No explanation for this has been known. Mechanical damage to the resistance element, whether of carbon or wire-wound surface, by the fluent synthetic resin has been precluded. And neither carbon nor wire would be expected to be affected by the relatively low degree of heat in the synthetic resin. Nor is there any chemical action. I have now found however, that by the features set forth hereinafter it becomes possible to cut this difficulty and loss which have correspondingly lessened efficiency and added to the cost of this kind of product. Other objects and advantages of the invention will appear from the following description.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is an enlarged scale axial sectional view, partly broken, showing a construction in accordance with the invention;

Fig. 2 is a fragmentary perspective view of a resistance element cover; and

Figs. 3, 4, 5 and 6 are fragmentary axial sectional views showing the features of construction applied where there are various forms of terminals.

In general, the construction includes an insulation core, upon the periphery of which is a resistance element, each end being connected to a terminal, and about the resistance element is a special direct cover layer, and then a synthetic resin cover over all. The insulation core may be of ceramic, steatite or other suitable material, and the resistance element thereon may be of carbon or wire winding. Carbon, such as deposited at high temperature in known ways is usually preferred, and it may involve a complete integral coat or it may be in the form of spiral-wise turns. In any case, at each end of the resistance element there is connected a terminal. Thus, as illustrated in Fig. 1, insulation core C is shown with a peripheral carbon resistance element *cr* in spiral-wise convolutions as known for instance by cutting in the manner of thread-cutting or grinding an initially integrally carbon coated core. In this form the ends of the core are coated with a plastic silver composition and the terminals *nt* are driven into place in end opening *o* in the core, seizing

therein by deformation of contacting surfaces, and a flange *f* on each terminal seating upon the silver deposit which soon sets and completes a connection between the metal terminal and the resistance element. The particular form of terminal shown in Fig. 1 has a non-circular cross-section, as with ribs or beads, driven into circular section openings in the core. Over the resistance element, and characteristic of the present invention, is a cover or close sleeve A. This may be applied by wrapping with asbestos fabric or asbestos paper of suitable body, or preferably the material may be initially in the form of a tube as indicated in Fig. 2, of co-related diameter such that appropriate lengths may be applied over the resistance element and fit sufficiently closely thereto that when in the next step of operation the assemblage is placed in the synthetic resin applying device, the synthetic resin will cover the asbestos and the ends of the core, without flowing into the resistance element. The metal terminals then project out through the synthetic resin covering at the ends. The synthetic resin may be applied in various ways, but usually by encasement in molds or by injection molding. Among synthetic resins which are applicable, are urea-formaldehyde, thiourea-aldehyde, melamine, phenol-aldehyde, styrene, etc.

Similarly, where a form of terminal which is of circular cross-section driven into a non-circular or serrated end opening is desired, such terminal, as *rt*, Fig. 3, is driven into the serrated end openings *s* of the insulation core C', and may have a carbon resistance element *cr* integral or spiral, covered with the asbestos cover A and the outside encasement of synthetic resin P. And analogously, a wire wound resistance element *wr*, Fig. 4, on an insulation core may be equipped with circular cross-section terminals *rt* driven into non-circular end openings *s* and the asbestos cover A and outer synthetic resin encasement may be applied.

Where terminals of the form involving a metal cap crimped onto the end and engaging the resistance element are preferred, such terminal *ct* with its cap *m*, Fig. 5, may be completed as a resistance unit with the asbestos cover A and the synthetic resin encasement P; or similarly, as in Fig. 6, such form of terminal with a wire wound resistance element *wr*, Fig. 6, may be completed as a resistance unit by applying the asbestos cover A and the synthetic resin encasement P.

In each instance, with slightly variant forms of cores, terminals and resistance element, the unit is completed by the asbestos cover and the synthetic resin encasement. The thickness of the asbestos cover may vary somewhat depending upon the volume size of the resistance unit; and thus for the small sizes common in radio and television receivers, it is recommended that a thickness of about twenty thousandths and not less than ten thousandths of an inch is desirable, and for larger sizes, this may be further extended correspondingly.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in 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 an insulation core, a resistance element applied thereon, in combination with a molded-on exterior casing of synthetic resin plastic, and between said exterior molded casing and said resistance element means for shielding the latter from flash-heat and damage of the displacement-drag of molding-flow of the applied molten encasing plastic, comprising directly on the resistance element a cover having high heat-resistivity of asbestos.

2. A resistance unit comprising an insulation core, a

resistance element applied thereon, in combination with a molded-on exterior casing of synthetic resin plastic, and between said exterior molded casing and said resistance element means for shielding the latter from flash-heat and damage of the displacement-drag of molding-flow of the applied molten encasing plastic, comprising directly on the resistance element a cover of asbestos at least ten thousandths of an inch in thickness.

3. In making a resistor, the associated steps of applying a resistance element to a core of insulation material, and molding-on an outside encasement of molten synthetic resin plastic while guarding the resistance element against heat-shock and the drag-displacement in the molding by interposing directly on the resistance element a shield having high refractoriness and heat-resistivity of asbestos.

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