

Jan. 10, 1939.

R. O. GRIDALE

2,143,414

ELECTRICAL DEVICE

Filed Aug. 25, 1934

FIG. 1

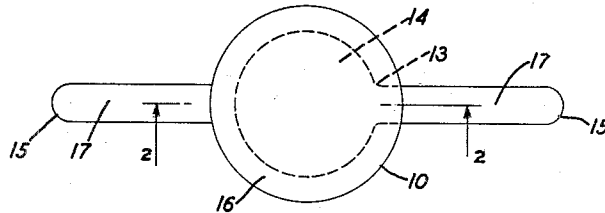


FIG. 2

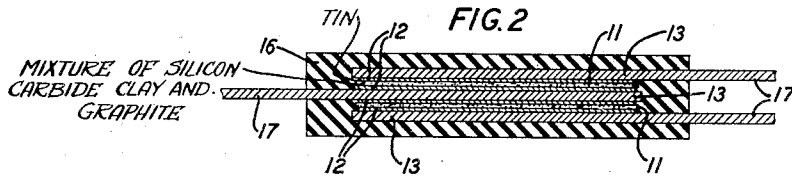


FIG. 3

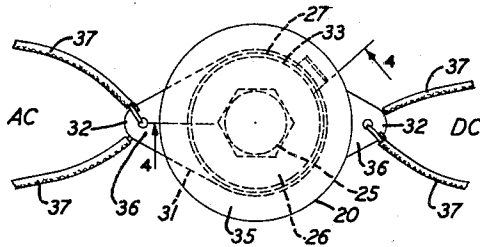


FIG. 4

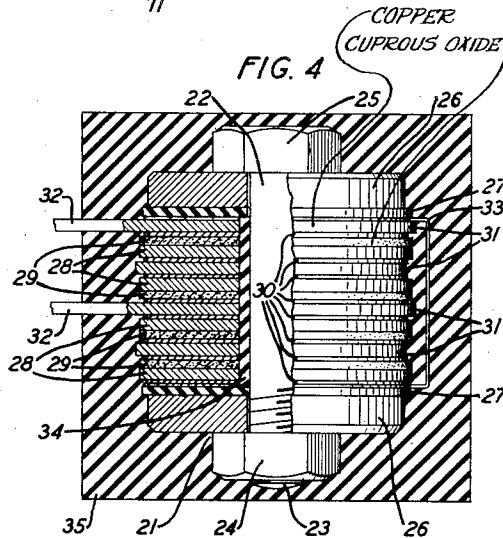


FIG. 5

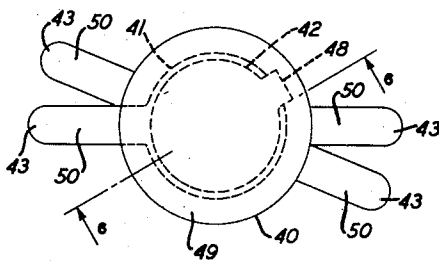
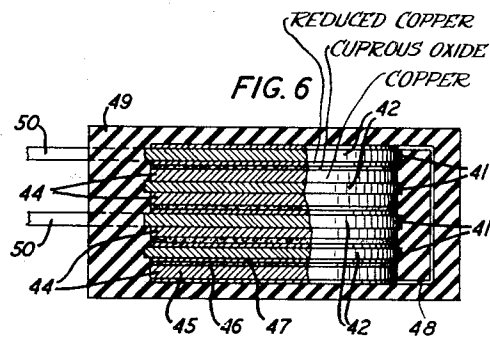


FIG. 6



INVENTOR
R. O. GRIDALE

BY

Halter C. Kiesel

ATTORNEY

UNITED STATES PATENT OFFICE

2,143,414

ELECTRICAL DEVICE

Richard O. Grisdale, New York, N. Y., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

Application August 25, 1934, Serial No. 741,367

2 Claims. (Cl. 201—76)

This invention relates to electrical devices and, more particularly, to a method of mounting such devices and to the article produced by the method.

An object of this invention is to mount an electrical device and, more particularly, a resistance device having a non-ohmic characteristic, so that its electrical characteristics are not affected by wide variations in humidity, or by severe mechanical shocks.

A feature of the invention comprises a method of mounting a resistance member, element or device having a non-ohmic characteristic, that comprises molding the device in an insulating material and, more particularly, a synthetic resin.

A further feature comprises, prior to the molding operation, impregnating the resistance member with a material selected from the group consisting of waxes, resins and asphaltic materials.

Another feature comprises an electrical device having an element of non-ohmic resistance embedded in a body of insulating material and, more particularly, a body of synthetic resin.

Still another feature comprises such an electrical device in which the element is initially impregnated with a wax, a resin or an asphaltic material.

Other and further features will be evident from the general and detailed description which follows hereinafter.

In accordance with this invention, a resistance body comprising a disc or discs of a non-ohmic resistance material containing silicon carbide, or a disc or discs of cuprous-oxide coated copper, is impregnated with a material selected from the group consisting of waxes, resins and asphaltic materials, such as ceresin, carnauba wax, rosin, polymerized styrol, benzyl cellulose, cellulose acetate, natural or compounded asphalt, and, thereafter is molded in a block or body of an insulating material, preferably a synthetic resin, such as a phenol condensation product, vinyl resin, plioform, benzyl cellulose or polymerized styrol, in a suitable die. The contact plates or discs are molded in the synthetic resin block, also, the only exposed portions thereof being projections or lugs to which electrical conductors may be connected.

A more complete understanding of this invention will be obtained from the detailed description which follows, taken in conjunction with the appended drawing, wherein:

Fig. 1 is a plan view of an electrical device in accordance with this invention;

Fig. 2 is an enlarged, cross-sectional view of the device of Fig. 1 taken along the line 2—2 thereof;

Fig. 3 is a plan view of another electrical device in accordance with this invention;

Fig. 4 is an enlarged side view of the device of Fig. 3, partly broken away and partly in section taken along the line 4—4 of Fig. 5;

Fig. 5 is a plan view of still another electrical device in accordance with this invention; and

Fig. 6 is an enlarged side view of the device of Fig. 5, partly broken and partly in section taken along the line 6—6 of Fig. 5.

The electrical device of Figs. 1 and 2, generally designated 10, comprises a resistance device comprising superposed discs, plates, elements or members 11, preferably of a material having a non-ohmic or non-linear voltage-current characteristic, for instance, a material containing approximately 59% silicon carbide, approximately 39% clay, and approximately 2% graphite. Each member 11 is provided on its outer surface with contact layers 12, preferably of tin, formed thereon, for instance, by Schoop-spraying. Contact discs, plates or members 13, which may be of brass and comprise a circular portion 14 of about the size of the members 11, and a radially extending, integral lug or terminal projection 15, engage the contact layers of the members 11, one contact member being interposed between the discs and the others engaging with the outer contact layers on the members 11. The members 11 and 13 are molded in a suitable die in a block or body 16 of insulating material, preferably a synthetic resin, such as a phenol condensation product, vinyl resin, plioform, benzyl cellulose, or polymerized styrol, the extremities 17, only, of the members 13 projecting from the body 16. As a step preliminary to molding the discs into the insulating body, it has been found desirable to impregnate the resistance members with a material selected from the group consisting of waxes, resins and asphaltic materials, such as ceresin, carnauba wax, rosin, polymerized styrol, benzyl cellulose, cellulose acetate, natural or compounded asphalt.

The electrical device of Figs. 3 and 4 comprises a full-wave, dry rectifier of the copper-cuprous oxide type, designated generally, 20. It comprises a unitary assembly 21, comprising a supporting member or bolt 22 engaged at its threaded end 23 by a clamping member or nut 24. Clamped between the nut 24 and the bolt head 25 are a pair of end plates 26, for instance, of steel; a pair of insulating washers 27, for instance, of phenol fiber; a plurality of copper discs or plates 28, each having a thin layer 29 of cuprous oxide integrally formed thereon by suitable heat treat-

ment; a plurality of contact washers or discs 30, of a malleable material, such as lead, tin, or tin-coated lead; a plurality of terminal plates 31, for instance, of brass, each of which has a radially extending lug or projection 32; and a connector strap 33; the discs or plates 28, 30, 31 being insulated from the bolt by a tubular member 34 of phenol fiber. The assembly 21 is molded, in a suitable die, in a block or body 35 of insulating material, preferably a synthetic resin such as is mentioned hereinabove with reference to the device of Figs. 1 and 2. The extremities 36, only, of the lugs 34 project outside of the block 35 and are adapted to have conductors 37 secured thereto, for instance, by solder.

The electrical device of Figs. 5 and 6 comprises a full-wave, dry rectifier of the copper-cuprous oxide type, designated generally, 40. It comprises a plurality of alternately disposed superposed terminal plates 41, for instance, of brass, each having a circular portion 42 and a radially extending lug or projection 43, and copper plates, discs, or members 44, each having a portion 45 of copper having a relatively thin layer 46 of cuprous oxide formed integrally thereon by suitable heat treatment, and a relatively thin layer 47 of reduced copper formed integrally on the layer 46; a connector strap or member 48; and a body 49 of insulating material into which the members 41, 44, 48 are molded in a suitable die. This insulating material is preferably the same as that embodied in the devices of Figs. 1-4. The extremities 50, only, of the terminal lugs 43 are outside of the body 49. As is well known, copper-cuprous oxide rectifier elements, such as 44, do not need to be mounted under pressure as in the case of the elements 28 of the device of Figs. 3 and 4.

Mounting electrical devices in the manner described hereinabove, produces a device whose electrical characteristics are not affected by wide

variations in humidity, or by severe mechanical shock. With reference particularly to the rectifier elements 44, protection is afforded, also, against atmospheric and other influences tending to cause corrosion of the reduced copper layer, which corrosion would result in a decrease in the rectification ratio as a result of an increased resistance in the forward or current passing direction of the element. In the case of the elements 28 of the device of Figs. 3 and 4, the oxide layers are protected, also, from influences tending to cause an increase in the resistance of the element in its forward or current passing direction with a resultant decrease in rectification ratio. An improved and more stable resistance device capable of effective use as an acoustic shock suppressor, electrical current rectifier, or the like, is thereby made available.

While this invention has been disclosed with reference to several specific structures, it will be understood that various modifications therein may be made without departing from the invention, the scope of which is to be considered as limited only by the appended claims.

What is claimed is:

1. A resistance element of silicon carbide, clay and graphite, in the approximate proportions respectively of 59, 39 and 2 percent, that has been impregnated with a material selected from the group consisting of waxes, resins, and asphaltic materials, said element being molded in an insulating material.

2. An electrical device comprising a plurality of discs of a material comprising silicon carbide, clay and graphite and each impregnated with a material selected from the group consisting of waxes, resins and asphaltic materials, and contact discs in engagement with said first mentioned discs, said discs being enclosed and molded in an insulating material.

RICHARD O. GRISDALE.