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RESISTOR AND METHOD OF MAKING THE SAME

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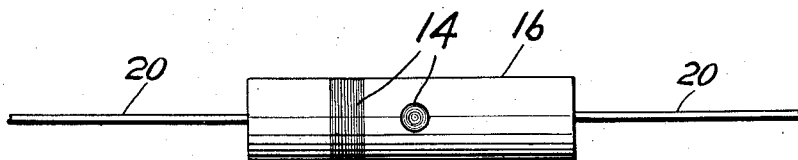


FIG. 1.

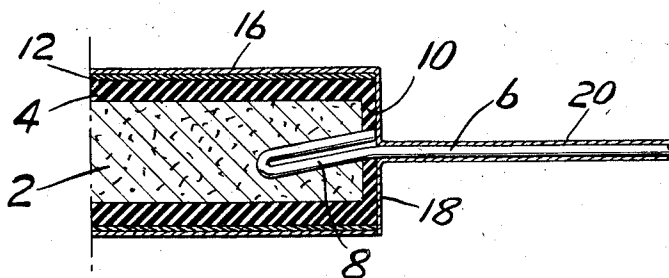


FIG. 2.

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RESISTOR AND METHOD OF MAKING THE SAME

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8 Claims. (Cl. 201—76)

This invention relates to resistors and particularly to resistors of molded type.

A type of resistor now commonly used, particularly in radio sets, comprises a molded body of resistance material into which wire leads are molded in the process of manufacture. After the molding is accomplished, the resistors are baked with the leads in place. The resistors may be of two types, one being without exterior insulation and the other type comprising insulating material outside the resistance material molded and baked with the resistance material.

These resistors are generally used under conditions in which it is necessary or desirable to solder the conducting leads. The baking process just referred to tends to produce tarnishing of the leads, which will cause them to resist soldering. This tarnishing may not be of a visible nature, and, in fact, after the resistors are manufactured, the failure to solder properly may progressively get worse, i. e., it has been found that in some cases, while soldering could be accomplished fairly readily immediately after the baking was completed, soldering was practically impossible after the resistors had been stored for several months. The above difficulties may be avoided to some extent by covering copper lead wires with a mixture of lead and tin, but even in such case corrosion takes place and soldering becomes difficult.

A second difficulty with molded resistors occurs in connection with the conventional marking of their resistance values by spots or rings of color. After the baking process, the resistor, whether insulated or uninsulated, will generally have a highly glossy surface to which paints will not adhere. It was found that by grinding the outside of the resistor or by roughening its surface in some other fashion, it was possible to make ordinary grades of enamel stick to the resistor so that color bands or markings were easily distinguishable. Furthermore, whereas in the case of attempts to paint the glossy surfaces of resistors the paint had to be dried in an oven, if the surfaces were roughened, as just described, and then painted, they would generally dry in a very short time after they were painted without the application of heat.

A fault arose, however, in connection with this in that the resistors became susceptible to changes of humidity, particularly those resistors which did not contain an insulating shell, although changes due to humidity were noticeable also in connection with those provided with insulating shells. The originally hard and shiny

insulating surface produced in the baking process is apparently resistant to moisture, whereas as soon as this surface is removed by grinding or the like, the moisture resistance is lost.

5 In accordance with the present invention, both difficulties mentioned above are avoided by dipping the entire resistor in a solution of a mixture of wax and rosin, with the resultant production of a very thin coating of the mixture on the resistor body and on the lead wires. Such a mixture is not only moistureproof, so that changes of resistance value due to changes of humidity are negligible, but the mixture further acts as a soldering flux, not only preventing atmospheric deterioration at ordinary temperatures, but greatly improving the solderability of the leads.

The invention will become apparent from the following description, read in conjunction with the accompanying drawing, in which:

20 Figure 1 is an elevation of the resistor embodying the invention; and

25 Figure 2 is a fragmentary sectional view of diagrammatic nature illustrating one end of the resistor body and a connecting lead.

30 The resistor comprises molded resistance material, indicated at 2, which may be of any conventional composition, comprising, for example, a plastic such as Bakelite, in which is embedded material of a type and in an amount necessary to secure the desired resistance value. The invention is not concerned with the nature of the resistance material, which may be stated to be quite conventional. While the invention is applicable to resistors without insulating shells, the resistor illustrated is provided with a shell 4 of insulating material such as a plastic of the phenol-formaldehyde type. This, also, is conventional. A lead wire 6, formed, for example, of copper, which may or may not be coated with a mixture, for example, of lead and tin, is provided with a bent head 8 embedded in the resistance material. If an insulating shell is provided, this may be carried across the end of the resistor, as indicated at 10. The resistors of the type illustrated may be formed by the procedure described in the application of Herrick and Velej Serial No. 370,010, filed December 13, 1940. In the manufacturing process, the resistor and insulating materials are compressed in powdered form about the heads of the leads. The combination thus formed will temporarily hold its shape and is subjected to a baking operation to bring the resistor into its final form. As the re-

sistor comes from the baking oven, it will have the hard shiny surface referred to above.

The resistor is now desirably subjected to a grinding operation to roughen the surface, whereupon paint may be selectively applied to the surface, as conventionalized at 12, to provide either throughout the surface or at locations as indicated at 14, bands or markings indicative, in accordance with the standard code, of the resistance value of the resistor. Due to the roughening of the surface of the resistor body, the paint will readily adhere and dry.

Thereafter, the entire resistor, including the leads, is dipped into a solution of the type indicated, which, upon evaporation, leaves a film of protective material about the body of the resistor, as indicated at 16, about its ends, as indicated at 18, and about the lead wires as indicated at 20.

The material thus deposited on the resistor is not critical as to composition and may take various forms. Most desirably, the material is what can be considered a moistureproof soldering flux. The simplest composition, and, in fact, the most desirable, is simply a mixture of rosin and wax. The rosin may be of any desired grade, and the wax of substantially any type, whether mineral or vegetable. The sole desirable and necessary property of the wax is that it be moistureproof so as to give somewhat better moisture resistance than that afforded by rosin, alone, to which it also imparts the property of better adherence. The quantity of the wax in the mixture, however, may be quite low consistent with the achievement of this result. Desirably, the rosin is present in substantial amounts, since the greater the amount of rosin present the more readily does soldering take place. Substantially equivalent results from the standpoint of moistureproofness, adherence and solderability occur with mixtures ranging from 75% rosin and 25% wax to mixtures comprising 25% rosin and 75% wax. Less rosin, down to say 10%, is thoroughly consistent with proper solderability, while going to the other extreme, the wax may be present almost to a vanishing degree if it is satisfactory to sacrifice some of the properties of better adherence and moistureproofness. Other components of non-harmful nature, such as plasticizing materials, may be included to give the film, in connection with lower percentages of wax, sufficient flexibility to resist its chipping off the wires if they are bent.

Only a very thin coating of the soldering flux of the type described is necessary. This is best achieved by dissolving the rosin and wax in a common solvent and dipping the resistor into the solution, then permitting the solvent to evaporate. Benzol is an ideal solvent and may be used to form quite satisfactory solutions containing, for example, 25% of the solid flux constituents, in which case dipping and permitting the excess to drip off will permit a satisfactory, though thin, coating. Other common solvents for wax and rosin may be used, as, for example, other aromatic hydrocarbons. In the case of waxes soluble in alcohols, various alcohols or mixtures thereof may be used. Mixtures of widely different composition capable of being satisfactorily used will be apparent to those skilled in the arts. As indicated above, the mix-

ture is far from critical and may have constituents varying in composition without departing from satisfactory effectiveness.

What I claim and desire to protect by Letters Patent is:

1. A resistor comprising a molded body portion, a plurality of wire leads extending from said body portion and having their ends embedded in said body portion, and coating material covering the exterior of said body portion and said leads substantially beyond said body portion, said coating material comprising largely wax and rosin.

2. A resistor comprising a molded body portion, a plurality of wire leads extending from said body portion, and coating material covering the exterior of said body portion and said leads substantially beyond said body portion, said coating material comprising largely wax and rosin.

3. A resistor comprising a molded body portion, a plurality of wire leads extending from said body portion and having their ends embedded in said body portion, and coating material covering the exterior of said body portion and said leads substantially beyond said body portion, said coating material constituting a moisture-resistant soldering flux.

4. A resistor comprising a molded body portion, a plurality of wire leads extending from said body portion, and coating material covering the exterior of said body portion and said leads substantially beyond said body portion, said coating material constituting a moisture-resistant soldering flux.

5. A method comprising coating a resistor, of the type comprising a body portion and lead wires having their ends embedded in said body portion, with a moisture-resistant soldering flux covering the exterior of said body portion and the leads substantially beyond said body portion.

6. A method comprising immersing a resistor, of the type comprising a body portion and lead wires having their ends embedded in said body portion, in a solution of a moisture-resistant soldering flux in a volatile solvent and causing evaporation of solvent from the solution adhering to the resistor, thereby leaving thereon the flux covering the exterior of said body portion and the leads substantially beyond said body portion.

7. A method comprising grinding the surface of a resistor, of the type comprising a molded body portion and lead wires having their ends embedded in said body portion, and then coating the resistor with a moisture-resistant soldering flux covering the exterior of said body portion and the leads substantially beyond said body portion.

8. A method comprising grinding the surface of a resistor, of the type comprising a molded body portion and lead wires having their ends embedded in said body portion, and then immersing the resistor in a solution of a moisture-resistant soldering flux in a volatile solvent and causing evaporation of solvent from the solution adhering to the resistor, thereby leaving thereon the flux covering the exterior of said body portion and the leads substantially beyond said body portion.

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