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2,282,398

METHOD OF MAKING INSULATED RESISTORS

Filed Oct. 24, 1940

Fig. 1.

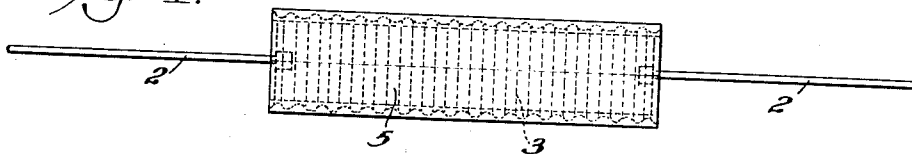


Fig. 3.

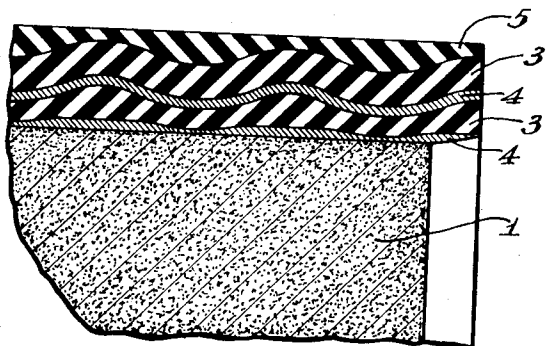


Fig. 2.

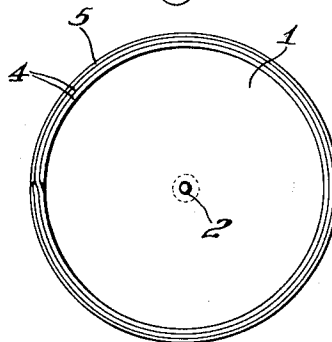


Fig. 4.

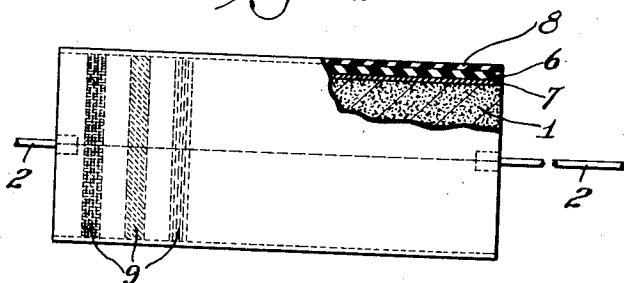


Fig. 5.

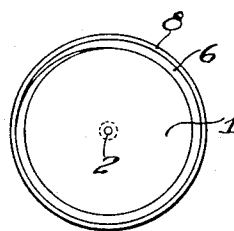
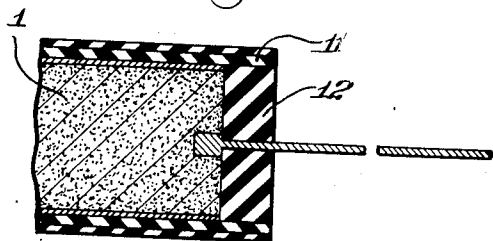


Fig. 6.



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METHOD OF MAKING INSULATED RESISTORS

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3 Claims. (Cl. 201—63)

This invention relates to electrical resistance elements, and more particularly to molded fixed resistors that are insulated.

Resistors of this character are made by molding a mixture of powdered carbon and a binder, such as Bakelite, into the form of small cylindrical slugs the diameter and length of which depend upon the wattage dissipation desired. At the same time that the slug is molded, wire leads are embedded or molded in its ends so that the resistor can be connected in an electric circuit. The slug is then baked to set the binder and thereby form a strong and hard resistor body. The general manner of insulating these resistors has been to place them in forms and then to mold resinous insulating coatings around them. This method of insulating the resistors is relatively costly and, as the insulation has a different coefficient of expansion than the resistor body, the insulation not infrequently cracks in use when the resistor becomes heated by an electric current flowing through it.

Another type of insulation that has been proposed is an insulating tube that is slipped over the resistor body and then secured in place. It is difficult to obtain a tight fit with such a tube because it must be loose enough to slide over the resistor body. It has also been proposed to wrap the resistor body with a narrow insulating tape wound spirally around the body, but this produces a long undesirable seam that may let in moisture, and the completed element is not neat in appearance. The ends of the resistor are especially difficult to take care of with such a tape.

It is among the objects of this invention to provide an electrical resistor with inexpensive insulation which satisfactorily adheres to and encloses the resistor body, which will not admit moisture or come loose, and which does not detract from the appearance of the resistor. Another object is to provide a method of insulating a fixed resistor. In accordance with this invention an insulating tape, which is at least as wide as the length of the molded resistor body to be insulated, is wound tightly and substantially straight around that body. By "straight" is meant that the tape is not wound spirally around the body from one end to the other. If more insulation is desired than given by one thickness of the tape it can be increased by wrapping the tape two or more times upon itself. The tape is held in place by an adhesive, and any tendency for the outer end of the tape to loosen can be avoided by coating the wrapped resistor with a liquid sealing material which is then hardened.

If the colored bands used in color coding the resistor are applied to the tape, the sealing film should be transparent so that they can be seen through it. The ends of the resistor can be insulated by projecting the tape beyond the ends of the resistor body in order to form cups that are then filled with an insulating composition. To still more securely unite the tape to the resistor body pressure is applied to the tape at spaced points so that it has a corrugated appearance. In pressing the tape in this manner it is stretched sideways and the portions adjacent its sides caused to firmly adhere to the resistor body throughout its length.

The invention is illustrated in the accompanying drawing in which Fig. 1 is a side view of one form of my invention; Fig. 2 is an enlarged end view thereof; Fig. 3 is a still further enlarged fragmentary sectional view of the resistor; Fig. 4 is a side view, partly in section, of a modification of this invention; Fig. 5 is an end view of this modification; and Fig. 6 is a fragmentary section through a third embodiment of the invention.

Referring to Figs. 1, 2 and 3 of the drawing, a cylindrical resistor body 1, that has been molded from a mixture of powdered carbon and a binder, has embedded in its ends the heads of pin-like wire leads 2 by which the resistor can be connected in an electric circuit. According to this invention the resistor body is insulated by a tape 3 that is wound straight around the body one or more times, depending upon the amount of insulation desired. The tape is made of a suitable insulating material that has the necessary flexibility and mechanical strength and that is not affected by humidity conditions. The tape is caused to tightly adhere to the resistor body by adhesive 4 previously applied to one of them, but preferably to the tape so that successive layers of the tape will adhere to one another.

The tape is of a width at least as great as the length of the resistor body, and may be drawn from a roll as it is wound around the resistor. After the tape has been wrapped around the resistor body, a plurality of axially spaced annular grooves are pressed into the tape. This presses the layers of tape still more tightly together and against the body and stretches them laterally beyond the ends of the body. Proper adhesion between the tape and the resistor body from end to end is thus assured. After the tape wrapping has been subjected to the heat dissipated by the resistor, it becomes hard and practically inseparable from the resistor body.

The tape is protected, and its outer end fur-

ther prevented from starting to unwind, by a coating film 5 of resinous material or the like which is sprayed or painted on or otherwise applied to the wrapped resistor. Preferably, this material is air drying. The coating film is thicker in the grooves in the tape than between them, and therefore forms a plurality of spaced reinforcing rings. When the resistor heats up in use the tape yields sufficiently to avoid cracking of itself or the coating film which also improves the electrical and humidity characteristics of the resistor.

In the modification shown in Figs. 4 and 5 the tape 6 is wound only once around the resistor body 1 to which it is secured by an adhesive 7, although it can extend around it more times if desired. Also, the tape wrapping is uncorrugated and of a width substantially the same as the length of the resistor body. To aid in preventing the outer end of the tape from peeling away from the resistor it is feathered, as shown in Fig. 5, and the entire wrapping is covered by a sealing film 8 similar to coating 5 of the first embodiment.

The color coding bands that indicate the resistance value of the resistor may be applied to the outer sealing film in the usual manner. Or, they may be painted or printed on the tape before it is formed into a roll or as it leaves the roll, in which case the sealing film should be transparent, as shown in Fig. 4, such as methacrylic resin, so that the code bands 9 can be seen through the film. This method of applying the color bands is considerably cheaper than racking and then painting each individual resistor. It also eliminates the necessity of subjecting the resistor leads 2 to the undesirable atmosphere of a paint room in which paint and oxides resulting therefrom deposit on the leads and prevent easy soldering.

Fig. 6 shows an embodiment of my invention in which, like in Fig. 3, the insulating tape 11 extends beyond the end of the resistor body 1 and forms therewith a cup. This cup is filled with insulating material 12, preferably a thermoplastic resin, whereby the ends of the resistor are sealed and insulated.

By using a tape which is wide enough to cover

the resistor body from end to end, the tape can be wound straight around the body so that the wrapping is of substantially uniform thickness and a straight seam of minimum length is provided. Also, the tape can be wound around the body a plurality of times, if desired, which could not be done if it were wound spirally as heretofore. The resistor body is thus most effectively insulated at a small cost, and its appearance is trim and neat.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. The method of making a resistor in which a molded body member is enclosed by an insulating tape member, comprising applying an adhesive to one of said members, wrapping said tape member tightly and substantially straight around said body member, and then pressing a plurality of body member surrounding grooves in the tape member whereby it is caused to firmly adhere to said body member.

2. The method of making a resistor in which a molded body member is enclosed by an insulating tape member, comprising applying an adhesive to one of said members, wrapping said tape member tightly and substantially straight around said body member, then pressing a plurality of body member surrounding grooves in the tape member whereby it is caused to firmly adhere to said body member, and coating the tape with a sealing material which fills said grooves.

3. The method of insulating a molded resistor body, comprising wrapping an adhesive-backed insulating tape tightly and substantially straight around said body a plurality of times, and then pressing a plurality of body-surrounding grooves in the tape whereby it is stretched sideways and its edge portions caused to firmly adhere to said body.

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