

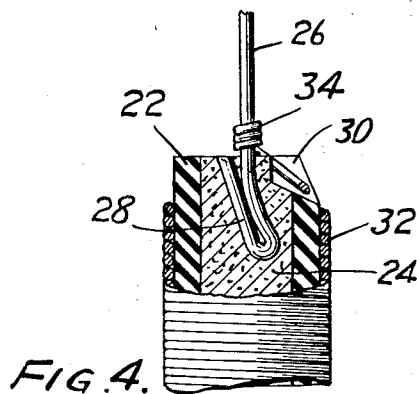
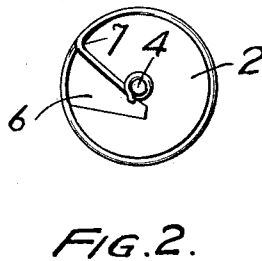
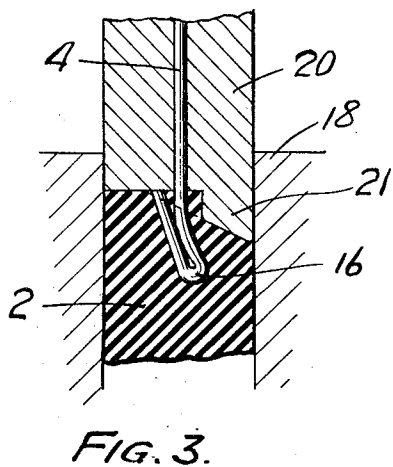
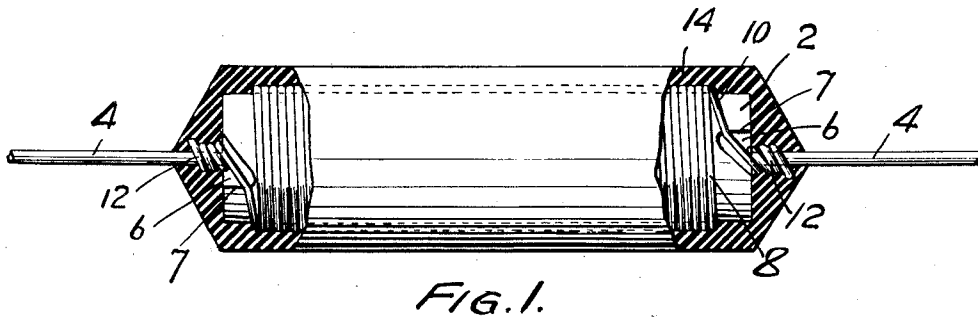
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2,355,611

CHOKE COIL, RESISTOR, OR THE LIKE

Filed March 15, 1943



WITNESS:

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2,355,611

CHOKE COIL, RESISTOR, OR THE LIKE

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8 Claims. (Cl. 201-63)

This invention relates to a choke coil or resistor or the like and to methods of making the same, the invention being applicable to the formation of small electrical elements in which a wire is coiled about a form. In the case of a choke coil for high frequency purposes, the wire thus coiled may have low resistance; on the other hand, when a wire wound resistor is provided, the wire may be of conventional high resistance type.

It has been customary to provide as high frequency chokes small coils wound on forms in single or multiple layers offering high impedances at radio frequencies. Such coils have been wound on insulating supports of Bakelite or other thermoplastic or thermosetting resins. There is involved a problem of anchoring the coil ends so that the coil will not accidentally unwind or shift in position, with resulting changes in its impedance. It has, therefore, been customary to provide elaborate types of terminals to serve as anchorages for the coil ends. In the case of wire wound resistances, similar complications were involved in anchoring the coil ends.

It is one object of the present invention to provide an improved and simple coil arrangement whereby the ends of a coil, constituting a choke coil or resistance, may be anchored in simple fashion to maintain constant the impedance value of the coil despite rough handling.

This object and further objects relating to the methods of forming such products and to details of construction, will become apparent from the following description, read in conjunction with the accompanying drawing, in which:

Figure 1 is a view partially in section showing a choke coil or wire wound resistor formed in accordance with the present invention;

Figure 2 is an end view of the same with the insulation omitted;

Figure 3 is a diagrammatic sectional view showing the fashion in which the insulating support is simultaneously molded and provided with wire-holding notches; and

Figure 4 is a fragmentary sectional view of a modified form of the invention in which a coil is shunted by a molded resistor.

Referring first to Figures 1 and 2, what is illustrated therein may be regarded as either a choke coil or resistor or combination thereof, depending upon the resistance of the coil of wire which is used. As illustrated in that figure, the product comprises a form 2 desirably made of molded thermosetting or thermoplastic resin,

preferably the former, if the product is a wire wound resistor, though possibly the latter if the temperature rise of the resistor is not expected to be too great, or if the product is merely a high frequency choke. Molded into the ends of this form 2, as will be indicated hereafter, are wire terminals 4. Adjacent the terminals 4 and in the ends of the form 2 there are provided in the molding process notches 6, preferably taking the form illustrated and providing edges 7 extending longitudinally of the form. About the form there is wound the low or high resistance wire 8, depending on the purpose of the product, which wire in general, will be, throughout the coiled portions thereof, insulated, either by enamel or other coating or the usual windings of silk or cotton. Uninsulated wire may be used, however, if the turns are spaced. The ends of this coil, for example, from the point indicated at 10 to one end, have the insulation removed therefrom (if otherwise insulated) and are coiled about the terminals 4, as indicated at 12. By drawing the wire ends tightly into the notches 6, and in particular about the sharp corners 7 formed by these notches, a copper or other wire, having little spring action, will be very securely fastened merely by having its free ends twisted about the terminal wires 4 as indicated, there being little chance that the wire will be disturbed in any ordinary handling of the element unless a special effort in that direction is made. The wire ends may be further secured by soldering or welding.

Generally speaking, the product, to the extent described, may be the final one. However, in some cases, it may be desirable to coat this product with insulation as indicated at 14, for which purpose injection molding by Bakelite or other similar resin may be utilized, the wire wound elements being located in suitable molds supported by their terminal wires and surrounded by the plastic material in the molding process. Alternatively, a thin insulating coating may be painted or sprayed thereon.

While in the product illustrated in Figure 1 there is shown only a single layer of winding, it will be obvious that the invention is equally applicable to multi-layer coils. The invention is further applicable to the making of non-inductive resistors by winding on the form a double length of wire, the ends being anchored in the respective notches as indicated. Various other fashions in which the principles of the invention may be utilized will be apparent to the art.

The formation of the body in a simple molding operation is illustrated in Figure 3. Die and

plunger elements are indicated at 18 and 20, respectively, the plunger elements being duplicated, as will be evident from consideration of the method more fully set forth in the application of Herrick and Veley, Serial No. 424,250, filed December 24, 1941. Upper and lower plungers designed to enter the upper and lower ends of the opening in the die 18 carry the terminal wires 4, which may be provided with bent heads such as indicated at 16 for the purpose of affording good anchorage and, in the instance hereafter described, good electrical contact with a molded resistor body. The plungers 20 are provided with projections 21, which form the notches 6 during the molding operation. The molding may be carried out as described in said Herrick and Veley application, simplified in the case such as that illustrated, in which the form is a simple cylinder of resistance material.

The invention is further applicable to the formation of elements in which a coil of wire is to be shunted by a resistance which may take the form of a molded resistor. For example, in the case of resistors designed to provide multiple ranges for meters, if the series resistors to be used have quite high resistance, the resistance of the meter may frequently be neglected. On the other hand, suppose, for example, that a milliammeter is to be used as a voltmeter having a resistance of 1,000 ohms per volt and a scale of 10 volts. Under such circumstances, if there was included in series with the meter only a resistance of 10,000 ohms, the resistance of the meter itself would introduce an error. To make allowance for the meter resistance, an accurate wire wound resistor of, say, 10,000 ohms, a standard value, may be shunted by a relatively high resistance molded resistor to give an external resistance, which, taken with the resistance of the instrument itself, will be 10,000 ohms to a high degree of accuracy. In accordance with the invention, standard wire and standard wire winding procedure may be used to provide series resistors for particular instruments by providing a reduction in effective resistance equal to that of the resistance of the meter coils by adopting the procedure of shunting the wire winding with a high resistance molded resistor body, the accuracy of the resistance value of which need not be particularly great. Figure 4 illustrates a product of this type. This comprises essentially a molded resistor of the type disclosed in said Herrick and Veley application and comprising an insulating shell 2 and a molded resistor portion 24, inside said shell, comprising the usual composition of plastic and conducting material such as graphite or the like, or possibly including materials serving to give a negative temperature coefficient value to the resistor. Into the conductive material 24 there are molded leads 26 having bent ends of the form illustrated at 28 serving to hold the leads securely in position and arranged to insure uniform penetration in the resistor formation. Molded in this case into both the insulating shell and the resistor material 24 are notches 30 of the type heretofore described at 6 to serve for the anchorage of the ends of the wire winding 32, which ends are twisted about the leads 26 as indicated at 34, it being understood that the construction illustrated in Figure 4 is duplicated at the opposite end of the resistor. Under such circumstances, the winding 32 may make up to a high degree of accuracy the major portion of the resistance to be used in series with the meter, for example, the winding machinery may be adjusted

to provide a definite length of resistance wire having, say, a resistance of 10,000 ohms, to a high degree of accuracy. If accurate wire wound resistors of this value are to be provided, the machine may be used to wind such wires on solid Bakelite or other insulating cores, as in Figure 1. On the other hand, if call arises to provide resistors to be used in series with some particular instruments, it is only necessary then to wind the same wire on a resistor of the type indicated, providing a shunting resistance causing the combination to have a resistance of 10,000 ohms less the resistance of the instrument.

It will be evident, also, that the resistor may thus be caused to shunt a choke under conditions where a choke coil is to have an impedance variation with frequency other than that which would be secured by the use of a simple choke winding alone; i. e., such that for low frequencies the combination acts as a reactance with a resistance substantially only that of the low resistance coil, and for high frequencies as a resistance with low reactance.

It will be evident that a combination of the type illustrated in Figure 4 may be externally insulated by injection molding or the like, as indicated in the modification of Figure 1.

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

1. In combination, a molded plastic support having molded therein leads extending axially therefrom and notches adjacent to said leads, said support being at least partially conductive to afford conductivity between said leads, and a wire winding about said support having its ends bent into said notches, and coiled about said leads so that the winding is thereby fixedly anchored in place.

2. In combination, a molded plastic support having molded therein leads extending axially from the ends thereof and notches formed in the ends adjacent to said leads, and a wire winding about said support having its ends bent into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends, so that the winding is thereby fixedly anchored in place.

3. In combination, a molded plastic support having molded therein leads extending axially from the ends thereof and notches formed in the ends adjacent to said leads, the notches presenting axially extending edges, and a wire winding about said support having its ends bent sharply about said edges into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends, so that the winding is thereby fixedly anchored in place.

4. In combination, a molded plastic support having molded therein leads extending axially from the ends thereof and notches formed in the ends adjacent to said leads, and a wire winding about said support having its ends bent into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends, so that the winding is thereby fixedly anchored in place, and a coating of insulation covering said winding.

5. The method of forming a mounted coil comprising molding a plastic support member by application of pressure to a molding powder while inserting therein wire leads to cause the same to extend axially from the support and simultaneously forming notches in the ends of the support extending adjacent to the axially extending

portions of the leads, and thereafter winding a wire about said support with its ends bent into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends.

6. A winding form comprising a molded plastic support having molded therein leads extending axially from the ends thereof and notches formed in the ends adjacent to said leads, said notches being arranged to anchor the ends of a winding bent into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends.

7. A winding form comprising a molded plastic support having molded therein leads extending axially from the ends thereof and notches formed in the ends adjacent to said leads, the notches presenting axially extending edges, said notches being arranged to anchor the ends of a

winding bent sharply about said edges into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends.

8. In combination, a molded plastic support of cylindrical form and of substantially uniform diameter having molded therein leads extending axially from the ends thereof and notches formed in the ends extending from points adjacent to said leads to the cylindrical surface of said support and providing thereat axially extending edges, and a wire winding about the cylindrical surface of said support having its ends bent sharply about said edges into said notches and coiled about the portions of said leads extending axially from the ends of said support adjacent to said ends, so that the winding is thereby fixedly anchored in place.

HUGH N. VELEY.