Nov. 17, 1942. G. E. MEGOW ET AL 2,302,564

INSULATED RESISTOR MAKING PROCESS

Filed Dec. 18, 1941 3 Sheets-Sheet 1

Fig. 4

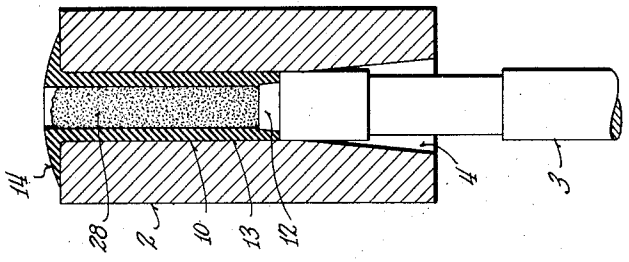



Fig. 3

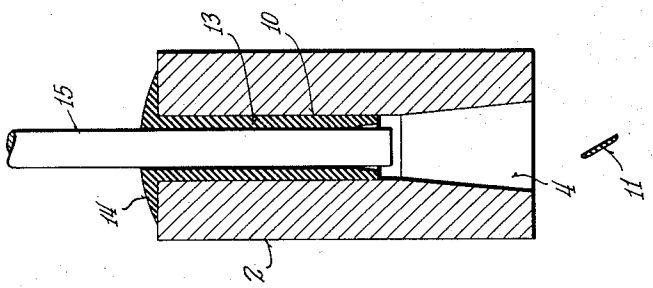



Fig. 2

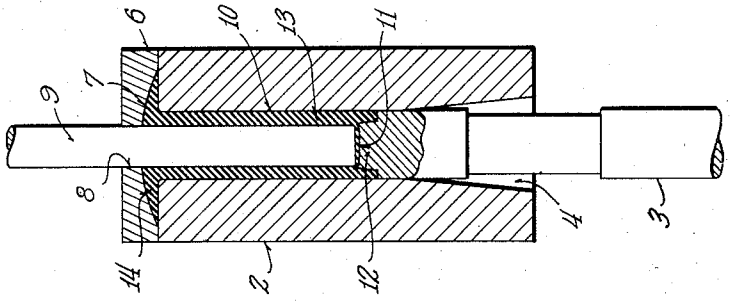
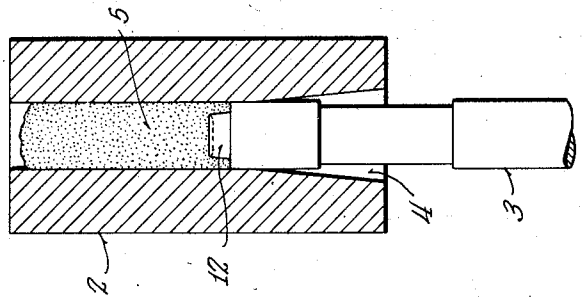



Fig. 1




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Fig. 8

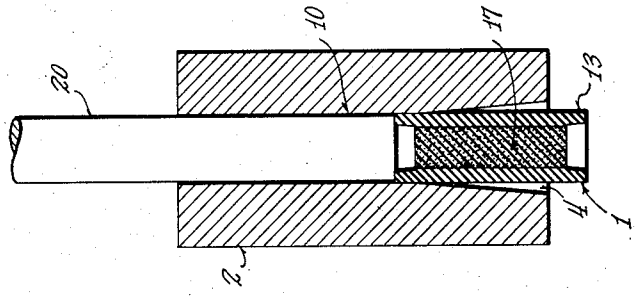



Fig. 7

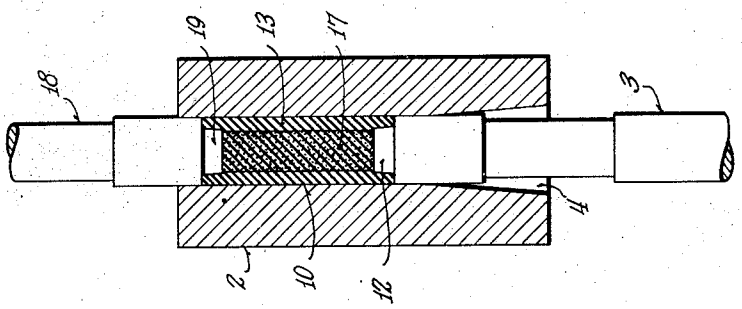



Fig. 6

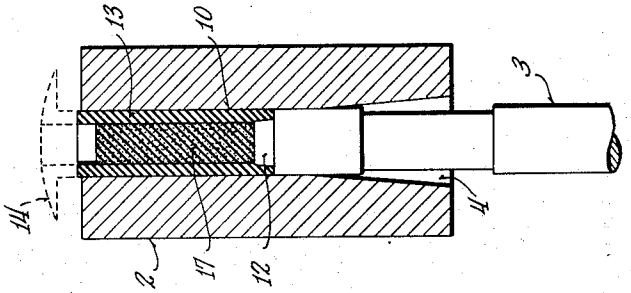
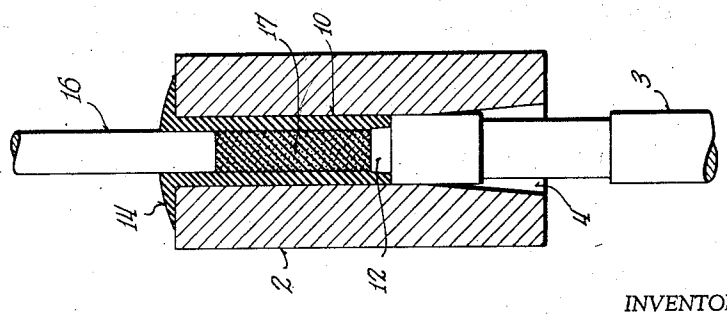



Fig. 5




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INSULATED RESISTOR MAKING PROCESS

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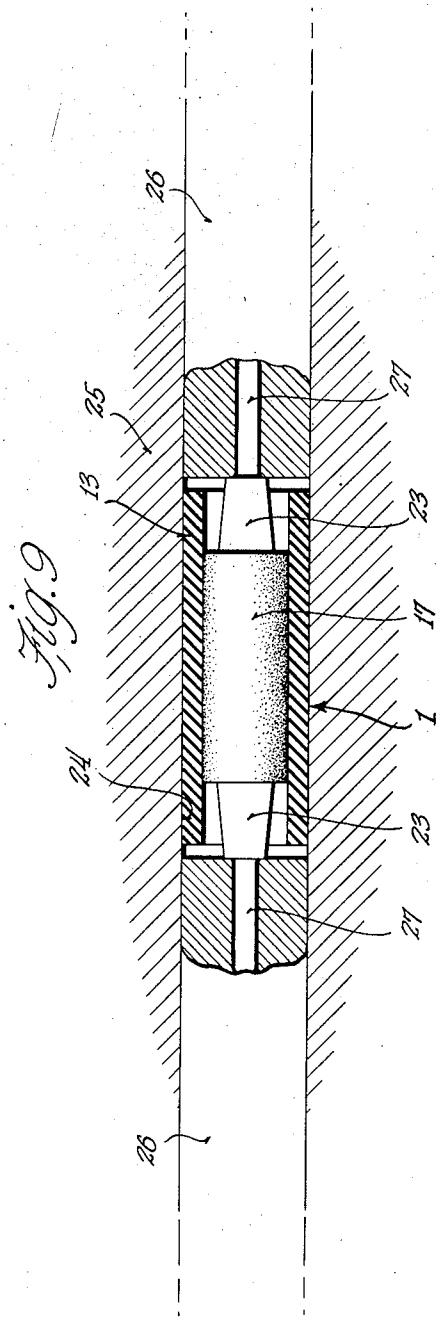



Fig. 9

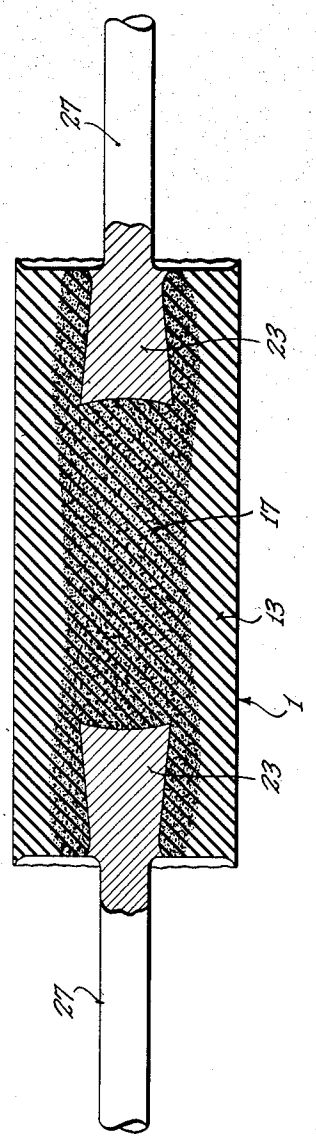



Fig. 10

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Patented Nov. 17, 1942 2,302,564

# UNITED STATES PATENT OFFICE

2,302,564

## INSULATED RESISTOR MAKING PROCESS

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Original application March 4, 1939, Serial No. 260,756. Divided and this application December 18, 1941, Serial No. 423,472

23 Claims. (Cl. 18—59)

This invention relates to the art of forming insulated radio resistors and resides in an improved process for making the same, involving the preparation of a blank made up of a sleeve of moldable insulating material within which there is positioned a core of moldable conductor material and also involving steps by which this blank is acted upon to cause flow of the moldable material, while both jacket and core are still in a moldable state, against and around the sides and the ends of electrode heads, as the result of which said heads become embedded in the material of the blank in contact with the conducting core, following which both the sleeve and the core material are polymerized or otherwise hardened in the presence of one another to form a strong, very compact radio resistor of the insulated type.

One object of this invention is to provide a process by which embedment of electrodes in a composite blank, having both core and sleeve-forming components, by flowage of blank material while the core and sleeve components are in the presence of one another prior to the final hardening of either, can be effected, for the purpose of avoiding residual internal mechanical stress between core and sleeve so that a greater part of the mechanical strength of both is effective for retention and support of the embedded electrodes.

Another object of this invention is to provide a process by which a composite blank consisting of a hardenable insulating sleeve-forming component and a hardenable conducting-core-forming component can be produced at moderate cost with the requisite precision and with the requisite properties of flowability and hardenability to adapt the same for embedment of electrodes.

Another object of this invention is to provide a process in which an insulated resistor blank having a polymerizable core surrounded by a polymerizable sleeve is acted on to embed electrodes in it and to reduce it to its final physical form and configuration and, as a final step, is acted on to polymerize the sleeve and core while in contact with one another and with the electrode so that intimate contact between the sleeve and core and between the core and electrode becomes established.

Heretofore in the art the methods by which molded insulated radio resistors have been formed have all involved a series of steps in which the conducting core is first formed complete with attached leads and thereafter the insulating jacket is applied thereto and hardened as a subsequent step. In addition to the disadvantage of complexity and expense which these prior methods have entailed, the resistor units produced thereby have exhibited several shortcomings. With the insulating jacket molded on as a subsequent step, the initial core and lead assembly must be made strong enough to be self-sustaining. This requirement makes necessary an unduly large core, or one consisting of or containing materials other than plastic molding composition.

After the unit is completed by adding the jacket it is either unduly large or unduly expensive. Another shortcoming arising out of a subsequently added jacket is the high probability that residual internal stresses will exist within the finished circuit, due to the forcing of the plastic jacket material against the unyielding core. The method of this invention avoids these difficulties and produces a satisfactory resistor unit at moderate cost.

The invention herein set forth and claimed is a division of our copending application Serial No. 260,756, filed March 4, 1939.

The process of this invention is herein described by reference to the accompanying drawings which form a part hereof and in which there is set forth by way of illustration and not of limitation representations of successive stages of one form of the process of this invention.

In the drawings:

Fig. 1, an elevation in section, shows a plastic powder load in position in a die preparatory to the formation of an insulating sleeve preform;

Fig. 2, an elevation in section, shows a preliminary stage in the formation of the insulating sleeve preform from the powder load shown in Fig. 1;

Fig. 3, an elevation in section, shows the step of removal of the residual diaphragm left after preliminary formation of the insulating sleeve preform;

Fig. 4, an elevation in section, shows the loading of conducting plastic powder core material into the sleeve preform;

Fig. 5, an elevation in section, shows the compacting of the conducting core material;

Fig. 6, an elevation in section, shows the severance of the upper excess of the insulating sleeve preform;

Fig. 7, an elevation in section, shows the final compacting of the assembled preform;

Fig. 8, an elevation in section, shows the ejecting of the complete preform with insulating jacket and conducting core;

Fig. 9, an elevation partly broken away and in

section, shows a preform in a die with electrode-carrying plungers; and

Fig. 10 is an elevation in section showing the finished resistor after the electrode-carrying plungers have acted upon the preform blank.

In performing the process of this invention a small tubular section of plastic insulating material in partially hardened condition is first formed and into this tubular sleeve a carefully measured quantity of moldable conducting material in powder form is inserted and compacted when in place. Thereafter, electrode leads are embedded and the material of the sleeve and core are hardened when in final form. The steps of preparing the insulating sleeve and core for the final steps of embedment of electrodes and hardening of the sleeve and core material are shown in successive stages in Figs. 1 to 8, inclusive.

The preform 1, from which the final resistor is molded, is prepared entirely within a die block 2, which is preferably heated. The die block 2 with a lower punch 3 inserted into an aperture 4 is loaded with the proper amount of moldable insulation powder 5, as shown in Fig. 1. Thereafter a collar-forming tool 6, as shown in Fig. 2, having a concave recess 7 and a cylindrical hole 8 centrally located with respect to the aperture 4, is placed over the top of the preform die block 2 and a cylindrical tube-forming punch 9 is inserted through the collar-forming tool 6 and into the insulation powder 5, causing it to flow into the form 10 shown in Fig. 2. As the tube-forming punch 9 completes its stroke it leaves a thin disk of flash 11 between the end of the tube-forming punch 9 and the tip 12 of the lower preform punch 3. Thereafter the tube-forming punch 9 is withdrawn and the collar-forming tool 6 is lifted, leaving a formed piece of insulation material having a sleeve portion 13, a collar 14, and a thin disk of flash 11.

After a short lapse of time the lower preform punch 3 is removed from the aperture 4 and a knock-out punch 15 is passed downwardly through the sleeve 10 to strike away the disk 11, as appears more clearly in Fig. 3. After removal of the disk of flash material 11 and withdrawal of knock-out punch 15 the lower preform punch 3 is returned to its original position and a predetermined quantity of moldable resistor powder 28 is loaded into the formed insulation piece or sleeve 10, as shown in Fig. 4. Thereafter, a punch 16 is brought downwardly, as shown in Fig. 5, to press the moldable resistor powder into a semisolid core 17, as shown more clearly in Fig. 5.

After the moldable resistor powder has been compacted as above described to form a semisolid core, the sleeve 10 and core 17 are lifted as a unit a small distance under the action of the lower preform punch 3 to the position indicated by dotted lines in Fig. 6. Having been thus lifted, the insulation collar 14 and any excess insulation sleeve material is severed and discarded. The severed portion is represented by the broken lines in Fig. 6.

To complete the preform 1, an upper preform punch 18, similar in form to the lower preform punch 3, is inserted in the recess 4 from above. The upper preform punch 18 is caused to act toward the lower preform punch 3, as shown in Fig. 7, and thus to press the insulation sleeve 13 and the moldable resistor core 17 into the configuration of the resistor preform 1 which is desired. It will be noted that the preform 1 is formed with a recess in each end formed by the tip 12 of the lower preform punch and the tip 19 of the upper preform punch 18. The lower preform punch 3 is then removed from the aperture 4 and the completely formed preform 1 is ejected by means of a punch 20, as shown in Fig. 8.

Under certain conditions it has proven to be advantageous to utilize the entire length of the insulation piece 10 and to only discard a portion of the collar 14. This can readily be accomplished by omitting the operation shown in Fig. 6 and with the insulation piece 10 and moldable resistor core 17 in place, as shown in Fig. 5, removing punch 16 and then by means of the top forming punch 18 simultaneously piercing the collar 14 and completing the final forming operation shown in Fig. 7.

The insulation material used may consist of any suitable thermal-setting insulating composition, such as one consisting of a phenol-aldehyde resin binder, quartz filler, and a lubricant, such as stearic acid. A suitable mix for this material is as follows:

| | | |
|---|---|---|
| Phenol-aldehyde resin (such as #175 Durez resin) | lbs. | 3 |
| Ground quartz | lbs. | 12 |
| Lubricant | gms. | 136 |

This material is mixed by rolling on a hot mixing roll until it acquires the proper plasticity. After cooling, the sheets are crushed and ground to a powder suitable for loading into the preform die.

The resistor material used may consist of conductor particles dispersed in an insulating thermal-setting binder, such as may be made from phenol-aldehyde resin binder, quartz filler, calcined carbon black, and a lubricant. An example of a suitable composition is as follows:

| | | |
|---|---|---|
| Phenol-aldehyde resin (such as #175 Durez resin) | lbs. | 4 |
| Ground quartz | lbs. | 10 |
| Calcined carbon black | lbs. | 2 |
| Lubricant | gms. | 136 |

This material may be mixed by rolling on a hot mixing roll until it acquires the proper plasticity. After cooling, the sheets are crushed and ground to a powder suitable for loading into the insulation sleeve.

In using the insulating compound referred to above, the die temperature may be maintained between 250 degrees F. and 450 degrees F., preferably at 300 degrees F., and the forming operations are carried out at time intervals, controlled in accordance with treating temperature. Where a temperature of 300 degrees F. is used the operation may be carried out according to the following preferred schedule:

| | Sec. |
|---|---|
| Insulation powder load | 0 |
| Insulation form | 7 |
| Flash removed | 71 |
| Resistor powder load | 95 |
| Insulation collar removed | 103 |
| Final forming | 112 |
| Ejected | 122 |

In the preferred form the preform 1 includes an insulating sleeve portion 13 and a resistor portion 17 so preliminarily mixed and heat-treated that it is possible upon further application of heat and pressure to embed lead wire heads and to cause the insulation material and resistor material to form into a continuous inte-

gral piece. This operation is performed to produce the completed resistor by the method disclosed in United States Letters Patent No. 2,261,-916, issued upon Megow and Thomson application, Serial No. 153,746. This is accomplished as shown in Fig. 9 by placing the preform 1 within a cylindrical aperture 24 in a heated die block 25. Centrally bored plungers 26—26 carrying lead wires 27—27 within the central bores and with heads 23—23 projecting from the ends thereof are then caused to act toward one another, applying pressure to the preform blank 1 to cause the blank material to flow in the configuration shown in Fig. 10. Following the flow of material into its final configuration, the hardening of the same takes place under the influence of heat, thus producing an insulated resistor with endwise projecting lead wires securely held in place in contact with the central conducting core.

If desired, by adjusting the plasticity of the core material, or the sleeve material, or both, there is easily obtainable a wide range of modified forms of this invention. While the form disclosed shows a resistor which is molded by an endwise application of molding and pressure applied to the preform, it is obvious that the molding pressure may be applied in the final step from any direction from which the electrode may be driven to embed the same in the core material.

By means of this invention it is possible to completely form an insulated resistor without the necessity of first manufacturing a noninsulated resistor. The insulated feature of the finished resistor of this invention begins to take form simultaneously with the preforming of the resistor core. The process of the invention provides for a more economical utilization of the component parts that are used to form the insulated resistor and each component enters the structure in such form and at such stages as to provide for each a high degree of functional utility. The embedment of the terminals and final formation of the insulating sleeve and resistor core occur together, the insulating sleeve material and resistor core material forming an integral molded piece in which the two materials are mechanically continuous.

Without departing from the spirit of the invention, the molding properties of the resistor material can be altered sufficiently so that structural discontinuity can exist between the insulating and resistor material. This alteration can continue to the point where the resistor material is added as a formed core and the embedded terminal is held in contact with the resistor core by means of the insulating sleeve material.

Although in the preferred form of this invention the insulating sleeve material and resistor core material both flux to form an integral molded piece, it is not intended that the coverage hereof be limited thereto since the invention contemplates the forming of an insulated resistor in which the terminals are placed in contact with the resistor core or resistor core-forming material and anchored or embedded by plastic deformation and flow of either the resistor core material, the insulating sleeve material, or both.

This invention has been herein described by reference to specific instances which have been found useful under particular conditions. It is not intended that the protection to be afforded hereby be limited by the examples set forth, the intent being that such protection extend to the limits of the inventive advance disclosed herein as defined by the claims hereto appended.

What we claim as our invention is:

1. The method of forming a resistor comprising first forming a moldable resistor-forming preform, including an outer sleeve of moldable insulation compound and an inner conducting core, and then molding said preform while embedding one or more terminals therein in electrical contact with said core.

2. The method of forming a molded, insulated, fixed resistor of the type employed in radio circuits, which comprises forming a tubular sleeve of partially condensed heat-condensible insulating material, then loading into said sleeve a core consisting of a measured quantity of a mixture comprising thoroughly mixed conducting particles and heat-condensible insulating binder, and then forcing electrodes into spaced portions of said core while applying heat and pressure to said sleeve and core to bring about condensation thereof.

3. The method of forming a molded, insulated, fixed resistor of the type employed in radio circuits, which comprises forming a tubular sleeve of partially condensed heat-condensible insulating material, then loading into said sleeve a core consisting of a measured quantity of a mixture comprising thoroughly mixed conducting particles and heat-condensible insulating binder, next applying pressure to said core-load to compact the same, and then forcing electrodes into spaced portions of said core while applying heat and pressure to said sleeve and core to bring about condensation thereof.

4. The method of forming an insulated, fixed resistor of the type employed in radio circuits, which comprises loading an insulating molding material into a recessed die, forcing a plunger having a cross-section less than said recess medially into said recess to form from said molding material a preformed tubular sleeve, withdrawing said plunger from said recess, then while said preformed sleeve is retained in said recess loading into the same a measured load of heat-condensible resistor composition, then applying pressure to said resistor load to fix the same in place within said sleeve to form a preformed sleeve and resistor core assembly, and then forcing electrodes into spaced portions of said core while applying heat and pressure to said preformed assembly to bring about condensation of the core and sleeve portions thereof.

5. The method of forming an insulated, fixed resistor of the type employed in radio circuits which comprises loading an insulating molding powder into a recessed preforming die, forcing a plunger having a cross-section less than that of said recess medially into said recess to form from said insulating molding powder a preformed tubular insulating sleeve, withdrawing said plunger from said recess, then while said preformed sleeve is retained in said recess loading into the same a measured quantity of a mixture comprising thoroughly mixed conducting particles and heat-condensible insulating binder, then applying pressure to said measured load to form a preformed conducting core assembled within said preformed insulating sleeve, then displacing said assembled preform from said recess and inserting the same into a second recessed die open in two directions and heated to a condensation-producing temperature, and then forcing plungers carrying electrodes into the two openings of said second recessed die to embed the electrodes carried thereby into said preformed core and to apply molding pressure to said pre-

formed assembly while heat-induced condensation of said assembly proceeds.

6. The method of forming an insulated resistor having an integrally bonded jacket of insulating material and a core of bonded conducting particles, which comprises, first, loading a cylindrical recessed die closed at one end by a removable closure with a load of heat-condensible insulating material, then inserting medially into said die through the open end thereof a plunger having a cross section less than that of said recessed die a sufficient distance to closely approach said removable closure while applying heat and pressure to said load to cause the same to form a partially condensed tubular member having a thin diaphragm representing load material trapped between said plunger and said removable closure, then removing said removable closure, then forcing a plunger further into said die to break said diaphragm to form an open-ended tubular insulating sleeve of partially condensed material, then loading said sleeve with a partially condensed mixture of condensible binder and conducting particles to form a resistor core therein, and finally applying heat and pressure to said sleeve and core to cause condensation thereof while in the presence of one another.

7. The method of forming an insulated resistor having an integrally bonded jacket of insulating material and a core of bonded conducting particles, which comprises, first, loading a cylindrical recessed die closed at one end by a removable closure with a load of heat-condensible insulating material, then inserting medially into said die through the open end thereof a plunger having a cross section less than that of said recessed die a distance sufficient to displace a portion of said condensible insulating material upwardly to form a collar surrounding said plunger at the upper end of said recessed die, then applying pressure to said load to cause the same to form a partially condensed tubular member having a collar surrounding one end thereof, then loading said tubular member with a partially condensed mixture of condensible binder and conducting particles to form a resistor core therein, then severing said collar from said tubular member and core assembly, then ejecting said tubular member and core assembly from said recessed die, and finally applying heat and pressure to said sleeve and core to complete the condensation thereof while in the presence of one another.

8. The method of forming an insulated resistor having an integrally bonded jacket of insulating material and a core of bonded conducting particles, which comprises, first, loading a cylindrical recessed die closed at one end by a removable closure with a load of heat-condensible insulating material, then inserting medially into said die through the open end thereof a plunger having a cross section less than that of said recessed die a sufficient distance to closely approach said removable closure and to displace a portion of said load from said recessed die outwardly to form a collar surrounding said plunger at the open end of said die, then applying pressure to said load to cause the same to form a partially condensed tubular member having a collar at one end and a thin diaphragm at the opposite end representing load material trapped between said plunger and said removable closure, then removing said removable closure, then forcing a plunger further into said die to break said diaphragm to form an open-ended tubular insulating sleeve of partially condensed material having a collar surrounding one end thereof, then loading said sleeve with a partially condensed mixture of condensible binder and conducting particles to form a resistor core therein, then severing said collar from said sleeve, and finally applying heat and pressure to said sleeve and core to cause condensation thereof while in the presence of one another.

9. The method of forming a resistor having a conducting core surrounded by an insulating jacket of heat-condensible material, which comprises, first, forming a partially condensed sleeve of insulating material, next loading said sleeve with a mixture of conducting particles and partially condensed binder, then placing said sleeve and core within a recessed die and while held therein applying heat thereto while applying pressure through an electrode-embedded plunger cooperatively engaging said recessed die, whereby said sleeve and core are condensed while in contact with one another into a body having a molding flash corresponding to the line of engagement of said plunger with said recessed die, then removing said condensed sleeve and core from said recessed die, and, finally, mechanically severing said molding flash from said condensed sleeve and core.

10. The method of forming a molded insulated resistor which comprises forming an open-ended sleeve of insulating material which is capable of being molded and hardened with a core of conducting material capable of being molded and hardened contained therein, positioning the end of a lead wire opposite an end of said sleeve and core assembly, laterally restraining said sleeve and core assembly and forcing said lead wire end against said core material while applying endwise pressure to said sleeve and core material to cause the same to flow around and against said lead wire end to embed the same and then subjecting said sleeve and core assembly to a hardening treatment.

11. The method of forming a molded insulated resistor which comprises forming an open-ended sleeve of moldable insulating material which is capable of being hardened, inserting hardenable moldable composition composed of binder material with conductor particles dispersed therein within said sleeve to provide for the formation of a conducting core therein, positioning the ends of lead wires one opposite each end of said sleeve and core assembly, then laterally restraining said sleeve and core assembly against lateral displacement while forcing said lead wire against said core material and while applying endwise pressure to said sleeve and core material to cause flowage of the same against said lead wire ends and then subjecting said sleeve and core assembly to a hardening treatment.

12. The method of forming a molded insulated resistor which comprises first forming an initially solidified tubular sleeve of moldable insulating material which is capable of being hardened, then inserting a core of hardenable moldable composition composed of binder material with conductor particles dispersed therein within said sleeve positioning the end of a lead wire adjacent an end of said sleeve and core assembly, then laterally restraining said sleeve and core assembly against lateral displacement while forcing said lead wire end axially against said core material and while applying endwise pressure to said sleeve and core assembly to cause flowage of material contained therein against said lead wire

end, and then subjecting said sleeve and core assembly to a hardening treatment.

13. The method of forming a molded insulated resistor which comprises first forming an insulating tubular sleeve of heat-hardenable phenol-aldehyde resin and partially hardening the same, then inserting a phenol-aldehyde composition containing conductor particles within said sleeve to provide for the formation of a conducting core therein, positioning the end of a lead wire opposite an end of said sleeve and core assembly, then laterally restraining said sleeve and core assembly against lateral displacement while forcing said lead wire end against said core material and while applying endwise pressure to said sleeve and core material to cause flowage of the same against said lead wire end, and subjecting said sleeve and core assembly to heat to harden the same.

14. The method of forming a molded insulated resistor which comprises first forming a tubular sleeve of heat-hardenable insulating resin and partially hardening the same by limited application of heat, then inserting a heat-hardenable composition composed of resin binder and conductor particles within said sleeve to provide for the formation of a conducting core therein and partially hardening the same, positioning the end of a lead wire opposite an end of said sleeve and core assembly, then laterally restraining said sleeve and core assembly against lateral displacement while forcing said lead wire end against the material of said core and while applying endwise pressure to said sleeve and core material to cause flowage of the same against said lead wire end, and then subjecting said sleeve and core assembly to a treatment to complete the hardening thereof.

15. The method of forming a molded insulated resistor which comprises first forming a tubular sleeve of hardenable moldable insulating material and partially hardening the same, then inserting hardenable moldable composition composed of binder material with conductor particles dispersed therein within said sleeve to provide for the formation of a conducting core therein and partially hardening said core in the presence of said sleeve, positioning the end of a lead wire opposite an end of said sleeve and core assembly, then laterally restraining said sleeve and core assembly against lateral displacement while forcing said lead wire end against the material of said core and while applying endwise pressure to said sleeve and core material to cause flowage of the material contained therein against said lead wire end, and then subjecting said sleeve and core assembly to a treatment to complete the hardening thereof.

16. The method of forming a molded insulated resistor which comprises first forming a tubular sleeve of moldable insulating material which is capable of being hardened, then inserting a moldable composition containing conductor particles within said sleeve, positioning the end of a metallic terminal opposite an end of said sleeve, then laterally restraining said sleeve while forcing said terminal against the material within said sleeve and while applying pressure both to said sleeve and to the material contained therein to cause flowage thereof around the end of said terminal, and then subjecting said sleeve and the material contained therein to a hardening treatment.

17. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in subjecting a load of heat-hardenable moldable insulating composition to a penetrating action to form said load into an elongated sleeve having a rim surrounding one end thereof and during such penetrating and forming action applying heat to partially harden said sleeve, compacting within the bore of said sleeve a core of heat-hardenable conducting molding composition, severing the rim from said sleeve, embedding lead wire ends in the ends of said core while applying pressure thereto, and then applying heat to complete the hardening of said core and the insulating material surrounding the same.

18. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in subjecting a load of moldable heat-hardenable insulating composition to a penetrating action to form said load into an elongated cup having a thin bottom and a rim surrounding the opposite end thereof, separating the bottom from said cup, compacting within the bore of said cup a core of heat-hardenable molding composition having conducting particles dispersed therein, severing the rim from said cup, embedding lead wire ends in the ends of said core while applying pressure thereto, and then applying hardening heat to said core and the insulating material surrounding the same.

19. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in subjecting a load of moldable insulating composition to a penetrating action to form said load into an elongated sleeve having a rim surrounding one end thereof, compacting within the bore of said sleeve a core of conducting molding composition, severing the rim from said sleeve, embedding lead wire ends in the ends of said core while applying pressure thereto, and then hardening said core and the insulating material surrounding the same.

20. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in subjecting a load of moldable insulating composition to a penetrating action to form said load into an elongated cup having a rim surrounding the open end thereof, separating the bottom from said cup, compacting within the bore of said cup a core of conducting molding composition, severing the rim from said cup, embedding lead wire ends in the ends of said core while applying pressure thereto, and then hardening said core and the insulating material surrounding the same.

21. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in placing a predetermined quantity of a heat-hardenable insulating resin within a recess closed at one end, surrounding the opposite end of said recess with a mandrel-admitting member to form a rim-forming cavity in communication with said recess, then passing a mandrel of cross section less than said recess through said mandrel-admitting member into said recess until said mandrel is arrested by said recess closure to subject said insulating resin to a forming pressure and to form the same into an elongated sleeve having a rim at one end, maintaining the temperature within said recess at a point sufficient to partially harden said resin, withdrawing said mandrel, compacting within said sleeve moldable heat-hardenable conducting resin to provide for the formation of a conducting core therein, severing the rim from said sleeve, ejecting said sleeve and core assembly from said

recess, and then embedding electrode terminals in the ends of said core while applying pressure and heat to form and harden said sleeve and core.

22. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in placing a predetermined quantity of a heat-hardenable insulating resin within a recess closed at one end, surrounding the opposite end of said recess with a mandrel-admitting member, then passing a mandrel of less cross section than said recess through said mandrel-admitting member centrally into said recess until said mandrel is arrested by the closure of the recess to subject said insulating resin to forming pressure and to form the same into an elongated sleeve having a residual diaphragm between the end of said mandrel and said bottom closure, maintaining the temperature within said recess at a point sufficient to partially harden said resin, withdrawing said mandrel, removing the bottom closure of said recess, separating said residual diaphragm from said sleeve, compacting within said sleeve a core of moldable heat-hardenable resin having conductor particles dispersed therein to form an insulated resistor preform, and then embedding electrode terminals in the ends of said preform core while applying pressure and heat to form and harden the same.

23. The method of forming a molded resistor having an insulating jacket and a conducting core, which consists in placing a predetermined quantity of a heat-hardenable insulating resin within a recess closed at one end, surrounding the opposite end of said recess with a mandrel-admitting member having a rim-forming cavity in communication with said recess, then passing a mandrel of less cross section than said recess through said mandrel-admitting member centrally into said recess until said mandrel is arrested by the bottom closure of said recess to subject said insulating resin to forming pressure to form the same into an elongated sleeve having a rim at one end and a residual diaphragm between the end of said mandrel and said bottom closure, maintaining the temperature within said recess at a point sufficient to partially harden said resin, withdrawing said mandrel, removing the closure of said recess, separating said residual diaphragm from said sleeve, compacting within said sleeve a core of moldable heat-hardenable resin having conductor particles dispersed therein to form an insulated resistor preform, severing the rim from said sleeve, ejecting said preform from said recess, and then embedding electrode terminals in the ends of said preform core while applying pressure and heat to form and harden the same.

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