June 10, 1930. H. H. WERMINE 1,763,114

ELECTRIC COIL AND TRANSFORMER AND PROCESS FOR MAKING SAME

Filed April 2, 1927

Fig. 1

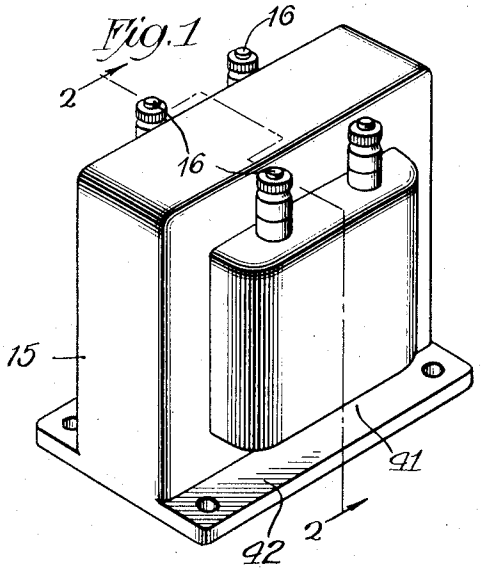


Fig. 2

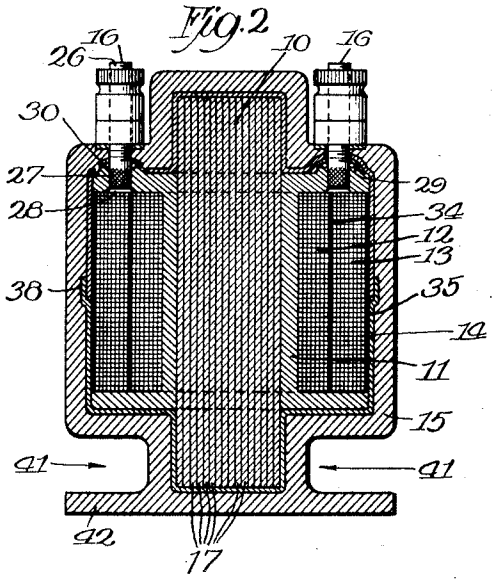


Fig. 3

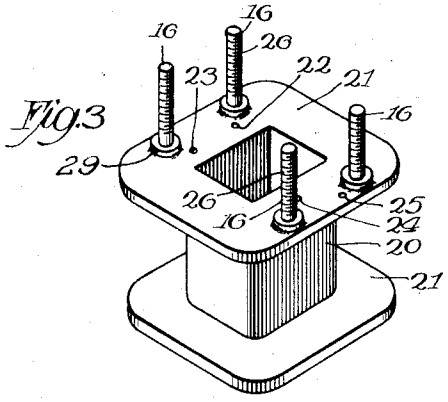


Fig. 5

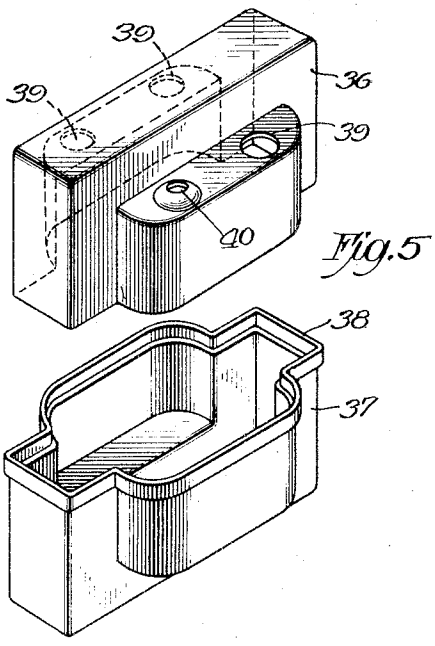
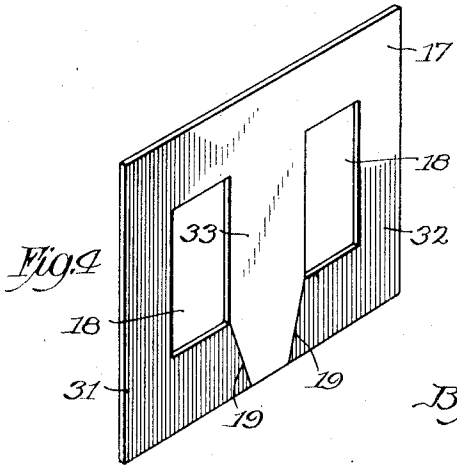


Fig. 4



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UNITED STATES PATENT OFFICE

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ELECTRIC COIL AND TRANSFORMER AND PROCESS FOR MAKING SAME

Application filed April 2, 1927. Serial No. 180,356.

This invention relates to electric coils, for example transformers and more particularly small coils or transformers used in signal, telephonic or high frequency circuits.

One of the objects of the invention is to provide a coil of the above described class which is completely enclosed within a protective casing preferably of insulating material impervious to moisture.

Another object is to provide an improved process and an improved mode of construction by which a weather proof casing may be molded around an electric coil of the described class without impairing the mechanical properties or electrical characteristics of the winding. Another object is to provide improved means for connecting the winding with an external circuit.

Other objects are to provide a coil structure of relatively few and simple parts which may be manufactured rapidly and economically and which will be strong and durable so as to be capable of withstanding rough handling, to which devices of this kind are sometimes subjected, and in general, to provide an improved coil structure of the character indicated.

Other objects and advantages of the invention will become apparent by reference to the following specification and accompanying drawing illustrating a telephone transformer made in accordance with a selected embodiment of my invention, and in which drawing:

Fig. 1 is a perspective of the finished transformer.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a perspective of the bobbin on which the transformer windings are wound.

Fig. 4 is a perspective of one of the elements used in forming the core, and

Fig. 5 is a perspective of a shielding element consisting of two parts, the parts being shown separated.

The transformer herein disclosed comprises a metal core 10, a bobbin 11, primary and secondary windings 12 and 13 respectively, a shield 14, an outer shell or casing 15 and binding posts 16. The core 10 is preferably laminated, being made up of a plurality of suitable iron plates 17 such as illustrated in Fig. 4. The plates 17 are apertured as indicated at 18—18 through which apertures the windings and bobbin passes, as will be hereinafter described, and the plate is slitted as indicated at 19—19 for a purpose which will be hereinafter brought out.

The bobbin is preferably a moulded member made up of insulating material, and comprises a tubular body portion 20 having laterally extending flanges 21—21 adjacent its ends. The primary and secondary windings 12 and 13 respectively, are wound about the body portion 20 between the end flanges 21—21 whereby they are retained on the body portion, and binding posts indicated at 16 are provided for receiving the terminals of the said coils or windings 12 and 13. The primary and secondary windings are preferably separated by a layer of suitable insulating material such as empire cloth indicated at 34 in Fig. 2, and the outer surface of the secondary winding is preferably covered with a wrapping of heat resisting insulating material such as mica, as indicated at 35. Apertures 22 and 23 are provided in one of the flanges 21 for the purpose of permitting the terminals of the primary coil to be extended from between the flanges 21 to the outside of the bobbin to facilitate electrical connection thereof to adjacent binding posts 16—16. Suitable apertures 24 and 25 are also provided in the same flange for permitting the passage of the terminals of the secondary winding from between the flanges to the outside of the bobbin and to facilitate electrical connection thereof to the adjacent binding post 16.

The binding posts 16 preferably comprise metal members provided with screw threading as indicated at 26 and knurling at their lower ends, as indicated at 27. The binding posts are permanently mounted on the bobbin by being moulded in place in one of the end flanges, the knurling facilitating secure holding of the posts by the material of the flange.

The binding posts are preferably set up from the inside of the flange as indicated at 28 (Fig. 2) so as to prevent any possible undesirable contacting between the end of the

binding post and the coils or windings 12 and 13, and the flange on which the binding posts are mounted is preferably provided with upstanding bosses as indicated at 29 around the respective binding posts so as to strengthen the flange in the vicinity of the post. The terminals of the coils are extended through the apertures 22, 23, 24 and 25 as above described, and are respectively connected to the binding posts by being bared and wound around the post at its base as best shown in Fig. 2. A spring washer 30 is pressed downwardly over the post so as to tightly clamp the wire against the face of the bosses 29 and is retained in such position by the screw threading 26 as will be readily understood from an inspection of Fig. 2. The spring washer 30 is effective to insure the establishment of good electrical connection between the terminals of the coils and the respective binding posts.

The core plates 17 are assembled one by one to form the complete core 10 by flexing the ends 31 and 32 out of alignment with the central portion 33, the slits 19—19 permitting this, and the central portion 33 being then passed through the tubular body portion 20 of the bobbin. A sufficient number of these plates 17 are so assembled on the bobbin to form a tightly packed complete core as indicated at 10 in Fig. 2.

The shield 14 comprises a pair of metal members as indicated in Fig. 5, wherein the members are shown separated and the upper member is indicated at 36, and the lower member at 37. These members are shaped to fit snugly about the upper and lower portions respectively of the assembled core and winding carrying bobbin 11. The lower section 37 of the shield is provided with an offset flange 38 which fits over the lower marginal portion of the upper section 36 as clearly shown in Fig. 2 so as to properly align the sections. The upper section 36 is provided with relatively large apertures 39—39 which pass freely over the respective binding posts 16 and spring washers 30 so as to avoid making electrical contact therewith. Another aperture 40 of smaller diameter is provided in the upper section 36 of the shield, and is adapted to fit rather snugly about one of the binding posts 16 and to overly the spring washer 30 on the post so as to establish good electrical connection therewith. It is contemplated that the small aperture 40 will be provided so as to contact with the one of the binding posts 16 which in the majority of radio receiving sets is grounded, and the shield will therefore be effective to prevent disturbance of or interference with the action of the transformer by outside electrical forces.

The casing 15 is preferably made up of insulating material such as bakelite or the like, and it may conveniently be made of semi-cured bakelite which is somewhat pliable and flexible, and capable of being pressed into the desired shape. In the present instance I make the casing 15 by first forming a recess in a sheet of semi-cured material introduced into the mold, which recess will be shaped so as to snugly receive an upper portion of the inverted transformer structure, with the binding posts 16 projecting therethrough. When the transformer structure has been positioned in the bakelite-lined recess of the mold a further supply of the material is disposed about the lower portion of the transformer, and then the die is closed and pressure and heat applied in the usual manner. To save material there may be formed side channels as indicated at 41—41. The flange 42 which consists of an integral part of the casing serves as a base or mounting by which the transformer may be secured in position. It will be readily understood that there is thus produced a unitary casing of solid impervious bakelite completely surrounding the transformer and permanently protecting the same from external deleterious agencies.

It will be manifest that powdered bakelite or analogous material may be employed instead of or in conjunction with the semi-cured sheet as above described. In the present instance it will be observed that the shield 14 when made of metal serves as a barrier for electrical inductive effects. Also, of whatever material it may be made, it has the additional functions of preventing bakelite from being forced into the interstices of the winding during the molding and curing operation and of protecting the winding from the heavy pressure necessarily employed in the described process.

The term bakelite as used herein means any kind of phenol condensation product or the like.

A casing such as above described, may be made in other ways than that which I have just described, and I am aware that other changes in the form, construction, and arrangement of parts may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims which should be construed as broadly as possible consistent with the state of the art.

I claim as my invention:

1. In a transformer of the class described, the combination of a bobbin, primary and secondary coils wound on said bobbin, a plurality of binding posts permanently mounted on said bobbin and connected respectively to the terminals of said coils, a metallic shield enclosing said bobbin and said coils, said shield being apertured to permit said binding posts to project outwardly therethrough and electrically connected to one of said posts but not to the others, and a casing of impervious material enclosing said shield.

2. In a transformer of the class described, the combination of a bobbin, primary and secondary coils wound on said bobbin, and having their respective terminals extending outwardly therefrom, a metallic shield enclosing said windings and connected to one of said terminals but not to the others, and a hermetically sealed casing of impervious insulating material enclosing said shield, said terminals projecting outwardly through said shield and casing for permitting connection of electric conductors thereto.

3. In a transformer of the class described, the combination of a bobbin having a tubular body portion and a pair of spaced flanges projecting laterally therefrom, a primary and a secondary coil wound on said tubular portion between said flanges, a plurality of binding posts fixedly mounted on one of said flanges and connected respectively to the terminals of said coils, a metallic shield enclosing said core, bobbin and coils, said shield being apertured to permit said binding posts to project therethrough, and a one-piece casing of impervious insulating material over said shield.

4. In a transformer of the class described, the combination of a bobbin having a tubular body portion and a pair of spaced flanges projecting laterally therefrom, a primary and a secondary coil wound on said tubular portion between said flanges, a plurality of binding posts fixedly mounted on one of said flanges and connected respectively to the terminals of said coils, a two-part metallic shield enclosing said core, and electrically connected to one of said binding posts, said shield comprising a lower part and an upper part, said upper part having a plurality of apertures for permitting said binding posts to project therethrough and one of said parts being provided with means for maintaining the other part in alignment therewith, and a one-piece casing of impervious insulating material enclosing said shield.

5. In an electric coil construction, the combination of a winding, a shield surrounding said winding, and a one piece casing of insulating material molded around and enveloping said parts and constituting a hermetic seal therefor.

6. In an electric coil construction, the combination of a bobbin, a winding thereon, a shield around said bobbin and winding, and a one-piece casing of insulating material molded around and enveloping said parts and constituting a hermetic seal therefor.

7. In an electric coil construction, the combination of a bobbin, a winding thereon, a shield around said bobbin and winding, and a one piece casing of insulating material, molded around and enveloping said parts, said casing constituting a hermetic seal for said parts and a supporting base for the coil.

8. In an electric coil construction of the class described, the combination of a winding, an impervious one-piece insulating shell enclosing said winding, connectors for said winding rigidly mounted on said winding and projecting outwardly through said shell, and means for preventing the casing material from entering the interstices of the winding during the molding process.

9. In an electric coil construction, the combination of a winding, a support for said winding, a one-piece rigid insulating shell molded around said winding and support and hermetically sealing the same, a connector for said coil supported by said support and extending outwardly through said shell, and a protective shield interposed between said shell and winding.

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