Nov. 29, 1932. J. S. BISHOP 1,889,398

ELECTRICAL COIL AND A METHOD OF MANUFACTURING IT

Filed March 5, 1932

FIG. 1.

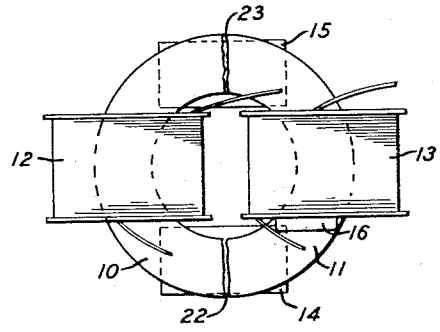
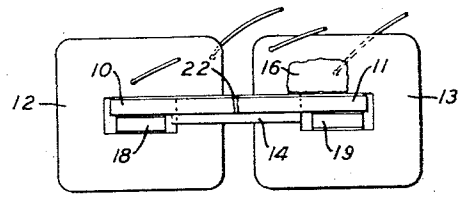


FIG. 2.



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UNITED STATES PATENT OFFICE

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ELECTRICAL COIL AND A METHOD OF MANUFACTURING IT

Application filed March 5, 1932. Serial No. 596,917.

The invention relates to an electrical coil and a method of manufacturing it, and more particularly to an inductance coil having a toroidal type core and a method of manufacturing it.

One type of an inductance toroidal core coil which is used in connection with telephone circuits to which the invention is particularly applicable comprises two coils, each having a number of turns of wire wound thereon, the coils being assembled on two substantially identical arcuate sections of a ring core composed of magnetic material. The manufacture of an inductance coil of this type with predetermined electrical properties including a definite impedance ratio between the two coils is a comparatively difficult and expensive procedure because of variations in the permeability of the cores and uncontrollable distribution of the wire in the windings even though the exact number of turns of wire are wound thereon, which in the subsequent inductance adjustment of the coil may require the removal of a portion of the wire or in some cases the addition of turns of wire.

The objects of the invention are to provide an improved type of electrical coil and a method of manufacturing it to a definite stable inductance value and having a definite stable inductance ratio between the two coils in a simple, inexpensive and expeditious manner.

One of the features of the invention is the use of a small piece of magnetic material, preferably the same material as used in the core, cemented to one of the windings, and/or the adjacent portion of the core.

The invention may be better understood by reference to the following description and accompanying drawing in which

Fig. 1 is a plan view of a completed inductance toroidal core coil embodying the features of the invention, and

Fig. 2 is a side elevation of the embodiment shown in Fig. 1.

Referring to the drawing, windings 12 and 13 are assembled over the semi-toroid core sections 10 and 11 and are preferably held in the positions desired by means of suitable non-magnetic spacers or wedges 18 and 19 respectively. Thin strips of non-magnetic material 14 and 15, preferably of ceramic material, are suitably secured to the core sections 10 and 11 by means of a non-magnetic cementing material, to secure the core sections 10 and 11 together to provide suitable air gaps 22 and 23 therebetween. A small piece of magnetic material 16, preferably of the same material as the core sections 10 and 11, is suitably secured to one of the windings 13 and/or to the adjacent portion of the core section 11 by means of a non-magnetic cementing material.

The preferred procedure in manufacturing coils of this type is as follows:

The semi-toroids10 and 11 forming the core of the coil are preferably made in the form of a continuous ring from finely divided magnetic particles formed under high pressure into a ring in a well known manner and subsequently suitably broken into two substantially identical circumferential sections or semi-toroids 10 and 11.

Upon the semi-toroids 10 and 11 are mounted coils 12 and 13 respectively. The coils 12 and 13 preferably comprise a number of turns of insulated wire wound on a spool assembly and are preferably secured to their associated core sections by means of non-magnetic spacers 18 and 19 respectively.

The core sections or semi-toroids 10 and 11 with the coils 12 and 13 respectively assembled over them, are placed in a suitable fixture such, for example, as disclosed in U. S. Patent 1,748,993 to C. A. Purdy, March 4, 1930. The thin strips of non-magnetic material 14 and 15 are secured to the semi-toroids 10 and 11 over the ends of the air gaps 22 and 23 by means of a suitable non-magnetic cement. The use of thin strips of ceramic material 14 and 15 to secure the core sections 10 and 11 together, which forms no part of this application, is disclosed and claimed in a copending application of H. Schwartzmann, Serial No. 596,918, filed March 5, 1932.

After the cement between the thin strips of non-magnetic material 14 and 15 and the semi-toroids 10 and 11 has hardened the coil

is connected to a test set of any suitable type well known in the art to determine the inductance unbalance between the two coils. If there is an unbalance between the two coils the operator determines which of the coils has the lower inductance.

In accordance with the invention the operator, instead of removing turns from the winding having the higher inductance, or adding turns to the winding have the lower inductance, applies a small amount of a suitable non-magnetic cement on one end of the winding having the lower inductance and/or on the adjacent portion of the core section. A small piece of magnetic material 16, preferably of the same material as the core, is placed on the cemented portion of the end of the winding and/or the cemented portion of the core and its position varied, preferably with respect to the center line of the core, until an inductance balance is obtained between the two windings. The size of the piece of magnetic material 16 to be used depends upon the amount of unbalance between the two windings and can be readily determined by trying several pieces of different sizes, or by adding material to a piece or removing a portion therefrom.

The invention is also capable of other modifications and adaptations not specifically referred to but included within the scope of the appended claims.

What is claimed is:

1. The method of manufacturing electrical coils which consists in forming a core, dividing the core into a plurality of substantially identical sections, placing windings thereon in sections, assembling the core sections in spaced relation, varying the space between the core sections until a definite predetermined effect is obtained in the coil, and adjusting the position of a piece of a magnetic material adjacent one of said windings until a definite predetermined effect is obtained in said one winding.

2. The method of manufacturing an electrical coil comprising breaking an annular core, mounting a plurality of divided windings on the core, joining the parts of the core so as to form a small air gap therebetween, adjusting the windings upon the core with relation to the joints between the parts of the core, securing the windings to the core and adjusting the position of a piece of magnetic material adjacent one of said windings until predetermined electrical properties are obtained.

3. The method of manufacturing an electric coil comprising breaking an annular magnetic core, mounting a pair of windings having approximately the same number of turns on the core, joining the parts of the core so as to form a small air gap therebetween, securing the windings to the core and adjusting the position of a piece of magnetic material adjacent the winding having the lower inductance until an inductance balance between the two windings is obtained.

4. A magnetic coil comprising a broken annular core, a pair of windings mounted one upon each section of the core, means for securing the parts of the core with a suitable air gap therebetween, and means comprising a piece of magnetic material secured adjacent one of said windings for obtaining an inductance balance between said windings.

5. A magnetic coil comprising a core, a pair of windings mounted upon different portions of said core, and means for adjusting the inductance of one of said windings without appreciably effecting the inductance of the other of said windings comprising a piece of magnetic material secured adjacent said first mentioned winding.

In witness whereof, I hereunto subscribe my name this 23rd day of February, 1932.

JOHN S. BISHOP.