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Meindl

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[54] **CORE**

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[52] **U.S. Cl.** **336/136;** 336/212; 336/233

[51] **Int. Cl.** **H01f 27/24**

[58] **Field of Search** 336/83, 136, 233, 212

[56] **References Cited**

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[57] **ABSTRACT**

A core for an inductance coil adapted to provide a variable inductance for inductance correction or the like. The core utilizes centrally located sleeve comprised of non-magnetizable, polymeric material threaded to receive a matingly threaded cylindrical core adjusting member.

2 Claims, 2 Drawing Figures

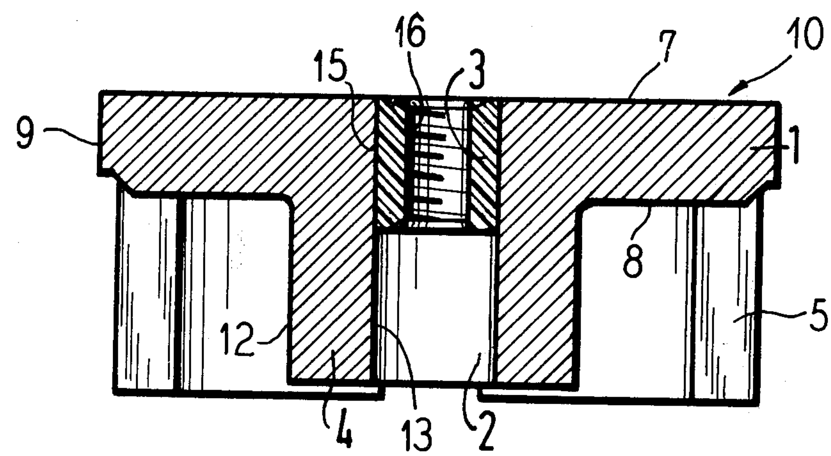


Fig.2

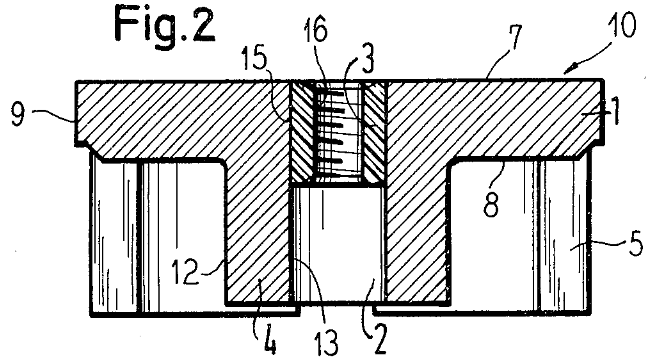
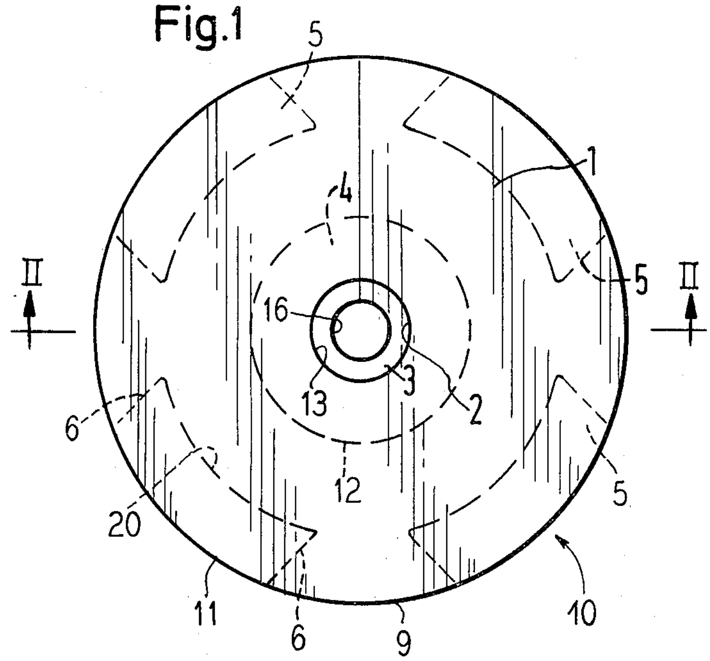


Fig.1



CORE

BACKGROUND OF THE INVENTION

Heretofore cores for inductance coils have been fitted with a variety of means for varying somewhat the inductance value associated with that core when wound with wire and duly mounted suitably in some sort of electrical circuit for use so as to permit an adjustment or a correction of such inductance value to fit the so wound coil properly into such an electrical circuit. One class of such adjustable inductance coil cores has employed, for example, a sleeve with threaded inside walls which is glued into a central bore formed in the core. A cylindrical adjusting member with outside walls matingly threaded engages the sleeve.

Such class of adjustable inductance coil cores suffer from several disadvantages. For one thing, the glue used can adversely affect the electrical properties of the product coil. For another, the sleeve used is difficult to locate and position properly in the core, so that inducting correction occurs unfavorably. For another, the sleeves heretofore used commonly had excessively high linear coefficients of thermal expansion which not only could harm the core structure in use as equipment undergoes thermal cycling during on/off operations, but also could make achievement of stable inductance valves difficult if not impossible to achieve in a product coil.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to a core for inductance coils which is adopted to overcome such disadvantages of prior art inductance coil cores and to provide the capability of making simple, accurate, stable adjustments or corrections the inductance of a product coil made therewith.

An object is to provide an inductance coil core containing a centrally located adjustable sleeve which is mounted in the core without the use of glue.

Another object is to provide in such a core an adjustable sleeve which is suitably located and positioned in the core.

Another object is to provide in such a core such an adjustable sleeve which has a suitable low linear coefficient of thermal expansion relative to the main core body.

Other and further objects, purposes, advantages, utilities, and features will be apparent to those skilled in the art from a reading of the present specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a top plan view of one embodiment of an inductance coil core of the present invention; and

FIG. 2 is a vertical sectional view taken along the line 2—2 of FIG. 1.

DETAILED DESCRIPTION

Referring to the drawings, there is seen a core assembly of this invention, herein designated in its entirety by the numeral **10**. Core assembly **10** incorporates a plate member **1** which has a generally circular perimeter **9** and also a front face **7** and a back face **8** in generally spaced, parallel relationship to one another. An aperture **2** is defined centrally therein and extends transversely therethrough. A core assembly of this invention may contain a plurality of apertures.

An integral, cylindrical collar extends from such back face **8** circumferentially about such aperture **2**, in effect lengthening aperture **2** axially.

For purposes of winding with wire (not shown) to fabricate an inductance coil, core assembly **10** is provided with at least two circumferentially, preferably equally, spaced, integral feet **5** extending from such back face **8** adjacent the perimeter **9** thereof. The side walls **20** and **11** of such feet **5** are in radially spaced, radially generally parallel relationship to the sidewalls **12** and **13** of such collar **4**. In the preferred embodiment shown in the drawings, there are four of such feet **5**, and each foot has its respective end walls **6** so contoured that radially opposed (as respects the center of axis of aperture **2**) pairs of feet **5** have their corresponding respective end walls **6** tangentially aligned with the outside wall **12** of collar **4**.

A sleeve **3** is mounted in aperture **2** so that the circumferential outside walls **15** of sleeve **3** are in face-to-face abuting engagement with the side walls **13** of aperture **2** in the region of plate member **1**. In the preferred embodiment shown in the drawings, the sleeve **3** projects slightly beyond the (projected) back face **8** of plate member **1** into the region of collar **4**. Sleeve **3** has its circumferentially extending inside walls **16** threaded.

Sleeve **3** is separately formed from the integral combination of plate member **1**, collar **4**, and feet **5**. Such integral combination is conventionally formed of a magnetizable material, preferably a ferrite.

For example, ferrite ceramic bodies are usually formed by first shaping, as by dry pressing, a ferrite powder composition followed by sintering at final temperatures ranging from about 1200° to 1400°C. Usually some form of surface finishing, such as grinding, is used to achieve close mechanical tolerances. Magnetically soft ferrites (Mn - Zn and Ni - Zn ferrites) are preferred for inductor cores.

Sleeve **3** is comprised of a plastic material which is substantially non-magnetizable, such as an organic polymer. Preferably sleeve **13** is formed of a composition which has a linear thermal coefficient of expansion which falls in the range from about 1 to 45 $\times 10^{-6}$/°C. when such integral combination is bound of ferrite. The sleeve **3** is conveniently formed of a thermoplastic of thermosetting organic polymeric material such as polyester, expoxide, silicone, phenol, polysulfone, polycarbonate, polyacetal, polyoxymethelene and the like. To achieve such a linear coefficient of expansion as indicated, and to make the sleeve **3** have magnetizable properties if desired, such organic polymeric material may be filled with a filler material such as a ferrite powder, a carbonyl iron powder, or the like. Typical filling rates range from about 60 to 90 parts by weight of filler per 100 parts by weight of organic polymeric material

Sleeve **3** can be formed in the core assembly by any convenient procedure, including injection molding, casting or the like using any convenient filler if desired, so long as the desired product sleeve properties are obtained.

Sleeve **3** is inset directly into aperture **2** without adhesive by any convenient procedure, for example, by press fitting, injection pressing, injection molding or the like, as those skilled in the art will readily appreciate. Such a sleeve **3** so combined into the aperture **2** eliminates many disadvantages occurring in the prior art core assemblies owing to deep or eccentric insertion and glueing of a threaded member into such an aperture **2**. Thus, for example, undesirable variations in electrical values of a product induction coil made with a core assembly **10** of this invention can be avoided by using a sleeve -**3**- which is injection pressed into a preformed integral combination of plate member **1**, collar **4**, and feet **5** by preheating such integral combination to a temperature in the range from about 100° to 300°C.

It is preferred, for purposes of the present invention, to have the cohesion between a sleeve -**3**- and such an integral combination be greater than about 3 kp without the use of any adhesive.

Thus, in one preferred process for making an inductance coil core assembly of this invention, one first forms of magnetizable material an integral combination of

1. a plate member having a generally circular perimeter and having a front face and a back face in generally spaced, parallel relationship to one another, said plate member having an aperture defined centrally therein and extending transversely therethrough,

2. a cylindrical collar extending from said back face circumferentially about said aperture,

3. at least two circumferentially spaced feet extending from said back face adjacent the perimeter thereof whose side walls are in radially spaced, radially generally parallel relationship to the sidewalls of said collar.

Then, one heats said so produced integral combination to a temperature ranging from about 100° to 300°C. and injection molds in said aperture a sleeve comprised of an organic polymeric material whose outside walls are mounted generally in face-to-face abuting engagement with the adjacent side walls of said aperture and whose inside walls are threaded. Finally, the product assembly is cooled.

In such preferred process, said organic polymeric material is preferably epoxide and the injection molding is carried out in a temperature in the range from about 140° to 300°C. Also in such preferred process, one uses an organic polymeric material (most preferably the epoxide) which is filled with a powdered material selected from the group consisting of ferrite and carbonyl iron and which has a linear coefficient of thermal expansion in the range from about **1** to **45** $\times$ **10**$^{-6}$/°C. In such an injection molding using such polymeric material so filled with a magnetizable powder as above indicated, the powder size range associated with such a powder preferably ranges from about 50 to 300 microns. Further, in such preferred process, the magnetizable material is a ferrite, as indicated above.

The combination of sleeve **3** with the integral plate member **1**, collar **4** and feet **5** subassembly is then utilized for the manufacture of an inductance coil by winding with wire (not shown) and by engaging the sleeve **3** with a matingly threaded cylindrical core member (not shown) which adapts the product inductance coil for corrections and/or adjustments in inductance electrical values in use.

Other and further embodiments and variations of the present invention will become apparent to those skilled in the art from a reading of the present specification taken together with the drawings and no undue limitations are to be inferred or implied from the present disclosure.

I claim:

1. A core assembly for an inductance coil comprising:

A. a plate member having
   1. a generally circular perimeter;
   2. a front face and a back face in generally spaced, parallel relationship to one another;
   3. an aperture defined centrally therein and extending transversely therethrough;

B. an integral, cylindrical collar extending from said back face circumferentially about said aperture;

C. at least two circumferentially spaced, integral feet extending from said back face adjacent the perimeter thereof whose side walls are in radially spaced radially generally parallel relationship to the side walls of said collar;

D. a plastic slug molded in place in said aperture, said plastic slug comprising a non-magnetizable, organic polymeric material;

E. means defining a threaded bore in said plastic slug;

F. said plate member together with said integral collar and said integral feet being comprised of magnetizable material;

G. a dispersion of a powdered material selected from the group consisting of ferrite and carbonyl iron being present throughout the polymeric material to render said slug magnetizable.

2. The core assembly of claim **1**, wherein said -slug- is so filled with from about 60 to 90 parts by weight of said powdered material per 100 parts by weight of said organic polymeric material.

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