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MAGNETIC CORE STRUCTURES

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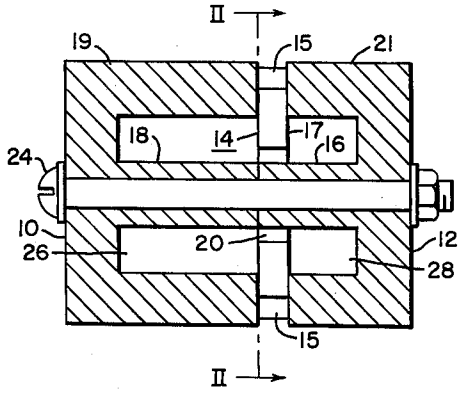


Fig. 1.

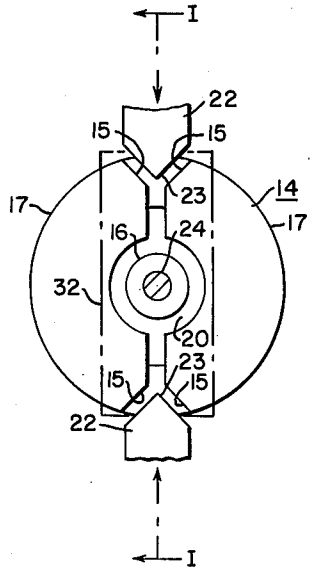


Fig. 2.

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MAGNETIC CORE STRUCTURES

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This invention relates to magnetic core structures, and more particularly to magnetic core structures such as those used in reactor and transformer coil and core assemblies, designed to have air gaps which can be readily adjusted to vary the reactance of the assembled unit.

In recent years, ferrite cores, and especially ferrite cup-cores have been increasingly utilized in such reactor and transformer devices. Due to manufacturing processes the tolerance of the magnetic properties of ferrites are not as close as commercially desirable, sometimes having a variance of as much as 20%. Therefore, some means are necessary to compensate for this variance during the final assembly of the coil and core into the completed unit to be used as a reactor or transformer or some other magnetic core device.

Accordingly, it is an object of this invention to provide a new and improved magnetic core structure.

It is a further object of this invention to provide an improved powdered and/or ferrite core structure which, when combined with a coil winding, can be readily adjusted to vary the reactance of the coil and core unit.

It is a general object of this invention to provide a means of obtaining adjustable air gaps in powdered and/or ferrite core during the assembly thereof into core and coil structures, and a means of retaining the adjusted air gap.

Briefly, the present invention accomplishes the above cited objects by providing a core composed of two facing E-section core members having a split annular magnetic shunt disc interposed therebetween. Adjustment of the air gap is effected by movement of the inner annular surface radially relative to a similarly shaped centrally extending core leg within the respective core members.

Further objects, features and advantages of the invention will become apparent as the following description proceeds, and features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

FIG. 1 is a longitudinally sectioned view taken generally along reference line I—I of FIG. 2 and showing the cup-core arrangment according to the invention utilizing a split shunt disc; and

FIG. 2 is a cross-sectional view showing the cup-core arrangement of FIG. 1 with a broken away portion of a manipulative tool and taken generally along reference line II—II thereof.

Referring now to the drawings, the core members depicted therein are generally of the type which have a central core leg having one or more coil windings located thereon while the remaining portion of the core forms a closed magnetic circuit enclosing the coil windings.

The core structure shown in FIG. 1 comprises two E-section cup-cores **10** and **12** in facing relationship with an annular magnetic shunt disk **14** interposed therebetween. The shunt disk is shown as being composed of two segments **17**, but it is to be understood that any number of segments could be used to form the annular disk without departing from the spirit and scope of the invention. It is to be understood, too, of course, that the cup-cores **10** and **12** and split shunt disk **14** can be of other than circular configuration. The device, as shown, illustrates the cup-core **10** as having a centrally extending leg **18** of substantially the same length as the outer barrel **19** thereof and the cup-core **12** as having a centrally extending leg **16** which is longer than the outer barrel **21** thereof by a distance determined by the width of the split shunt disk **14** so that legs **18** and **16** are in abutting relationship. However, it is to be understood that these legs need not abut to be within the contemplated scope of the invention. An air gap **20** is formed in the radial direction between the outer periphery of the leg **16** and the inner periphery of the shunt disk segments **17**. The reactance of the circuit can be changed by varying the width of the radial air gap **20**, in the manner presently to be described.

As illustrated in FIG. 2 by utilizing a pair of complementary or split shunt disk segments **17** each having tapered edge portions **15** at the outer ends thereof, the air gap **20** can be varied by moving the shunt disk segments **17** either inwardly toward the central leg which decreases the air gap **20** or outwardly which increases the air gap **20**.

A simple hand tool (partially shown) can be constructed to facilitate the spreading of the shunt disk segments **17**, the tool having opposing wedge-shaped portions **22** which cooperate with the tapered edges **15** of the shunt disk segments **17**, and, as force is exterted by the wedge-shaped portions **22** toward the center leg **16**, the shunt disk segments **17** are spread apart with respect to one another to increase the radial air gap **20**. This process can also be accomplished by using tapered screws (not shown) and matingly threading the tapered edge portions **15** of the disk segments **17**. Two winding receiving openings **26** and **28** are provided on either side of the shunt disk **14** and with the coils inserted therein the final adjusted assembly can be maintained in a fixed relationship by a suitable fastening means such as a bolt **24** inserted through a bolt-receiving opening in legs **18** and **16**, which when tightened, clamps the shunt disk segments **17** between the opposing rim portions of the cup-core barrels **19** and **21** in order to preserve the adjusted width of the air gap **20**.

It can be readily seen from the foregoing description that the core structures as illustrated contain a completely closed magnetic circuit in its outer periphery while still providing an air gap within the unit to vary the reactance by external means or manipulation after the coil and core are assembled.

It is to be understood that the core arrangements of FIGS. 1 and 2 can be of planar configuration insofar as at least the cup-cores **10** and **12** are concerned, as denoted by the dashed outline **32** of FIG. 2.

Whi'e there has been shown and described what is at present considered to be the preferred embodiment of the invention, modifications thereto will readily appear to those skilled in the art. It is not desired therefore that the invention be limited to the specific arrangements shown and described, and it is intended to cover in the appended claims all such modifications that fall within the true spirit and scope of the invention.

I claim as my invention:

1. In a magnetic core structure, the combination comprising a first cup-shaped member having a centrally extending leg portion therein, a second cup-shaped member having a centrally extending leg portion therein protruding beyond the rim portion thereof, the leg portions of said first and second member being in facing coaxially aligned relationship, an annular magnetic shunt disc interposed between the rim portions of said first and said second members and abutting therewith, said disc comprising a plurality of segments each spaced from said leg portions to form a radial magnetic gap between said disk and said leg portions, whereby a displacement of said segments with respect to adjacent segments results in a radial displacement of the inner portion thereof with respect to the legs of said members to alter the radial

length of said magnetic gap to adjust the reactance of said core structure and means for binding said structure in fixed relationship to maintain said adjustment.

2. In a magnetic core structure, the combination comprising a first core member having a centrally extending leg portion therein, a second core member spaced from said first core member but having a centrally extending leg portion therein extended into abutting engagement with said first core member leg portion, an annular magnetic shunt disc interposed in the space between said first and said second members, said disc comprising a plurality of segments each spaced from said leg portions to form a radial magnetic gap between said disc and said leg portions, whereby a displacement of said segments with respect to adjacent segments results in a radial displacement of the inner portion thereof with respect to the legs of said members to alter the radial length of said magnetic gap to adjust the reactance of said core structure, and means for binding said structure in fixed relationship to maintain said adjustment.

3. In a magnetic core structure the combination comprising a first core member having a centrally extending leg portion therein, a second core member spaced from said first core members but having a centrally extending leg portion therein extended into abutting engagement with said first core member leg portion, an annular magnetic shunt disc interposed in the space between said first and said second members and abutting therewith, said disc forming an air gap between the inner periphery thereof and at least one of said centrally extending leg portions, said annular shunt disc being composed of at least two segments, cooperating means on adjacent radial segmental surfaces for insertion of a manipulative device, whereby said segments are displaced from one another to provide radial adjustment of said air gap.

4. In a magnetic core structure, the combination comprising a first cup-shaped member having a centrally extending leg portion therein, a second cup-shaped member having a centrally extending leg portion therein protruding beyond the rim portion thereof, the leg portions of said first and second members being in facing abutting coaxially aligned relationship, an annular magnetic shunt disc interposed between the rim portions of said first and said second members and abutting therewith, said disc forming an air gap between the inner periphery thereof and at least one of said leg portions, said annular shunt disc being composed of at least two segments, cooperating means on adjacent radial segmental surfaces for insertion of a manipulative device, whereby said segments are displaced from one another to provide radial adjustment of said air gap.

5. In a magnetic core structure, the combination comprising a first cup-shaped member having a rim portion and also having a centrally extending leg portion therein, a second cup-shaped member having a rim portion and also having a centrally extending leg portion therein protruding beyond the rim portion thereof, the leg portions of said first and second members being in facing coaxially aligned relationship, an annular magnetic shunt disc interposed between the rim portions of said first and said second members and abutting therewith, said disc comprising a plurality of segments each spaced from said leg portions to form a radial magnetic gap between the segments comprising said disc and said leg portions, binding means extending through said core legs and adapted to be loosened to permit movement of said segments comprising said disc, each of said segments being radially movable upon loosening of said binding means to provide a radial displacement of the inner portion thereof with respect to the legs of said members to alter the radial length of said magnetic gap and vary the reactance of said core structure, and said structure normally held in fixed relationship by said binding means to maintain proper radial displacement of said segments.

6. In a magnetic core structure, the combination comprising a first core member having a centrally extending leg portion therein, a second core member spaced from said first core member but having a centrally extending leg portion therein extended into abutting engagement with said first core member leg portion, an annular magnetic shunt disc interposed in the space between said first and said second members, said disc comprising a plurality of segments each spaced from said leg portions to form a radial magnetic gap between the segments comprising said disc and said leg portions, binding means extending through said core legs and adapted to be loosened to permit movement of said segments comprising said disc, each of said segments being radially adjustable upon loosening of said binding means to provide a radial displacement of the inner portion thereof with respect to the legs of said members to alter the radial length of said magnetic gap to adjust the reactance of said core structure, and said structure normally held in fixed relationship by said binding means.

7. In a magnetic core structure the combination comprising a first core member having a centrally extending leg portion therein, a second core member spaced from said first core members but having a centrally extending leg portion therein extended into abutting engagement with said first core member leg portion, an annular magnetic shunt disc interposed in the space between said first and said second members and abutting therewith, an air gap formed between the inner periphery of said disc and at least one of said centrally extending leg portions, said annular shunt disc comprising at least two segments, cooperating means on adjacent radial surfaces of the segments comprising said disc and adapted to receive a manipulative device, binding means extending through said core legs and adapted to be loosened to permit movement of said segments comprising said disc, said segments adapted to be uniformly displaced from one another upon loosening of said binding means to provide a uniform radial adjustment of said air gap, and said structure normally held in fixed relationship by said binding means to maintain a desired air gap between the segments comprising said disc and at least one of said centrally extending leg portions.

8. In a magnetic core structure, the combination comprising a first cup-shaped member having a rim portion and also having a centrally extending leg portion therein, a second cup-shaped member having a rim portion and also having a centrally extending leg portion therein protruding beyond the rim portion thereof, the leg portions of said first and second members being in facing abutting coaxially aligned relationship, an annular magnetic shunt disc interposed between the rim portions of said first and said second members and abutting therewith, said disc forming an air gap between the inner periphery thereof and at least one of said leg portions, said annular shunt disc comprising at least two segments, cooperating means on adjacent radial segmental surfaces of said segments and adapted to receive a manipulative device, binding means extending through said core leg and adapted to be loosened to permit movement of said segments comprising said disc, said segments being displaced from one another when said binding means is loosened to provide radial adjustment of said air gap, and said structure normally held in fixed relationship by said binding means to maintain a desired air gap between said segments and at least one of said centrally extending leg portions.

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