Feb. 7, 1967 M. STIMLER 3,303,449

TOROIDAL MAGNETIC CORES HAVING VARYING CROSS-SECTIONAL AREAS

Original Filed Feb. 28, 1962

FIG.1.

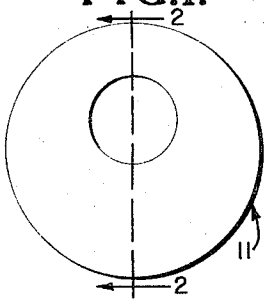


FIG.2.

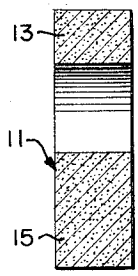


FIG.3.

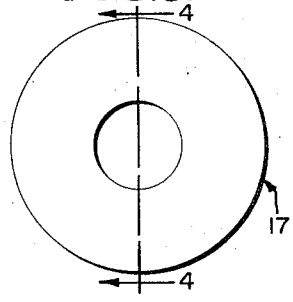


FIG.4.

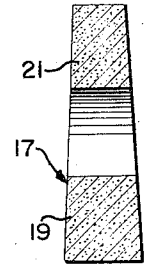


FIG.5.

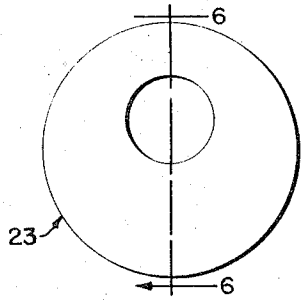


FIG.6.

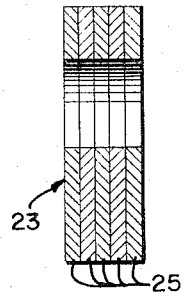


FIG.7.

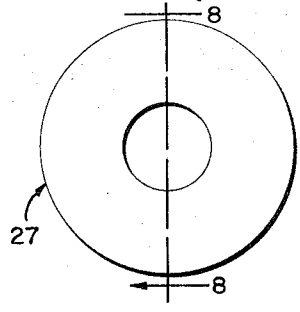


FIG.8.

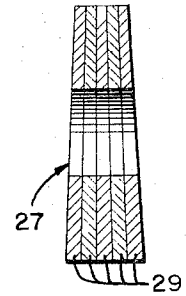


FIG.9.

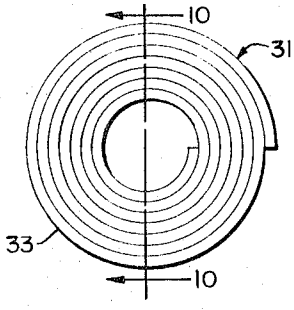


FIG.10.

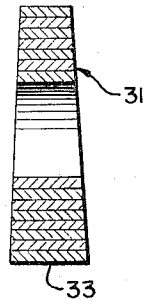


FIG.12.

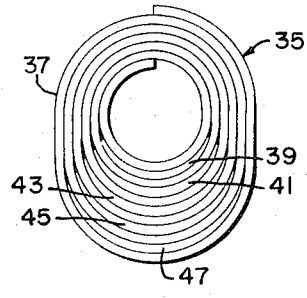
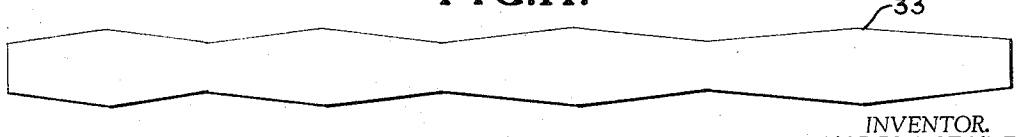


FIG.11.



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TOROIDAL MAGNETIC CORES HAVING VARYING CROSS-SECTIONAL AREAS

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Original application Feb. 28, 1962, Ser. No. 176,458. Divided and this application Feb. 28, 1964, Ser. No. 354,493

1 Claim. (Cl. 336—213)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This application is a division of my copending application, Ser. No. 176,458, filed February 28, 1962 and now abandoned.

This invention relates to magnetic cores and more particularly to magnetic cores adapted for progressive saturation.

With the use of progressive saturation techniques, the need has arisen for magnetic core structures which provide increasing cross-sectional areas along the lengths thereof. In this invention magnetic cores having tapering non-uniform cross-sectional areas are provided which may be progressively saturated. Toroidal cores having varying cross-sectional areas are provided by making the cores of varying thickness or by locating the hole within the toroid in an eccentric position.

An object of this invention is to provide a magnetic core having a non-uniform cross-sectional area.

A further object of this invention is to provide a toroidal magnetic core having a non-uniform cross-sectional area.

A still further object of this invention is to provide a toroidal powdered iron core having a gradually changing cross-sectional area throughout the length thereof.

Yet another object of this invention is to provide a toroidal laminated magnetic core having a non-uniform cross-sectional area.

Still another object is to provide a wound magnetic closed core having a non-uniform cross-sectional area.

Other objects and many attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a view of a circular powdered iron magnetic core;

FIG. 2 is a sectional view taken along the line **2—2** of the core of FIG. 1;

FIG. 3 is a view of a powdered iron core having a tapering thickness;

FIG. 4 is a sectional view taken along line **4—4** of FIG. 3;

FIG. 5 is a laminated ferromagnetic core according to an alternative form of the invention;

FIG. 6 is a sectional view taken through the line **6—6** of FIG. 5;

FIG. 7 is a view of a laminated ferromagnetic core having tapered laminations;

FIG. 8 is a sectional view taken along line **8—8** of the core of FIG. 7;

FIG. 9 is a view of a tape wound core of progressively changing thickness;

FIG. 10 is a sectional view taken along the line **10—10** of the core of FIG. 9;

FIG. 11 is a developed layout of the tape used in making the core of FIG. 9; and

FIG. 12 illustrates a tape wound core having laminations inserted between the layers of the magnetic tape.

Referring now to FIGS. 1 and 2 of the drawing, a powdered magnetic core **11** is shown having a hole within the core **11** eccentrically located to provide a core having a cross-sectional area varying from a minimum at portion **13** to a maximum at portion **15** with progressively increasing cross-sectional areas therebetween. The thickness of core **11** is uniform as indicated in FIG. 2.

Referring now to FIGS. 3 and 4 of the drawing illustrating a powdered magnetic core **17** having a hole concentrically disposed within core **17**. In FIG. 4 it may be seen that core **17** has a tapered cross-section providing for a maximum cross-sectional area of core material at **19** and a minimum cross-sectional area at **21** with varying intermediate cross-sectional areas therebetween.

Referring now to FIGS. 5 and 6 of the drawing, core **23** is made up of laminations **25** each having a uniform thickness throughout. Unequal cross-sectional core areas are provided by the eccentric location of the hole therein.

Referring now to FIGS. 7 and 8 of the drawings, a core **27** is made up of laminations **29** which have a tapering thickness assembled to provide unequal cross-sectional areas as illustrated.

Referring now to FIGS. 9, 10 and 11, core **31** is a wound core made from a preformed tape **33** as shown in FIG. 11. With this type of core, the wider portions will be substantially aligned with each other to form a large cross-sectional area of the core and the narrow portions will be substantially aligned with each other to form a small or minimum cross-sectional area portion of the core.

Referring now to FIG. 12 of the drawing, a core **35** is made up of convolutions of tape **37** having constant width and thickness. Unequal cross-sectional areas are provided by strips **39**, **41**, **43**, **45** and **47** of magnetic material which are disposed between successive layers of tape **37**.

In operation a winding or windings, not shown, may be added to the cores illustrated to effect the desired progressive saturation thereof.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claim, the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

A saturable core adapted for progressive magnetic saturation comprising a generally toroidal shaped tape wound core formed from several layers of a ferrous tape material, a plurality of arcuate tapered laminations of ferrous material aligned in a radial sector and disposed between the layers of said tape material, whereby said core will have cross-sectional areas which progressively vary in magnitude from a minimum to a mixmum to a minimum throughout one circumferential revolution of the core, said core having a single hole formed therein, said hole being circular and eccentrically disposed within the core.

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