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[54] CORE ASSEMBLY FIXTURE

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[52] **U.S. Cl.**.....**29/203 MM**, 29/203 P, 29/203 V, 29/DIG. 46

[51] **Int. Cl.**.....**H05k 13/04**, H01r 43/00

[58] **Field of Search**.....29/203 MM, 203 V, 29/203 MW, 203 R, 604, DIG. 46, 203 P; 269/21, 40, 55

[56] **References Cited**

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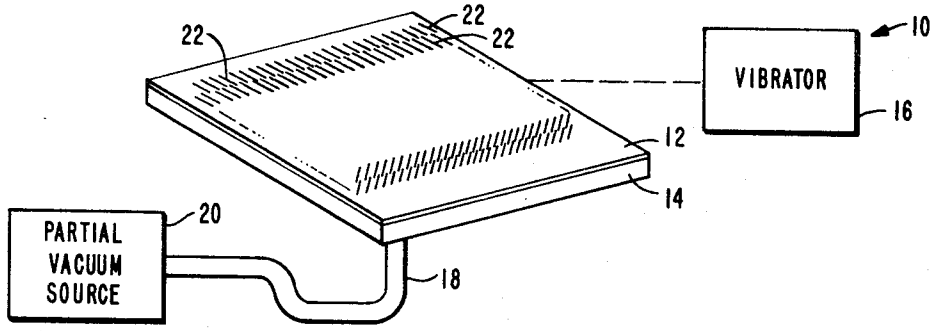
[57] **ABSTRACT**

A core assembly fixture for small toroidal magnetic memory cores includes a cavity plate, a partial vacuum generator connected to maintain a partial vacuum on a bottom side of the cavity plate and a vibrator connected to vibrate the cavity plate. A plurality of contoured core receiving cavities are located on the top side of the cavity with a proper orientation for holding magnetic cores in a desired matrix pattern prior to transfer to a substrate for subsequent wiring. The contoured cavities generally conform to the shape of a core, thereby increasing the amount of material in the cavity plate and permitting very thin separator walls between cavities without damage from vibration. The cavity plate construction is laminated in a fashion enabling manufacture with conventional etching techniques.

9 Claims, 4 Drawing Figures



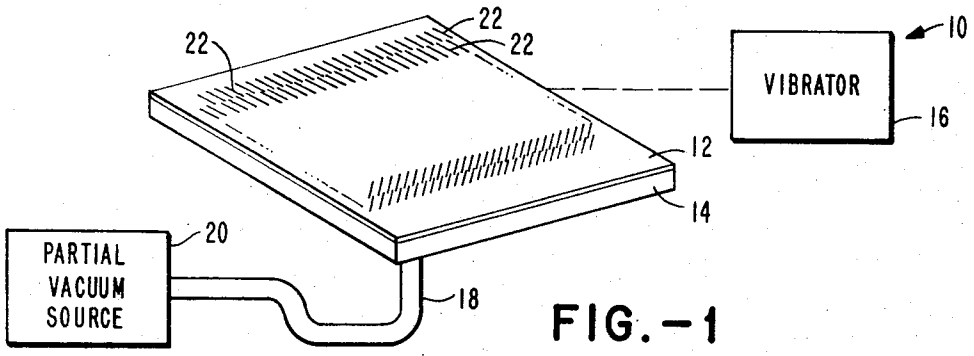


FIG.-1

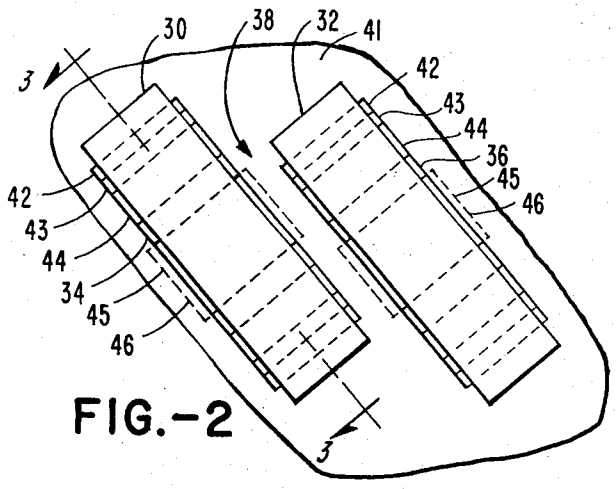


FIG.-2

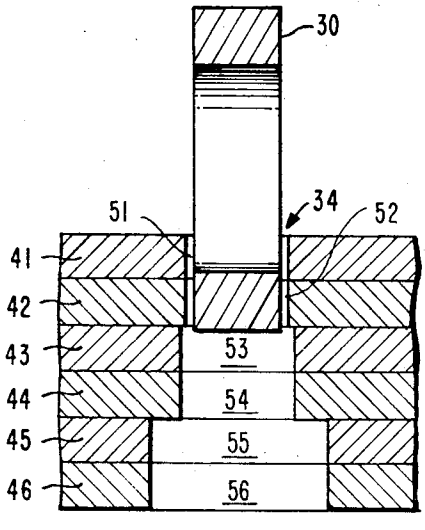


FIG.-4

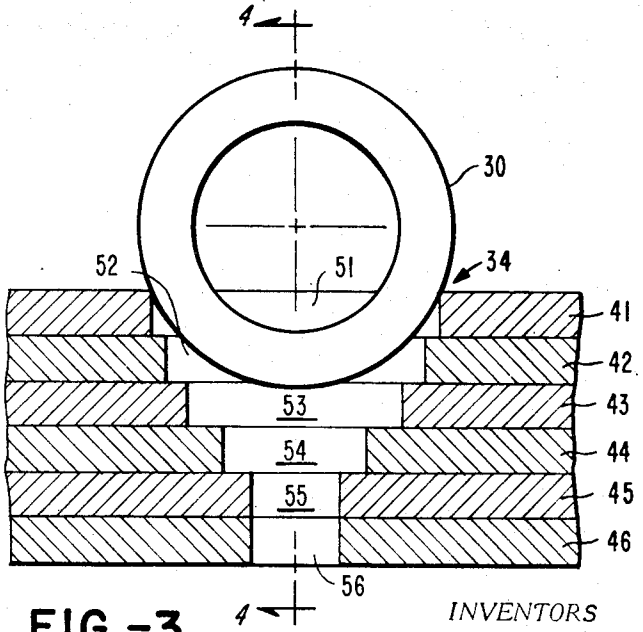


FIG.-3

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CORE ASSEMBLY FIXTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to fixtures for aligning toroidal cores for magnetic core memories and more particularly to fixtures having cavities contoured to conform to the shape of a core.

2. History of the Prior Art

Magnetic core memory matrices, in the present state of the art, are arranged as dense planes of minute toroids through which orthogonally disposed drive wires, as well as optional additional wires, are threaded. In order to get magnetic cores properly aligned and arranged to form the matrix, the cores are first placed on the top side of a cavity plate in random alignment. The cavity plate contains a plurality of cavities, each corresponding in position and alignment to a core position in a memory matrix. These cavities, which extend through the bottom of the cavity plate to communicate with a partial vacuum, are large enough to receive and support a portion of a magnetic core but not large enough to permit the passage of a core therethrough. Consequently, as the cavity plate is vibrated by a connected vibrator, the magnetic cores enter the cavities and are held in place by the partial vacuum to form a magnetic core matrix of the desired shape and size.

After all of the cavities in the cavity plate are filled, a substrate surface having adhesive thereon is brought into contact with the cores and they are lifted from the cavity plate. Typically they will then be sprayed with a bonding agent to bond them to the substrate before being threaded with drive and sense lines.

The cavities are produced by etching rectangular holes in a thin metal plate and have a substantially constant size and shape throughout the thickness of the plate. Although such an arrangement is adequate for low density core matrices, as core densities increase the cavities must be located closer together. In order to increase density, the wall of material separating adjacent cavities must become thinner, until a point is reached with existing devices where the walls are not strong enough to withstand the forces of vibration. This imposes a limitation on the density of core memories which can be assembled with the present cavity plate technique.

SUMMARY OF THE INVENTION

In an improved core assembly fixture in accordance with the invention, the cavity plate has a laminated construction with corresponding concentric core receiving apertures in each layer changing in size to generally conform to the shape of an inserted core from a minimum size on the bottom which provides communication with a vacuum to a maximum size on the top which is slightly smaller than the outside dimension of a core. This arrangement imparts maximum strength to the walls separating cavities and permits use of the fixture for assembling cores into high density matrices without damage when the cavity plate is vibrated. At the same time, the contoured core receiving apertures are fabricated by relatively simple and inexpensive techniques.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the invention can be had from a consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a partially perspective and partially block diagram representation of a high density core assembly fixture in accordance with the invention;

FIG. 2 is an enlarged plan view of a portion of the fixture shown in FIG. 1 showing a portion of a cavity plate having two cavities containing cores therein;

FIG. 3 is a section side view, greatly enlarged, of a portion of a cavity plate having a core containing cavity therein taken as indicated by the arrows 3—3 in FIG. 2; and

FIG. 4 is a section end view, greatly enlarged, of a portion of a cavity plate having a core containing cavity therein taken as indicated by the arrows 4—4 in FIG. 3.

DETAILED DESCRIPTION

A core assembly fixture in accordance with the invention has a cavity plate supported on a frame which is connected to a vacuum source. The cavity plate is also mechanically coupled to a vibrator. When tiny, randomly oriented cores are placed atop the vibrating cavity plate, they enter the plurality of cavities therein and are held in place by the vacuum. The extremely small, closely spaced cavities are precisely oriented and positioned to provide a selected core memory matrix and are contoured to conform to the shape of the cores. This contouring strengthens the walls or fingers of material separating cavities and permits very high density core matrices. After all cavities in the cavity plate are filled, the cores can be lifted out without disturbing their alignment by bringing them into contact with an adhesive coated surface of a substrate on which they are to be mounted for threading.

As shown in FIG. 1, a high density core assembly fixture **10** in accordance with the invention includes a relatively flat, thin laminated cavity plate **12** which is supported by a frame **14** and which is mechanically coupled to a vibrator **16**. The cavity plate **12** may have layers made of steel, fiberglass or other suitably strong material. Tubing **18** provides communication between the frame **14** on the bottom side of the cavity plate **12** and a partial vacuum source **20**. When cores are placed on the top side of the vibrating cavity plate **12**, they individually enter each of a plurality of cavities **22** therein and are held in place by a partial vacuum generated by the source **20**. The cavities **22** are spaced and angled at desired orientations for the subsequent memory assembly steps that are to follow.

As shown in FIG. 2, a pair of cores **30**, **32** are supported in a pair of cavities **34**, **36** respectively which are contoured to substantially conform to the shape of the cores **30**, **32**. It can be seen that the wall or finger of material **38** separating the two cavities **34**, **36** is quite thin and easily broken. However, the contoured cavity construction maximizes its strength by minimizing the length and depth over which the most narrow part of the wall **38** must extend.

The detailed construction of the cavity **34** with a core **30** therein is best shown by FIGS. **3** and **4**. It can be seen that the cavity plate is built from **6** individual

laminations 41–46 which are bonded together in conventional fashion, and have individual apertures 51–56 respectively therein to form the contoured cavity 34. The use of separately apertured and related multiple laminations contours the cavity 34 to conform to the shape of the cores 30, 32. The individual laminations 41–46 are advantageously formed by etching in a conventional manner rectangular apertures of varying sizes in the different layers without varying the size of the apertures throughout a given layer. As shown in FIG. 3, the length of the rectangular apertures increases from a minimum in the bottom layer 46 to a maximum somewhat smaller than the outside dimension of the core 30 in the top layer 41. Although the etched apertures 51-56 in the various layers 41–46 are shown as having uniformly straight sides and square corners, it should be appreciated that the etching process by which the apertures are made leaves rounded corners and somewhat nonuniform sides.

For standard 22 mil cores, it is satisfactory if the layers 41–46 each have a thickness of about 0.004 inch and the lengths of the rectangular apertures are as follows: aperture 51, 0.020 inch; aperture 52, 0.019 inch; aperture 53, 0.015 inch; aperture 54, 0.011 inch; aperture 55, 0.004 inch; and aperture 56, 0.004 inch. The primary function of the two bottom layers 45 and 46 is to provide a strong base for supporting the upper layers. The layer 44 separates the bottom of the edge of core 30 from the small apertures 55, 56 in layers 45 and 46, to prevent a constriction of the air passage between the cavity 34 and the vacuum source 20 when a core 30 is in the cavity. The length of the apertures in the layers 41, 42 and 43 are chosen to conform the contour of the cavity 34 to the shape of the cores 30, 32.

As best illustrated in FIG. 4, the width of the top apertures 51, 52 is approximately 0.0072 inch, slightly larger than the 0.0060 inch width of a core 30, 32. The widths of the apertures 52, 53 in layers 42, 43 correspond to or are slightly larger than the width of the apertures 51, 52 in layers 41, 42. Although these widths are not critical dimensions, care should be taken to avoid the formation of a ledge which will interfere with the entrance of a core 30 into the cavity 34.

The width of the rectangular apertures in the bottom layers 45, 46 is approximately 0.010 inch, somewhat greater than its length. This relatively large width permits a large positioning tolerance of the layers 45, 46 with respect to the upper layers without restricting the passage of air and has little effect on the operation of the fixture.

Although there has been described above a specific embodiment of a high density core assembly fixture in accordance with the invention, it will be appreciated by those skilled in the art that the invention will not be limited thereto. Accordingly, all variations, modifications or similar arrangements which may occur to those skilled in the art should be considered to be within the scope of the invention.

What is claimed is:

1. An assembly fixture for aligning a plurality of magnetic cores in a selected pattern comprising:

a laminated cavity plate having at least one base layer and a plurality of core receiving layers stacked on the base layer with all adjacent layers being bonded together, the base layer having a plurality of apertures therethrough, each being positioned opposite a desired center point of an aligned core and each being small with respect to the outside diameter of a core, and each of said core receiving layers having a plurality of rectangular apertures therein, said rectangular apertures being positioned to define the alignment of the magnetic cores, said rectangular apertures having a width slightly larger than the width of a core and said rectangular apertures having a length increasing successively from a length much smaller than the outside diameter of a core in the layer adjacent the base layer to a length slightly less than the outside diameter of a core in a layer farthest from the base layer;

means for reducing the atmospheric pressure on the base side of the cavity plate with respect to the core receiving side of the cavity plate; and

means for vibrating the cavity plate.

2. A magnetic core assembly fixture comprising:

a laminated cavity plate having a plurality of cavities therein for receiving magnetic cores and holding them in a desired alignment, each of said cavities substantially conforming to the shape of an inserted core and having an aperture at the bottom thereof for communication with a partial vacuum;

means communicating with the apertures at the bottom of the cavities for providing a partial vacuum; and

means for vibrating the cavity plate.

3. For use in a core assembly fixture having a vibrator coupled to vibrate a cavity plate and means for generating a pressure differential on opposite sides of a cavity plate, a laminated cavity plate comprising a plurality of coextensive plate elements, each having a plurality of apertures disposed concentrically about individual spaced apart core insert positions, the apertures varying in dimension through successive plates at each core insert position to provide a mating fit for a core inserted in one side and an orifice in the other side.

4. In a core assembly fixture having a partial vacuum source communicating with a bottom side of a cavity plate and a vibrator mechanically coupled to a cavity plate, a cavity plate comprising:

a relatively thin flat member having a bottom side communicating with a partial vacuum and a top side having a plurality of core receiving cavities therein contoured to substantially conform to the shape of a magnetic core, each of said cavities having communication with the partial vacuum at the bottom of the member.

5. The invention as set forth in claim 4 above, wherein said cavity plate is constructed of several layers bonded together, each layer having a plurality of apertures therein corresponding to and defining the core receiving cavities, the apertures in each of the upper layers having a size and shape substantially conforming to the size and shape of a core within a cavity at the depth of the layer and the apertures in the lower layers providing communication between the cavities and the vacuum at the bottom of the cavity plate.

6. The invention as set forth in claim 5 above, wherein there are three upper layers, each having a thickness of approximately 0.004 inch.

7. The invention as set forth in claim 5 above, wherein said upper layers have a thickness less than one fifth the outside diameter of magnetic cores being assembled.

8. The invention as set forth in claim 7 above, wherein the apertures in the uppermost layer are rectangular in shape and have a length somewhat less than and a width somewhat greater than the outside diameter and width respectively of cores being assembled.

9. A laminated core assembly fixture comprising:

a relatively thin flat laminated cavity plate having a top surface and a bottom surface and including:

a first layer forming the top surface and having a plurality of rectangular apertures therein, said apertures having a width somewhat greater than the width of cores being assembled and a length somewhat less than the outside diameter of cores being assembled;

a second layer bonded to the first layer and having a plurality of rectangular apertures therein corresponding to and aligned with the apertures in the first layer, said apertures having a width substantially corresponding to the width of the apertures in the first layer and a length somewhat less than the apertures in the first layer but corresponding to the outside dimension of the cores at the depth of the second layer when inserted into apertures in the first layer to maximum depth;

a third layer bonded to the second layer and having a plurality of rectangular apertures therein corresponding to and aligned with the apertures in the first and second layers, said apertures having a width substantially corresponding to the width of the apertures in the first and second layers and a length somewhat less than the length of the apertures in the second layer but corresponding to the outside dimension of the cores at the depth of the third layer when inserted into apertures in the first layer to maximum depth;

at least one layer bonded to the third layer and forming the bottom surface of the cavity plate, said at least one layer having a plurality of apertures therein positioned to provide communication between the apertures in the first, second and third layers and the bottom surface of the cavity plate;

means for vibrating the cavity plate; and

means for providing a pressure differential between the top and bottom surfaces of the cavity plate.

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