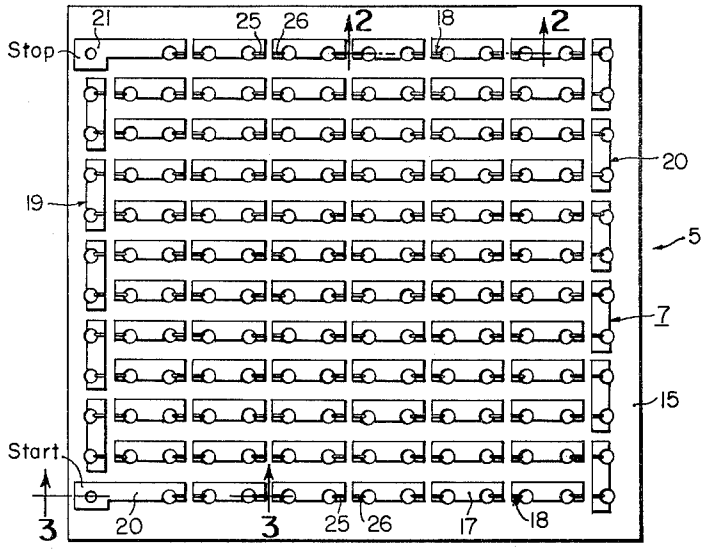
March 13, 1962 A. W. GELLERT 3,025,502

MAGNETIC CORE MEMORY CONSTRUCTION

Filed Jan. 19, 1959

Fig. 1



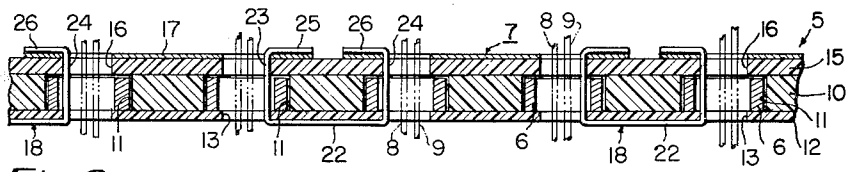


Fig. 2

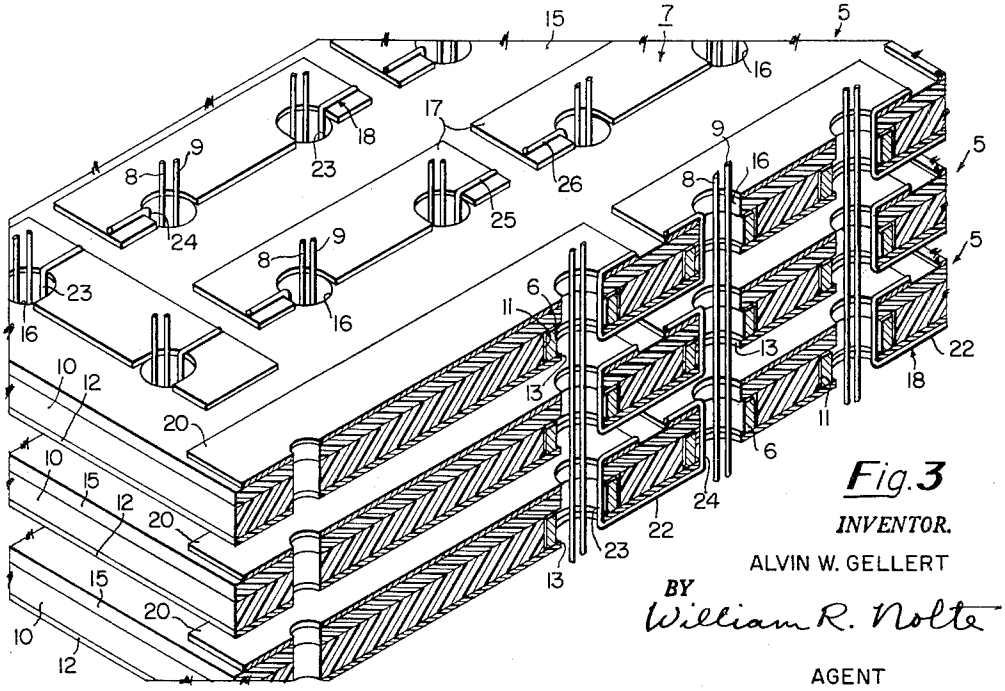


Fig. 3

INVENTOR.

ALVIN W. GELLERT

BY William R. Nolte

AGENT

United States Patent Office 3,025,502 Patented Mar. 13, 1962

3,025,502

MAGNETIC CORE MEMORY CONSTRUCTION

Alvin W. Gellert, Phoenixville, Pa., assignor to Burroughs Corporation, Detroit, Mich., a corporation of Michigan

Filed Jan. 19, 1959, Ser. No. 787,765
5 Claims. (Cl. 340—174)

This invention relates to memory devices and in particular to a magnetic core matrix structure.

The construction of typical toroidal ferrite core memories is costly because of the technique employed in fabricating the core planes. It generally consists of a form of weaving in which X and Y coordinate wires must be threaded through a myriad of cores. Aside from the expense entailed in producing these planes, several distinct disadvantages of this form of construction are apparent. In the first place the construction is inherently frail since the matrix wires provide the sole support for the cores. Secondly, a strain is imposed upon the cores by such support, and in addition the sharp inner edges of the cores tend to scrape the insulation from the wires. Thus if any of the cores or the wires become inoperative a complete rethreading of a large portion of the matrix plane is required.

An important object of the invention, therefore, is to provide an improved memory device overcoming these difficulties.

Another important object of the present invention is the provision of a magnetic core structure having unique conductor means which enables simple and rapid assembly of a memory plane by the use of mass production techniques.

Still another object of the present invention is to provide improved means for supporting cores in, and wiring a magnetic core matrix memory.

In accordance with the above objects and first briefly described, the invention comprises novel means for protectively supporting an array of toroidal magnetic cores without stress in combination with novel wiring means associated therewith.

Other objects of the invention will appear from the following description, reference being made to the drawing in which:

FIG. 1 is a top plan view of a magnetic core memory matrix structure, constructed in accordance with the present invention;

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

FIG. 3 is a sectional perspective view taken along the line 3—3 of FIG. 1 and also showing how a plurality of such matrices may be assembled in stacked relationship.

Referring first to FIG. 1 it is seen that the invention has been illustrated in connection with a memory device 5 consisting generally of a plurality of cores 6 (FIG. 2) received in compartments aligned in rows and columns thus to form a planar core memory matrix. A novel electrical conductor 7, formed in accordance with an important feature of the present invention, is threaded through the cores to form the sense of information conductor, as more fully described hereinafter. As shown in FIG. 3, these matrices may be assembled in stacked relationship and provided with the usual read and write conductors 8 and 9 respectively, passing through aligned holes and cores.

Referring now to FIGS. 1 and 2 it will be seen that each core matrix 5 includes a centrally located core supported in a panel 10 made of non-magnetic, non-conducting material, having a plurality of spaced holes 11, punched or otherwise formed therein. Secured against the lower face of this board by suitable means such as cement, is a thin board 12 formed of non-magnetic, non-conductive material and having holes 13 concentric with

holes 11. A magnetic core 6 is positioned in each hole 11 of core panel 10, and may, if desired, be secured to the panel by a suitable resilient cement such as a neoprene-base adhesive or some other equivalent cementing agent. Each core has an outside diameter smaller than the diameter of hole 11 and its thickness is also less than the thickness of the panel to assure that the core is not subjected to mechanical stresses. A printed circuit board 15, also of non-magnetic and non-conductive material, and having holes 16 of the same diameter and centered with holes 13 in board 12, is secured to the top face of the core panel in a similar manner as board 12. It is seen that boards 12 and 15 when so assembled with panel 10 form a composite panel having a plurality of spaced core receiving compartments therein.

The holes 13 and 16 of the outside boards which sandwich the cores therebetween are slightly smaller than the apertures of the cores to thereby protect the cores from the novel sense wiring 7 which passes through the cores, and now to be described.

The printed circuit board 15 includes a plurality of electrically conductive portions or islands 17 formed in rows and columns across its top surface, and each embracing a pair of holes 16 as best seen in FIG. 3. A conductive wire clip 18, preferably in the form of a staple, and inserted from the bottom side of the panel as seen in FIG. 2, interconnects adjacent pairs of islands 17 and provides a continuous conductor threaded through each core in a row. Vertically disposed island columns 19 and 20 at opposite sides of the matrix serve to interconnect adjacent rows thereby to form one continuous connector threaded through all the cores in each matrix beginning at a "start" island 20 and ending at a "stop" island 21.

The vertically disposed columns 19 and 20 of conductive islands 17 on each side of the matrix are arranged in staggered relationship with each other. Commencing with the "start" conductive island 20 in the bottom row, the sense wire path through the cores is rightwardly across the matrix to the lowermost island in the extreme right vertical column 20, which connects the bottom or first row of islands with the second row from the bottom. The current through the second row is then leftward to the lowermost conductive island in vertical column 16. This island in turn bridges the second row with the third row, and so forth through successive higher rows until the terminal island 21 is reached.

Each staple is of electrically conductive material and prior to being fastened or clinched in position in the planar core assembly, is of generally U-shaped configuration. The base 22 of the U has a length which corresponds to the distance measured rowwise between the edges of an adjacent pair of holes contained in a given row. The upright arms 23 and 24 of each staple thus pass through adjacently disposed holes and cores in close proximity to the inner wall surfaces of the cores, and the free ends 25 and 26 of the arms are bent or clinched inwardly toward each other and against the printed conductor to conductively interconnect adjacently disposed conductive islands 17. The free ends of the staples may thereafter be dip soldered, or spot welded to assure good electrical connection with the islands. The spacing of arms 23 and 24 of the staple from the inner wall surfaces of the cores eliminates stressing of the cores, by the arms.

To minimize the possibility of solder bridging the holes 16 in the printed circuit board when the board is dip soldered, and thus shorting the conductors, the continuity of the material forming the conductive islands surrounding the holes 16 is broken. In other words the material forming the conductive islands only partially

surrounds the peripheral margin of each hole 16 in the printed circuit board.

Having thus described the preferred embodiment of the invention for purposes of illustration, it will be understood that the inventive concept may be embodied in other forms without departing from the scope of the invention.

What is claimed is:

1. In a magnetic memory device, the combination comprising a panel formed of non-magnetic, non-conductive material, a series of holes in said panel, magnetic toroidal cores mounted within the holes in said panel each having a thickness dimension less than that of the panel, first and second insulating boards mounted on opposite surfaces of said panel each board including a like series of holes as in said panel and concentrically located therewith, said first insulating board including conductive island portions extending around adjacent pairs of holes, and electrically conductive staple means passing through adjacent pairs of holes and cores, said staple means each including end portions clinched into engagement with adjacent island portions to electrically interconnect the latter.

2. In the memory device as set forth in claim 1, wherein each electrically conductive island portion is cut away adjacent each hole of said pair so that only a marginal portion of each hole thereon is enclosed by said island portion.

3. In the memory device as set forth in claim 1 wherein the diameters of the holes in said first and second insulating boards are smaller than the inside diameters of said magnetic cores and wherein the margins of said holes serve to space the staples from the inner surfaces of said cores.

4. A magnetic core matrix comprising a panel of non-conducting, non-magnetic material and having a plurality of holes therethrough in rows and columns, a plurality of magnetic toroidal cores mounted within the holes in said panel and each core having a thickness dimension less than that of said panel, first and second insulating boards mounted on opposite surfaces of said panel, each board including a like series of holes as in said panel of smaller diameter than the inner diameter of said cores

and concentrically located therewith, each hole of said series being of a smaller diameter than the inside diameter of said core, said first insulating board including electrically conductive island portions extending around adjacent pairs of holes, and wherein each island portion is cut away adjacent each hole of said pair so that only a marginal portion thereof is enclosed by said island portion, and electrically conductive staple means passing through pairs of holes and cores, said staple means including end portions clinched into engagement with adjacent island portions to electrically interconnect the latter, and wherein said staple means are maintained spaced from the inner surfaces of the cores by the marginal edge portions defining the holes in said first and second insulating boards.

5. A core memory structure comprising, a composite panel of insulating material and having a plurality of spaced compartments therein, a magnetic toroidal core in each compartment, each compartment including inwardly extending top and bottom portions contiguous therewith and defining apertures axially aligned with and being of a smaller diameter than the bore of each core, printed circuit pads on the surface of one side of said panel and encompassing adjacent pairs of apertures thereon, and staple means each comprising a loop of wire having arm portions thereof extending through a pair of said apertures and cores therein from the other side of said panel the free ends of said arm portions being clinched to bind adjacent printed circuit pads into electrical engagement with each other to thereby form a continuous conductor threaded in series through said cores, and wherein said inwardly extending top and bottom portions defining said apertures maintain said staple means spaced from said cores.

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