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MAGNETIC CORE ASSEMBLY

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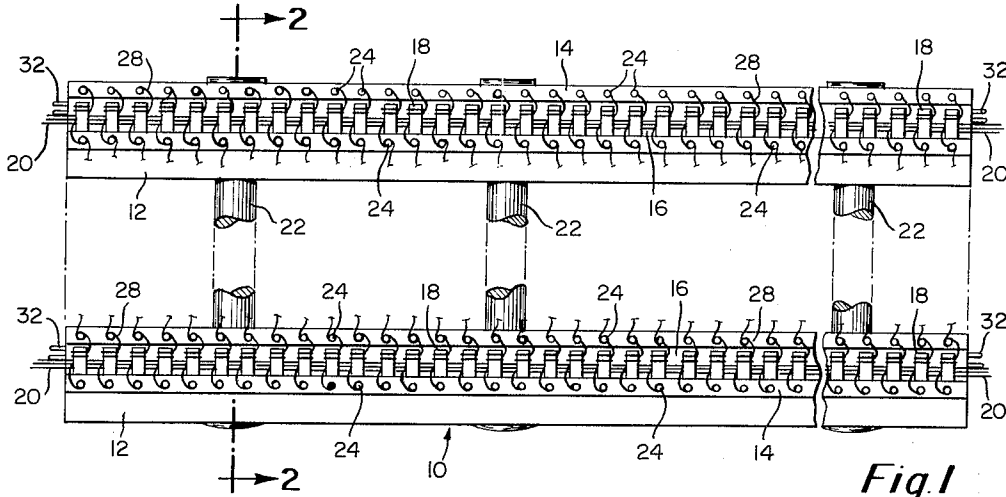


Fig. 1

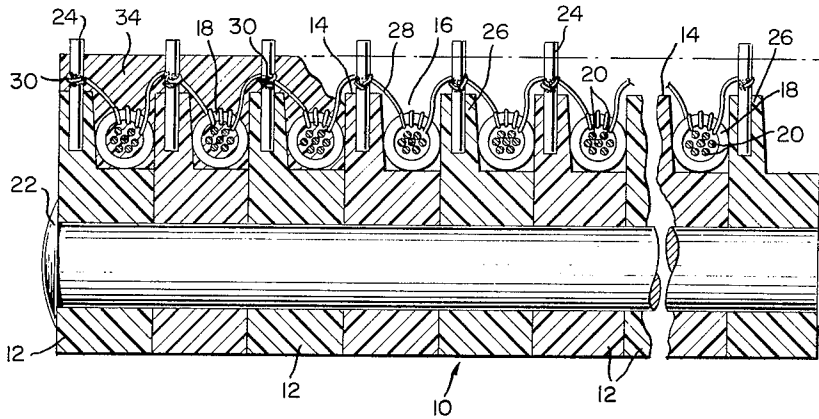


Fig. 2

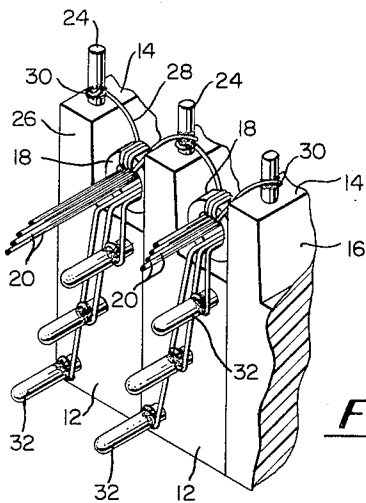


Fig. 3

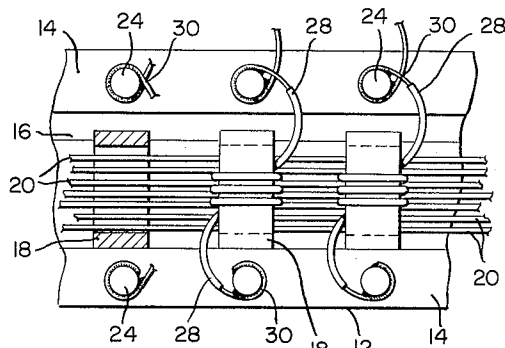


Fig. 4

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3,213,432

MAGNETIC CORE ASSEMBLY

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7 Claims. (Cl. 340—174)

The present invention relates to magnetic core memories and more particularly to assemblies of bistable magnetic cores in a sub-miniature matrix memory.

Recent programs to produce reliable, small, light-weight computer systems for ballistic missile guidance and space navigation have resulted in making electronic components and circuits orders of magnitude smaller. At the same time these systems have grown inordinately complex thus increasing the need for reliability of the components so produced. By way of example, it has been found that the assembly of ferrite cores in sub-miniature matrix memories used in such systems pose particular problems pertaining to interconnections and signal interactions. Thus as the size of ferrite cores and circuits decrease, their interconnections require a greater proportion of the total space available. As a consequence and because of the tightening of tolerances, less and less surface area is available to make interconnections. Moreover because of the small separation between the ferrite cores and the wires which thread the same, careful and special arrangements and geometrics are needed to preclude signal interactions.

Accordingly, the principal object of this invention is the provision of an improved magnetic core assembly.

It is a more specific object of this invention to provide an improved sub-miniature ferrite core assembly in which the cores and their driver lines are arranged in a manner to facilitate interconnections and to eliminate signal interactions therebetween.

In accordance with the foregoing objects and first briefly described, a plurality of elongated similarly shaped members are assembled in a manner to receive a multiplicity of cores therebetween. Each of the members includes a groove extending along its length and into which is received a plurality of cores strung on sense wires, similar to beads on a string. A line of terminal posts are imbedded in each member along a marginal edge of the groove, a post being provided for each core position along the groove. A short driver wire passed through each core of known polarity has one free end thereof fastened to the post corresponding to its position while the other free end thereof is fastened to a correspondingly positioned post on the next adjacent grooved member. By providing taut connections to the posts, the cores are mechanically spaced apart along the sense wires. Thereafter the cores may be potted by suitable material and then dip-soldered to secure the wrappings on each terminal post.

Other objects of this invention will be pointed out in the following description and claims, illustrated in the accompanying drawings which disclose by way of example the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawings:

FIG. 1 is a greatly enlarged plan view partially in phantom of a sub-miniature core assembly in accordance with this invention;

FIG. 2 is a sectional view of the assembly of FIG. 1 taken through the section 2—2;

FIG. 3 is an enlarged perspective view of a fragmentary end portion of the core matrix assembly shown in FIG. 1; and

FIG. 4 is an enlarged plan view of a fragmentary portion of FIG. 1 partially in section.

Referring now to the details of the drawings, a sub-miniature ferrite core memory matrix assembly 10 is shown constructed in accordance with the invention. The assembly is made up of a plurality of electrical insulating non-magnetizable elongated members 12 having one of their top edge surfaces 14 grooved as at 16 to provide edge recesses for the reception of rows of toroidal magnetic cores 18. Each row of cores is threaded lengthwise upon sense wires 20, as beads upon a string. The grooved members are generally L-shaped in cross-section as seen in FIG. 2 and when assembled, as described below, in complementary relation by means of rods or rivets 22, form a plurality of channels for the reception of the rows of cores. A plurality of electrically conductive pins 24 are suitably imbedded in the top portion 26 of the L-shaped member, each pin corresponding to a core position along the sense wires. The pins are provided to mechanically space the cores one from another along the rows thereof and to provide means for interconnecting cores in one row to cores in another.

A short driver wire 28 individual to each core passes through or is wrapped to encircle each core and its end portions extend generally in a direction transverse to the direction of the groove in which the core is contained. The extremities 30 of the driver wires are connected a row at a time as each successive L-shaped member is secured to a preceding L-shaped member. More specifically, one extremity of a driver line passed through a core is terminated to the post corresponding to the position of that core along the row in which the same is contained. The other extremity of the same driver wire is terminated on the correspondingly located pin of the next adjacent member 14. In this manner, the polarity of each successive row of cores may be ascertained prior to connecting the next row of cores in place. Moreover by wrapping the free ends of the driver lines so that each is taut, mechanical spacing of the sub-miniature cores one from another in each row is assured, thus minimizing the danger of signal interaction between adjacent driver lines.

The length and the number of L-shaped members assembled one to another, determine the size of the memory module and may be selected so as to form "X" words, "Y" bits in length; wherein "X" is the number of cores placed in each groove and "Y" is the number of L-shaped members successively assembled one to another. The adjacent bits of each word are connected in series by wrapping the free ends of each adjacent pair of driver wires about a common post.

Each L-shaped member also includes a plurality of additional terminal pins 32, projecting from the end surfaces of the L-shaped members, as seen in FIG. 3, to permit termination of the sense lines which run axially through the cores. Thus if two L-shaped members are assembled as in FIG. 4 and one row of cores is inserted in the channel formed by the two members, and with the free ends of the driver lines terminated in electrical connections to the two rows of pins, a complete "X" bit memory is established and the polarity of the cores can readily be tested prior to the assembly of the next row of cores.

Moreover, after all the rows of cores are assembled and tested, the entire assembly may be dip-soldered and the grooves 16 may be filled with a resilient potting material 34. When so soldered and potted, the cores are protected against shock and vibration and the wires wrapped to their respective terminal posts are permanently connected.

There has been described herein a novel and useful memory assembly for sub-miniature magnetic toroidal cores arranged in a manner to facilitate the making of electrical interconnections. Further a memory system

has been shown which minimizes the danger of unwanted signal interactions.

What is claimed is:

1. In a memory core system, a plurality of complementary members of dielectric material for holding a multiplicity of toroidal cores therebetween, each of said members having an aligned groove therein into which said cores fit, a plurality of posts disposed in a line along a margin of the groove of each said member and on the opposite end surfaces thereof, the posts on adjacent members being aligned with one another and in a direction transverse to the longitudinal direction of the members, a driver winding individual to and encircling each core and having its free ends electrically connected to a pair of posts in line with one another between adjacent core receiving members, and a plurality of sense windings threaded axially through the cores in each said groove and electrically connected to the posts on the opposite end surfaces of the members.

2. In a memory core system, a plurality of elongated electrical insulating non-magnetizable members each having a portion of its top cut away and assembled lengthwise one to another so that adjacent pairs of members define a channel, a plurality of toroidal magnetic cores positioned in each channel, a plurality of electrically conductive posts disposed along the top surface of each member and on the opposite end surfaces thereof, the posts on adjacent members being aligned with one another in a direction transverse to the channels formed by said adjacent members, a driver winding individual to each core and having its free ends connected to a pair of posts disposed on opposite margins of the channel containing said core, and a plurality of sense windings threaded axially through the cores aligned in each said channel and electrically connected to the posts on the opposite end surfaces of the members.

3. In a memory core system, a plurality of elongated electrical insulating non-magnetizable members each having a top portion thereof cut away to define an open-sided groove and assembled lengthwise one to another so that adjacent pairs of members define a channel, a plurality of toroidal magnetic cores positioned in each channel, a plurality of electrically conductive posts disposed along the top surface of each member, the posts on adjacent members being aligned with one another in a direction transverse to the channels formed by said adjacent members, a driver winding individual to each core and having its free ends connected to a pair of posts disposed on opposite margins of the channel containing said core, and a plurality of sense windings threaded axially through the cores aligned in each said channel.

4. In a memory core system, a plurality of elongated electrical insulating non-magnetizable members each having a portion of its top cut away and assembled lengthwise one to another so that adjacent pairs of members define a channel, a plurality of toroidal magnetic cores positioned in each channel with their axes parallel to the direction of said channel, a plurality of posts disposed along the top surface of each member, the posts on adjacent members being aligned with one another in a direction transverse to the channels formed by said adjacent members, a driver winding individual to each core and having its free ends connected to a pair of posts disposed on opposite margins of the channel containing said core, and a plurality of sense windings threaded axially through the cores aligned in each said channel.

5. In a memory core system, a plurality of elongated

electrical insulating non-magnetizable members each having a portion of its top cut away and assembled lengthwise one to another so that adjacent pairs of members define a channel, a plurality of toroidal magnetic cores positioned in each channel, a plurality of electrically conductive posts disposed along the top surface of each member and on the opposite end surfaces thereof, the posts on adjacent members being aligned with one another in a direction transverse to the channels formed by said adjacent members, a driver winding individual to and encircling each core, and having its free ends connected to a pair of posts disposed on opposite margins of the channel containing said core, and a plurality of sense windings threaded axially through the cores aligned in each said channel and electrically connected to the posts on the opposite end surfaces of the members.

6. A magnetic core assembly comprising in combination, a plurality of separate elongated support members each having a line of like spaced terminal posts disposed along a top marginal edge thereof, each said member having a transverse cross-section which exhibits an elongated two-side recess adjacent said line of posts and disposed along the opposite top marginal edge thereof, said plurality of support members being assembled lengthwise one to another so that the two-sided recess of each said member cooperates with a surface on an adjacent member to form a three-sided recess, a plurality of toroidal cores received in each said three-sided recess one opposite each post therealong, a plurality of sense wires threaded axially through the cores in each said three-sided recess, and a plurality of driver wires each passing through a corresponding core and having one of its free ends wrapped around the post opposite the core in the member in which the same is received and the other free end thereof wrapped around the like spaced post in the member immediately adjacent thereto.

7. In a memory core system, a plurality of elongated electrical insulating non-magnetizable members each having a top portion thereof cut away to define an open-sided groove and assembled lengthwise one to another so that adjacent pairs of members define a channel, a plurality of toroidal magnetic cores positioned in each channel, a plurality of electrically conductive posts disposed along the top surface of each member, the posts on adjacent members being aligned with one another in a direction transverse to the channels formed by said adjacent members, a winding individual to each core and having its free ends connected to a pair of posts disposed on opposite margins of the channel containing said core, and a plurality of windings threaded axially through the cores aligned in each said channel.

References Cited by the Examiner

UNITED STATES PATENTS

2,778,977	1/57	Lubkin.	
2,823,372	2/58	Jones.	
2,910,672	10/59	La Patha.	
2,978,681	4/61	Sims et al.	340—174

OTHER REFERENCES

November 1960, Publication I: "Magnetic Core Support," IBM Tech. Bulletin by C. T. Daniels and M. A. Every, vol. 3, No. 6.

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JOHN F. BURNS, *Examiner*.