

Feb. 11, 1958

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2,823,360

MAGNETIC CORE ASSEMBLY

Filed May 20, 1955

2 Sheets-Sheet 1

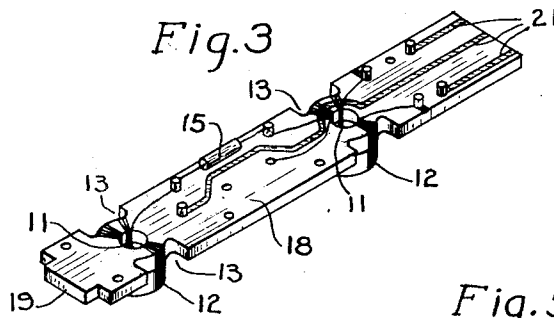
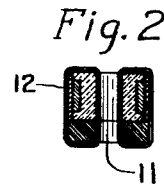
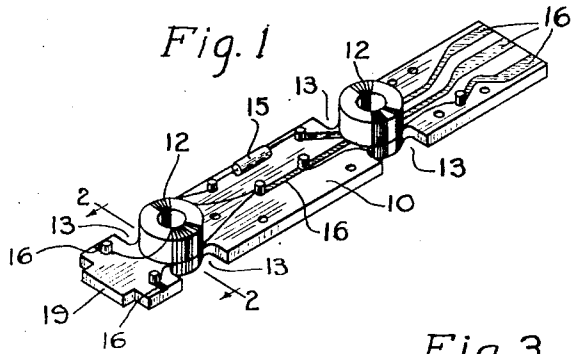
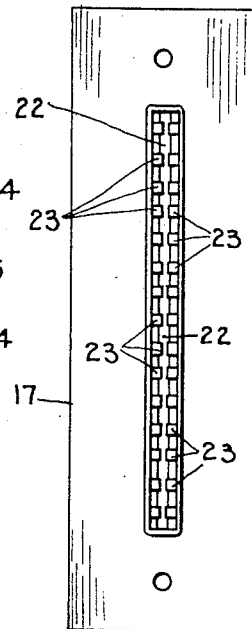
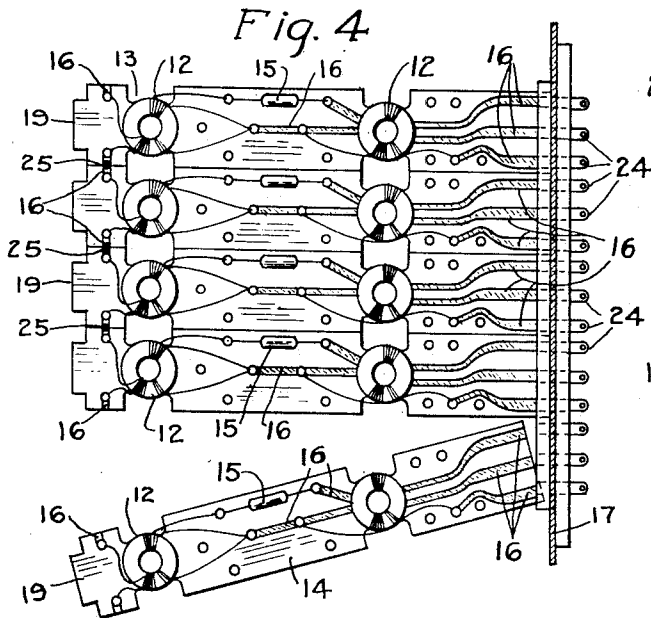


Fig. 5



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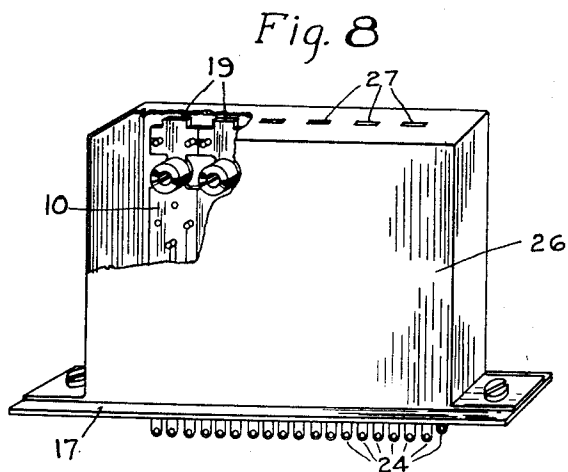
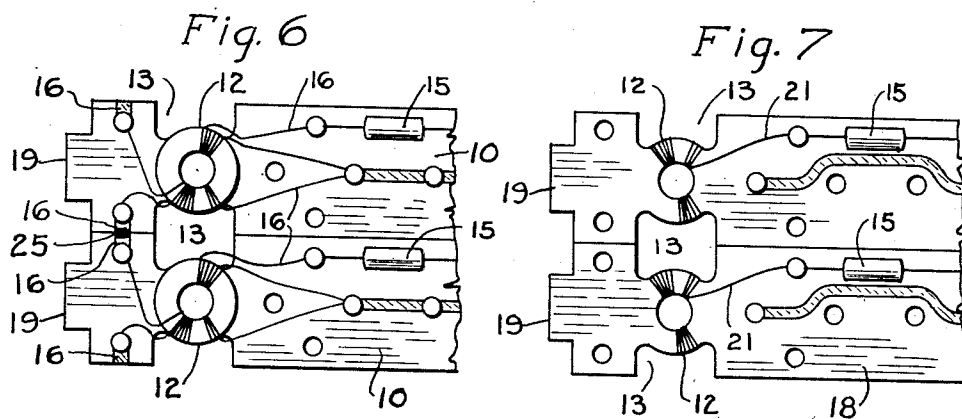
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MAGNETIC CORE ASSEMBLY

Filed May 20, 1955

2 Sheets-Sheet 2



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2,823,360

MAGNETIC CORE ASSEMBLY

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Application May 20, 1955, Serial No. 509,855

9 Claims. (Cl. 336—65)

The present invention relates to circuit assemblies and more particularly to the assembly of magnetic cores upon a terminal board while in association with a plurality of electrical circuits, and is an improvement upon the magnetic core mounting assembly described and claimed in applicant's pending application Serial No. 472,135, filed November 30, 1954.

In assemblies of the type to which the invention relates, it has heretofore been the practice to mount a plurality of core assemblies upon a single terminal board or panel of insulating material and because of the size of the board and the inaccessibility of the cores on the board, it is difficult if not impossible to apply windings to the cores by means of an automatic core winding machine. It therefore becomes necessary to wind the cores by "hand weaving" techniques which involves the use of a needle-shaped shuttle-bobbin. An operator winding the cores must first wind wire on the shuttle, then, by threading the shuttle through the core center, wrap the turns of the windings on one at a time. Since a single board takes from eight to twelve manhours to wind, the lost time becomes a vital factor in production costs.

Further the boards in present day use have long transverse wires which run the length of the board from a socket at the end, so the conglomeration of wires adds to the chances for error and confusion. Also, it will be seen that, the arrangement of components on either side of the board makes the unit unadaptable to dip-soldering techniques.

Another objectionable feature of such prior package is that the entire weight of the unit is exerted upon the socket connector and so there is a tendency to loosen the socket contacts and in time will cause sagging of the board or package.

A further disadvantage to a single board or unitary package is that trouble in one of its components due to mistakes in wiring or otherwise requires the entire package to be discarded.

An object of the present invention is to provide an improved package for magnetic core assemblies or the like.

Another object is to provide a printed wiring card package wherein a plurality of separate components are so interconnected as a complete assembly that any component can be readily removed and replaced.

Another object is to provide a magnetic core assembly wherein the cores can be wound by automatic winding machines.

A further object is to provide a card and receptacle system of assembly wherein the heretofore old arrangement of transverse wiring is minimized.

A still further object is to present a technique for the manufacture of individual module bits, which, when assembled into a specific grouping, will perform logical functions. For example, a particular grouped assembly might be put together to make a shift register, or a

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counter, or any other logical function that might be desired.

In the accompanying drawings,

Figure 1 is a perspective view of a magnetic core supporting structure, such as a board, card or panel of insulating material, forming a wired component of a core assembly of the invention and showing one face of the board;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a perspective view of the same showing the opposite face of the board;

Figure 4 is a face view of a complete assembly of components of the type shown in Figures 1 and 3 and showing one board released for replacement;

Figure 5 is a fragmentary detail, on a larger scale, of the assembly showing the interconnecting means for one end of the components;

Figure 6 is a fragmentary detail, on the same enlarged scale, showing generally the wiring thereon;

Figure 7 is a showing of the opposite face of the board shown in Figure 6;

Figure 8 is a perspective, partly broken away, of a complete assembly as a housed unit.

Referring to Figures 1 and 3 of the drawings, a single component is shown as representing any one of the components in an assembled package, and comprises a dielectric board or card 10 exhibiting a strip-like configuration and of rigid insulating material having holes 11 therethrough for respectively mounting magnetic toroid cores 12, as well as forming a base for circuit wiring. In the preferred form the wiring is of the printed conductor pattern type, such pattern being formed by copper laminated phenolic photo-sensitized, exposed through a negative having the desired configuration, developed and etched, thereby having on the board the proper conductor pattern. The cores 12, prior to winding, are cemented in place upon the board 10 respectively concentrically arranged with respect to the holes 11, namely with the inside diameters of the cores placed in direct axial alinement with the matching holes 11.

In order to permit easy winding of the cores 12, but more particularly to make automatic winding possible, the card or board 10 is formed with a narrow dimension in one direction, having as shown a width slightly greater than the outer diameter of the cores 12. The board 10 is provided, at two opposite edges of each core location, with notches 13 in close proximity to its adjacently mounted core 12 and preferably arced with the same radius of curvature as that of the periphery of the core. Thus a winding can be made through the two closely located notches to encircle the core on opposite sides thereof while also passing through a board hole 11, which arrangement makes possible ready winding by automatic winding machines.

Illustratively the strip or the board 10 is shown on face 14 as wired for two cores 12 and diode components 15, while the printed wiring 16 extends over the surface of the board. Some of the wiring 16 terminates at one end of the strip for plug-in relation to a socket connecting panel 17, which receives the terminal ends of all of the strips when assembled as a package. The opposite face 18 of the strip or board 10 is likewise provided with associated printed wiring 21 for proper circuitry and terminates as described for wiring 16 in terminals to enter the socket panel 17. The end of the board 10, opposite to the terminal end, has a projecting lug or key 19 for associating with a cover member as will be later explained.

The socket panel 17 has a slot 22 longitudinally disposed to receive and seat the terminals or contact ends of the boards or strips 10 and establish circuitry con-

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necting means through pairs of spring contactors 23 in the slot 22 of the panel 17. For the particular circuits here shown, three such contactors for each board are mounted transversely in the slot 22 and arranged respectively for spring pressed contact with the related conductors 16 and 21 on the respective faces of each board 10. These contactors project beyond one side of the panel 17 to provide, in an assembled package, a row of lugs 24 for soldering connections or plug-in sockets.

For board and circuit connection between abutting strips or boards to form a unitary package, certain terminals of the wiring 16 terminate at one or both side edges of the board, the arrangement being such that conductors on the respective adjacent boards align and abut each other. Thus when one board abuts an adjacent board in edge to edge relation, the two meeting conductors may be conductively coupled by a dab 25 of solder to thereby complete not only an electrical connection, but also to lock the two boards together in coplanar relationship. In this manner, a large number of strips 10 may be assembled in side-by-side relationship and locked together to form a composite printed wiring panel. A panel in the process of being built-up in this manner is shown in Figure 4. In the event of malfunction, instead of requiring replacement of the entire panel the component strip containing the faulty element may be easily separated from the balance of the panel and replaced by a correctly functioning strip. The strip 10 may be easily separated by softening the soldered connections 25 and reformed into a new panel by resoldering the original connections.

When a package is completed, as shown in Figure 4, it is preferable to enclose it in a cover 26 with the panel 17 as a base to which the cover 26 is attached by suitable fastening means. The top of the cover 26 is provided with a row of slots 27 corresponding in number to the number of components 10, such slots 27 being dimensioned to snugly seat the respective projecting end lugs 19. The unitary assembly of cover and base thus becomes a rigid retaining frame for the core components, besides being an effective dust protector and shield against injury.

It will now be apparent that a complete unitary supporting structure for magnetic cores and circuits has been devised in the form of a package, made up of a plurality of individual strips or boards attached together in edge to edge relation in conductively coupled relation to form a unit, such attaching means being detachable for the release of any individual board for repair or replacement. Further the novel conductor assembly, with its bonding medium, reduces transverse wiring to a minimum. Also it will be seen that the number of boards to make up a package can be varied to meet different conditions including the use of boards having different circuits and cores as substitutes for any board where necessary. Such changes are possible by merely unsoldering the bonding medium between selected boards. It will also be seen that the relatively large notches bounding opposite sides of a magnetic core provides easy access to the cores for winding by automatic means, thereby eliminating the usual hand winding of the relatively miniature core.

What is claimed is:

1. A supporting structure for package mounting of toroidal magnetic cores comprising a board of dielectric material, having parallel opposite side portions, each of said side portions being provided with an indentation, said indentations being oppositely aligned and together form a spaced apart pair between which said board is provided with an aperture, a toroidal magnetic core disposed on said board between said pair of indentations, with the bore of the core in axial alignment with said aperture and windings threaded through said

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core, said aperture, and around said indentations so as to bind said core to said board.

2. A supporting structure for package mounting of magnetic cores and electrical circuits, comprising a plurality of individual boards of nonmagnetic, dielectric material, arranged side by side for edge to edge contact, conductors on at least one face of each board terminating in an aligned abutting relation with the respective conductors of an adjacent board, each one of said boards having edge notches located at opposite sides thereof together forming an aligned pair, the area between said notches being provided with an aperture, and a toroidal magnetic core disposed on each of said boards, with the bore of the core axially aligned with the aperture, windings threaded through said core, said aperture and around one of said notches to bind said core to said board, a conducting medium bonding the abutting conductors together to form said boards into a rigid assembly, a base to support said rigid assembly, and a cover member secured to said base and cooperating therewith to enclose said assembly.

3. A supporting structure for package mounting of toroidal magnetic cores and electrical circuits, comprising a plurality of boards of non-magnetic dielectric material, arranged side by side for edge to edge contact, conductors on at least one face of each board having a terminal portion aligned in abutting relation with the respective terminal portion of a conductor on an adjacent board, each of said dielectric boards being provided with a plurality of edge notches and being further provided with an aperture adjacent said notches, a toroidal magnetic core disposed on at least one of said boards, the bore of the core being axially aligned with the aperture of said board, windings extending through said core, said aperture, and around one of said notches, and a conducting medium bonding the abutted conductors together, whereby the boards form a complete rigid package from which any board can be removed by breaking the bond therebetween.

4. A supporting structure in accordance with claim 3, wherein an electrical insulating socket panel is adapted to receive aligned board ends in interfittng relation, and electrical conductive contactors being carried by said panel for respectively engaging the conductors on the board.

5. The combination, according to claim 4, wherein an opposite end of each board is provided with a projecting lug, and wherein a cover is provided for housing said assembly, said cover being provided with slots to engage said lugs so as to align the boards within the cover and form a rigid, closed unit.

6. A supporting structure for package mounting of toroidal magnetic cores comprising a plurality of narrow finger-like flat boards of non-magnetic dielectric material having parallel opposite side portions, at least one of said side portions being provided with an indentation, each of said boards being provided with an aperture adjacent to said indentation, a toroidal magnetic core disposed on each of said boards with the bore of the core in alignment with said aperture, and windings running through said core, said aperture, and around said indentation to bind said core to said boards, said boards being arranged side by side for edge-to-edge contact, and electrical conductors on at least one face of each board, certain of said conductors having terminals in aligned abutting relation with respective conductors of an adjacent board.

7. A supporting structure for package mounting of electrical circuits comprising, a plurality of thin, elongated, finger-like flat strips of electrically insulating, non-magnetizable material, said strips being mounted in edge abutting relationship and in the same plane forming a composite board, each of said strips being provided with a plurality of apertures extending there-

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through, toroidal magnetic cores disposed on one side of each of said strips with the bore of each core in axial alignment with a respective one of said apertures, said strips having a transverse dimension approximately equivalent to the diameter of said magnetic core, electrical conductors on opposite faces of each of said strips, certain of the conductors on one strip contacting conductors on an adjacent strip thereby forming electrical wiring extending from one strip to another, said contacting conductors being connected by frangible connections for ready separation for replacement of individual strips, and means on said cores connecting said cores to said electrical conductors.

8. A supporting structure for package mounting of electrical circuits comprising, a plurality of individual flat strips of dielectric non-magnetic material, said strips being arranged side by side for edge to edge contact, each of the strips being provided with at least two apertures extending therethrough, toroidal magnetic cores disposed on one surface of each of said strips and projecting away therefrom with the axes of the cores extending perpendicular to the plane of the strips, the bore of each core being in alignment with a respective one of said apertures, electrical conductors disposed on opposite surfaces of each of said strips, certain of said conductors terminating in aligned abutting relation with conductors of an adjacent strip, other conductors on said strips terminating at a free edge thereof, electrical windings on the cores, said windings being provided with leads, at least certain of said leads passing through said apertures, and terminals disposed on opposite faces of said strips, said leads being fixed to the terminals on the opposite sides of the strips from which the cores project.

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9. A supporting structure for package mounting of electrical circuits comprising, a plurality of narrow, flat strips of non-magnetic dielectric material, said strips being arranged side by side for edge to edge contact, each of said strips being provided with a plurality of apertures extending completely therethrough, toroidal magnetic cores disposed on one side of said strips and projecting away therefrom, the bore of each core being disposed in alignment with a respective one of said apertures, electrical conductors disposed on opposite faces of each of said strips, certain of said conductors terminating in aligned abutting relation with conductors of an adjacent strip, and other conductors on said strips terminating at a free edge thereof, and windings on said cores with leads from certain of the windings passing through said apertures to certain of the electrical conductors on the opposite face of the strip from which the cores project.

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