Feb. 11, 1958 J. P. JONES 2,823,371

MAGNETIC CORE MOUNTING ASSEMBLY

Filed Nov. 30, 1954 2 Sheets-Sheet 1

Fig. 1

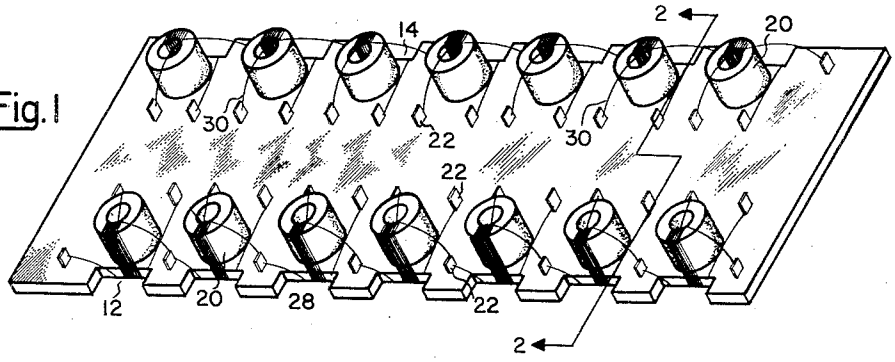


Fig. 2

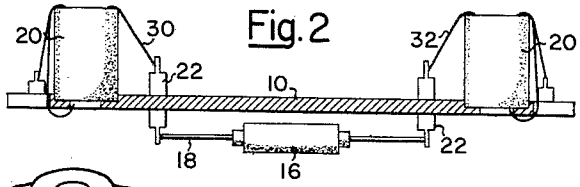


Fig. 2a

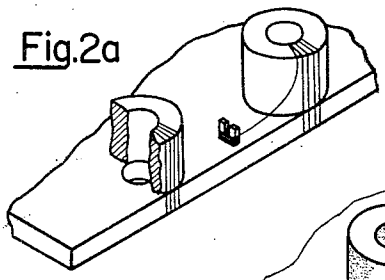


Fig. 3

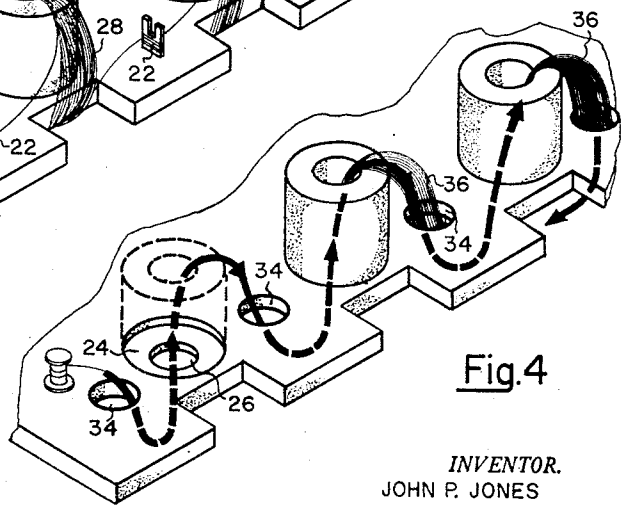


Fig. 4

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MAGNETIC CORE MOUNTING ASSEMBLY

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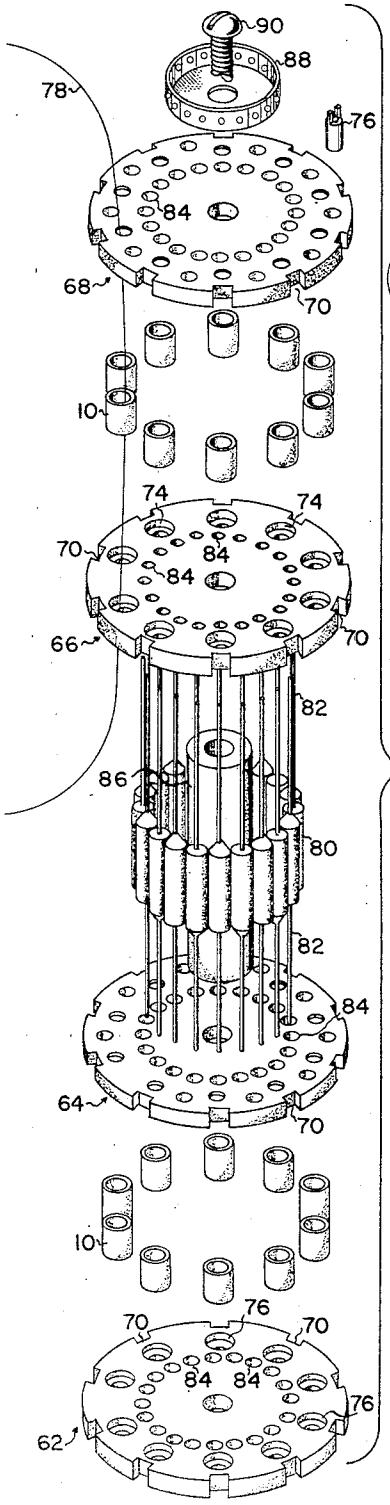


Fig. 5

Fig. 7

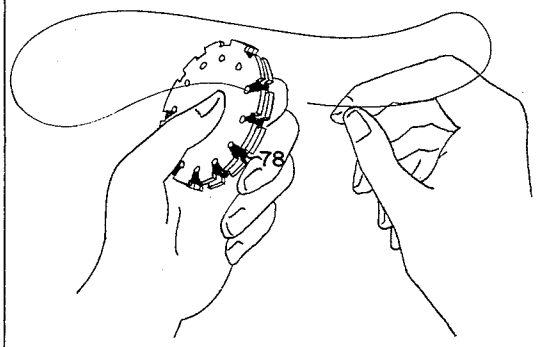
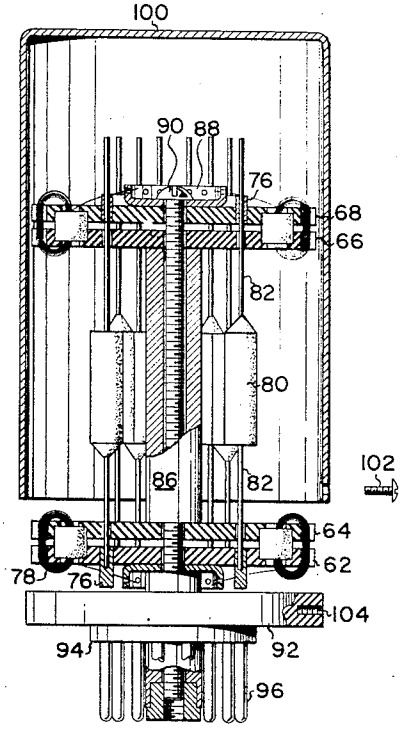


Fig. 6



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MAGNETIC CORE MOUNTING ASSEMBLY

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Application November 30, 1954, Serial No. 472,135

15 Claims. (Cl. 340—174)

This invention relates to structures for electrical apparatus and more particularly to structures especially adapted for mounting magnetic storage devices having the general configuration of a toroid or ring.

In the development of high speed magnetic circuits for use in computers and the like it has been found that the electrical power requirements are the lowest and the switching time the highest when the smallest magnetic cores are utilized. Magnetic cores for the applications herein described are usually provided with one or more toroidal windings. However, such small size cores cannot as a practical matter be wound efficiently by machine so that costly and time consuming hand winding has been resorted to. Also, in those instances wherein a shift or advance winding is to be incorporated in the circuit an additional problem is presented by virtue of the small size of the core and the generally serpentine or zig-zag pathway usually followed by this extra winding.

It is an important object of the present invention to provide a magnetic core mounting means which solves the above-mentioned problems.

Another important object of the invention is to provide a core mounting structure in which the symmetrical arrangement of the individual cores aids in the application of the electrical windings to the cores.

A further important object of the invention is to provide a magnetic core mounting seructure which provides a saving in handling time and material.

A still further important object of the invention is to provide an unitary magnetic core mounting structure or package adaptable for dip soldering techniques.

Other objects and advantages of the present invention will become more fully apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a magnetic core mounting assembly constructed in accordance with the teachings of the present invention;

Fig. 2 is a cross sectional view taken along the line 2—2 of Fig. 1;

Fig. 2*a* is an isometric view of a corner fragment of an assembly similar to the assembly of Fig. 1 but wherein the edge notches and the core recesses have been omitted;

Fig. 3 is an enlarged isometric view of a corner fragment of the assembly shown in Fig. 1;

Fig. 4 is a similar enlarged isometric view of a corner fragment of a modified magnetic core mounting assembly incorporating the invention;

Fig. 5 is an exploded view of a turret form of a magnetic core mounting assembly constructed in accordance with the present invention;

Fig. 6 is a longitudinal sectional view of the turret form illustrated in Fig. 5 but showing the parts in assembled condition together with a removable cover member; and

Fig. 7 is a pictorial representation illustrating one method of manually placing the windings upon a turret mounting assembly of the type shown in Figs. 5 and 6.

In the embodiment of the invention illustrated in Figs. 1, 2 and 3, a core mounting assembly includes a substantially flat insulating member or panel **10** of rectangular configuration as shown in Fig. 1. The panel is provided with a series of cut-outs or notches along each one of its long sides, the notches on one side being indicated at **12** and those on the other side at **14**, as will be brought out more fully hereinafter. The panel serves to carry electrical components and these are mounted on the opposite faces thereof. For example, as shown in Fig. 2, diode components, one of which is shown at **16**, may be carried on the under side of the panel **10** and mounted in a row with each diode extending transversely of the panel. On the opposite or top surface of the panel there are provided a plurality of magnetic toroids or cores **20** arranged as shown in two rows with each row adjacent to a notched edge of the panel. Extending through the panel are terminals or lugs **22** which are used to connect the diodes on one side of the panel with certain of the windings or other electrical connections associated with the magnetic cores on the other side of the panel.

With more particular reference to Fig. 3, it is evident that each magnetic core **20** associated with a particular notch **12** or **14**, as the case may be, and in line therewith transversely of the panel. To provide a rigid support for each core and to enable winding turns to be passed completely through the panel as hereinafter described, the panel is provided with a counter sunk hole **24** for each magnetic core in which the core is recessly seated. As shown in Fig. 2*a* the magnetic cores may also be placed conveniently near the edge of the panel so as to shorten the winding turns necessary to mount the core to the panel.

The hole **24** has a shape conforming substantially in size and shape to the exterior dimensions of the particular core, in this instance being circular to agree with the cylindrical arrangement of the core **20**. The counter sunk hole **24** is provided with a central aperture **26** of less diameter than the core and it is apparent that this aperture registers with the hole or bore through the core which is seated therein. The larger portion **24** of te hole **26** is preferably cut approximately half the way through the thickness of the panel **10** leaving the balance of the thickness for forming the smaller central hole **26**. Received in these holes, the cores are preferably positioned in an upright manner as shown in Fig. 1 with their exterior sides adjacent to or substantially coextensive with the notches of the panel.

Depending upon what the magnetic core assembly is to be used for, one or more electrical winding turns are placed around each core. If more than one wniding is placed on the core they may be initially wound around the core before fitting in their respective holes of the panel. At least one winding of each core, such as that identified by the reference character **28**, not only encircles the core but passes through the adjacent notch and through the aperture **26** and bore of the core and thus serves not only its electrical function to change the electrical characteristics of the core but also the mechanical function to hold the cores tightly within the recesses in which they are seated. Furthermore, the notch provides a relief for the winding during assembly of the unit or in the handling or service of the assembled unit. In the embodiment of the invention illustrated in Figs. 1, 2 and 3, each magnetic core has its own information advance winding, preferably such winding as that identified at **28**, which extends through the adjacent notch and is protected from damage by virtue of such notch.

Lead wires extend from each core to adjacent terminals **22** as is evident in the several figures disclosing the

first embodiment of the present invention. The particular connections are of no special interest in consideration of this invention since these may be modified to adapt the assembly for different uses. However, it is noted in Fig. 2, for example, that a lead wire **30** may be extended from a winding on a core **20** to the upper end of a terminal lug **22** which extends through the panel **10** and is connected at its lower end to a lead wire **18** of the diode **16**. The terminal lug to which the opposite end of the diode is connected may have a lead **32** extending to the core on the opposite edge of the panel from the first core but shifted one notch toward one end of the panel. An arrangement like this might be used in a magnetic core shift register assembly. For connections of this character the cores, notches and projections along one margin of the panel may be slightly displaced toward one end thereof with respect to the cores, notches and projections on the opposite margin of the panel as shown by the embodiment in Fig. 1. It is noted that there are seven cores in each row of cores illustrated in Fig. 1. However, there may be ten or more cores per row and it is to be expressly understood that the number of cores illustrated is by way of example only.

Fig. 4 illustrates a modification of the present magnetic core mounting assembly wherein a common advance winding may be used for all of the cores in a single row. The panel structure is substantially similar to that previously described in Figs. 1, 2 and 3 except that in the region of the panel provided for each row of cores there is also provided a series of apertures **34**. One aperture **34** is associated with each core. These apertures may be positioned approximately half way between each pair of cores and for the core at one end of the row the aperture is located between the core and the end of the panel. A single advance winding for all the cores in one row is indicated at **36**. It is threaded in a zig-zag path from the underside of the panel through each aperture **26** and upwardly through the bore of each core and out the top thereof, as indicated by the course of the arrow in Fig. 4. Thereafter the advance winding **36** is fed through the adjacent aperture **34** to the underside of the panel for re-entry to the next adjacent aperture and thence up through the core seated thereover. It is evident from the foregoing that wiring of multiple cores onto a notched supporting structure as herein described is extremely simple and efficient. This results from the symmetrical arrangement of components and their physical disposition on the supporting structure or panel **10**.

With conventional electrical circuitry, such for example as is called for in magnetic shift registers and the like, the repetition of parts and the inherent symmetry of the electrified circuit lends itself to an even more compact structure and design than has been previously described. When logic circuits are needed one magnetic core may drive many other cores. In each circuitry the shortest electrical leads provide the best and most efficient electrical operation.

Referring now more particularly to Figs. 5, 6 and 7, there is shown a unitized magnetic core mounting assembly exhibiting a compact and symmetrical design in the form of a tube or turret wherein all of the components are packages in one or more circular layers and the magnetic cores are secured between insulating disc-like members to provide flexibility in handling, ease in dip soldering and fabrication generally, as well as to provide a unitary pluggable and completely enclosed and, if desired, sealed package.

A plurality of insulating circular members or discs **62**, **64**, **66** and **68**, which exhibit a wafer configuration, are each peripherally notched as indicated at **70** to provide a relief for the various electrical windings used therewith, as will be described hereinafter. The number of notches corresponds to the number of magnetic cores which are to be employed with the particular circuit for which the unit is to be used. In Fig. 5, a dual turret assembly with twenty cores is shown. It is understood that assemblies with larger or smaller numbers of cores may be used. One surface of each disc **62**, **64**, **66** and **68** is provided with a circular row of counter sunk holes **74—76** similar to the counter sunk holes **24—26** previously described. The counter sunk holes in the embodiment of Figs. 5, 6 and 7 are located in the discs adjacent to the notches **70** and preferably in radially alignment therewith as shown by the discs **62** and **66** in Fig. 5. The four discs are arranged in two pairs with the counter sunk portions **74** of the holes of each pair of discs facing and aligning with one another. The rows of counter sunk holes **74—76** and the notches **70** of the two pairs of discs are aligned so that electrical connections therebetween will be as short as practicable. The individual cores **10** are disposed between the pair of discs **62** and **64** and the pair of discs **66** and **68** by seating the cores within the opposing counter sunk recesses of each set of discs. The assembled position of these elements is shown in Fig. 6.

As shown in Fig. 7, with a pair of discs clamped in this manner about a circular row of cores, the required windings **78** can be threaded through the bores of the cores and wrapped about the adjacent edge portions of the discs to thus securely fasten the core within the recesses in the discs. As in the case of the previously described embodiment of the invention, the windings **78** extend through the notches **70** of the discs and are protectingly recessed therein.

Additional components of the assembly, such as the diodes **80**, may be circularly arranged around the axis of the assembly and between the two sets of discs and have their leads **82** inserted within and projected through various ones of an inner row of holes **84**. A hollow insulating cylinder **86** (Fig. 6) provides a separating support for the structure and serves as a spacer to maintain the two sets of discs in spaced apart relation to thereby form a compact and symmetrically arranged structure. The cylinder **86** may be adapted to support other and associated electrical or mechanical components.

Mounting caps **88** together with a central tie bolt **90** provide means for securing the pairs of discs together so as to complete the unitized turret assembly. The bolt **90** offers the additional feature of providing a ground or common reference point for the electrical circuitry of the assembled structure of Fig. 6. A terminal disc **92** of insulating material may be provided for the turret assembly for electrically connecting the components of the turret to other associated circuitry (not shown). A pluggable member **94** which may be integral with or merely secured to the terminal disc **92** is provided with one or more projecting pin type connectors **96** adapting the assembly for plug-in connection to external circuitry. A removable cover or shield **100** normally encloses the assembled unit and it is secured thereto by means of the screw **102** which enters the threaded hole **104**. The cover is shown in Fig. 6 as unsecured and raised slightly above its normal position. The cover prevents the ingress of dust and moisture and protects the assembly including the magnetic cores from damage due to careless or rough handling.

Since the leads **82** are exposed at either end of the assembled unit the entire turret assembly is thus adapted for dip soldering. It is evident from the foregoing that by first dipping one end of the turret assembly in a hot solder path and then quickly inverting the assembly and dipping the opposite end, both sets of exposed leads can be soldered simply and efficiently.

There has thus been described an improved magnetic core mounting assembly. A simple and inexpensively fabricated unitized design results from the disc type core captivating apparatus set forth herein. The operating windings for the cores are easily applied. By being located adjacent the edges of their supporting members and

by virtue of the reliefs provided by the peripheral notches of the panels and discs, the windings may be easily applied either by hand or machine. The notches at the same time afford a measure of protection thereby for the windings and prevent them from shifting around on the cores after assembling them on their respective mountings. In the turret arrangement of Figs. 5, 6 and 7, the operational simplicity of dip soldering may be taken advantage of through the use of the terminal lead wire connectors disposed at the opposite ends of the assembled unit.

What is claimed is:

1. A magnetic core assembly comprising, in combination, a relatively thin flat electrically insulating, non-magnetizable supporting member having a margin thereof provided with a series of alternate notches and projections, a series of annularly shaped magnetic cores mounted on said margin of the member with their respective axes extending perpendicular to the plane of the member and with each core disposed adjacent to an individual one of said notches so that an outer surface portion of the core is substantially coextensive with an edge portion of the notch, and an electrically conductive winding on each core extending through the member to the side thereof opposite to the core and thence upwardly through the adjacent notch closely past said substantially coextensive portions of the notch and the core.

2. A magnetic core assembly comprising, in combination, a relatively thin flat supporting member having at least a marginal portion thereof formed of electrically insulating, non-magnetizable material and provided with one or more apertures extending completely therethrough, a series of annularly shaped magnetic cores mounted on said marginal portion of the member with their respective axes extending perpendicular to the plane of the member and with the bore of each core substantially registering with an individual one of said apertures, and an electrically conductive winding on each core extending through the bore thereof and through the registering aperture of the member and returning to the core around the edge of the marginal portion of the member so as to secure the core to the supporting member.

3. A magnetic core assembly comprising, in combination, a relatively thin flat supporting member having at least a marginal portion thereof formed of electrically insulating, non-magnetizable material and provided with an aperture extending completely therethrough, an annularly shaped magnetic core mounted on said marginal portion of the member with its axis extending perpendicular to the plane of the member and with its bore substantially registering with the aperture, and an electrically conductive winding on the core extending through its bore and the aperture and looped around the edge of the marginal portion of the member, said winding being tautly drawn and acting to secure the core to the member.

4. A magnetic core mounting assembly comprising an electrically insulating, non-magnetizable panel having a row of notches along one side thereof, the area immediately adjacent each one of said notches having a recess therein and each recess being provided with a central aperture, an annular magnetic core disposed in each recess with the bore of the core in registery with the central aperture, and a zig-zag winding threaded through the central apertures of the panel and the bores of the magnetic cores.

5. A magnetic core mounting assembly comprising a first pair of electrically insulating, non-magnetizable annular members, each one of said pair of members having a series of notches along its edge portion, a second pair of electrically insulating, non-magnetizable annular members similarly notched as said first pair of members, said annular members being provided with an aperture adjacent each notch, means maintaining said first and second pairs of annular members in space apart relation, toroidal magnetic cores disposed between the annular members of said first and second pairs with the bore of each core axially aligned with its respective aperture, windings encircling the cores extending through their respective bores and looped around the notches of each pair of annular members so as to tightly secure the cores between separate pairs of annular members, means connecting the cores of said first pair of annular members with the cores of said second pair of annular members, and a plugable member provided with a plurality of conductive elements adapted to electrically connect the cores of said first and second pair of annular members to a source of potential, selected windings of each of the cores of the second pair of said annular members being electrically connected to said conductive elements whereby each of said cores may be selectively energized from said source of potential.

6. A magnetic core mounting assembly comprising a rectangular panel at least one edge of which is formed of electrically insulating, non-magnetizable material and provided with a series of notches, said notches being equally spaced along said edge, the area of said panel immediately adjacent each one of said notches having a recess therein, said recesses extending approximately half way through said panel and being of a diameter to receive a magnetic core therein, each one of said recesses being further provided with a central aperture of reduced dimension extending through the panel to the other side thereof, an annularly shaped magnetic core seated in each one of said recesses so that the bore of said core registers with the central aperture, and windings on said cores extending through their respective bores and looped around the notches and being tightly drawn thereby to serve to secure said cores to said panel.

7. A magnetic core mounting assembly comprising an elongated panel of electrically insulating, non-magnetizable material having oppositely disposed alternate projections and notches along parallel sides thereof, the notches and projections being slightly displaced with respect to each other so that the projections of one side of the panel are directly opposite the notches of the opposite side, the area between each pair of projections and adjacent to a notch being provided with a recess adapted to receive a magnetic core therein, each of said recesses being provided with a central aperture, at least one annularly shaped magnetic core mounted in each one of said recesses with the bore of each core axially aligned with its aperture, and windings threaded through said cores and said apertures so as to encircle said cores and said notches and thereby fasten the cores within the recesses.

8. A magnetic core mounting assembly comprising a first pair of disc-like members formed of electrically insulating, non-magnetizable material, each one of said disc-like members having alternate projections and notches along the edge thereof, the notches and projections being of substantially similar cross sectional areas and of rectangular configuration, a second pair of disc-like members formed of electrically insulating, non-magnetizable material similarly notched as said first pair of members, an elongated member disposed between said first and second pair of disc-like members to support said pairs of disc-like members in spaced apart relation, each pair of disc-like members being adapted to be joined together with the notches and projections of each disc of each pair in registry, the inner opposed surfaces of each pair of said disc-like members being provided with a series of circularly arranged recesses, each recess of the series being directly adjacent to an individual notch and each recess being provided with a central aperture, an annularly shaped magnetic core disposed between each pair of recesses and adjacent to a notch with the bore of the core axially aligned with an aperture, said cores being thereby enclosed by said pairs of disc-like members when said discs are joined together, and windings threaded through said apertures and said cores so as to tightly secure said cores between said discs.

9. A magnetic core mounting assembly comprising a panel of electrically insulating, non-magnetizable material, at least one edge of said panel being provided with cut away areas and having openings passing through said panel from one side thereof to the other side, each of said openings being located opposite an individual one of said cut away areas, toroidal magnetic cores arranged on said panel one adjacent to each cut away area, the bores of the cores being aligned with the openings in the panel, and a winding on each of said cores passing through the bore of the core and through the opening with which the core is aligned and tightly around the adjacent cut away area so as to bind the core to the panel.

10. A magnetic core mounting assembly comprising an annularly shaped member of electrically insulating, non-magnetizable material, one edge of said annular member being cut away to provide a series of alternate notches and projections, said member being further provided with openings therethrough each adjacent to an individual one of said notches, a toroidal magnetic core disposed adjacent to each notch in said annular member with the bore thereof axially aligned with the adjacent opening, and one or more windings surrounding a portion of each of said cores and passing through the opening with which the core is aligned and tightly around the adjacent notch so as to bind the core to the annular member.

11. A magnetic core mounting assembly comprising a supporting member of electrically insulating, non-magnetizable material, said supporting member having a series of notches disposed along at least one edge thereof and being further provided with perforations extending through said supporting member one opposite each notch, toroidal magnetic cores disposed on said insulating member, each one of said cores being disposed adjacent to an individual notch with the bore thereof being axially aligned with the adjacent one of said perforations, and winding turns on each of said cores passing through the bore thereof and through the perforation with which the bore is aligned and around the adjacent notched edge portion of the panel securing the core to the supporting member.

12. A magnetic core mounting assembly comprising in combination an electrically insulating, non-magnetizable supporting member having an edge thereof provided with a series of alternate notches and projections and further having a perforation therethrough adjacent to each notch, an annularly shaped magnetic core disposed opposite each notch with the bore of the core in axial alignment with the adjacent perforation in the member, and an electrical conductive winding encircling a portion of the core and an edge portion of the member, said winding extending through the bore of the core and past an edge portion of the notch adjacent to which the core is disposed thus securing the core to the supporting member.

13. A magnetic core mounting assembly comprising, in combination, a pair of disk-like members formed of electrically insulating non-magnetizable material and arranged in spaced apart parallel relation to one another, said disk-like members being provided with alternate projections and notches along at least a portion of their respective peripheries, the notches and projections of the two members being substantially similar to one another and substantially aligning with one another, said disk-like members further being provided with apertures in their said respective peripheral portions, the apertures of the two members being similarly arranged and in alignment with one another, toroidal magnetic cores positioned between the disk-like members with the axes of the bores of the cores extending perpendicular to the planes of the members and each in registration with an individual set of aligned apertures in said peripheral portions of the two members, and windings encircling the cores and extending through their respective bores and looped around the adjacent notches of each disk-like member thereby serving to secure the cores and the members together into a unitary assembly.

14. A magnetic core assembly comprising, in combination, a pair of relatively thin flat supporting members each having at least a marginal portion thereof formed of electrically insulating non-magnetizable material and each further having an aperture extending completely therethrough, said members being disposed in spaced apart parallel relation to one another with the insulating non-magnetizable portions of the two members in opposed relation and with the apertures of the two members in axial alignment with one another, an annularly shaped magnetic bore between said marginal portions of the two members and arranged with its axis extending perpendicular to the planes thereof and with its bore substantially registering with the apertures, and an electrically conductive winding on the core extending through its bore and the apertures of the members and looped around the edges of the marginal portions of the members, said winding being relatively tautly drawn and acting to hold the core and the marginal portions of the members in engagement with one another.

15. A magnetic core mounting assembly comprising, in combination, a panel of electrically insulating non-magnetizable material having a recess in at least one edge thereof and further having an opening through the panel from one side to the other side thereof adjacent to the recess, a toroidal magnetic core on said panel and arranged adjacent to the recess with the axis of the bore of the core extending perpendicular to the plane of the panel and in registration with the opening through the panel, and an electrically conductive winding on the core passing through the bore of the core and through the opening of the panel and looped around the recessed edge portion of the panel, said winding being relatively tautly drawn and acting to hold the core upon the panel.

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U. S. DEPARTMENT OF COMMERCE

PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,823,371 February 11, 1958

John Paul Jones

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 41, for "seructure" read -- structure --; column 2, line 43, for "te hole" read -- the hole --; line 52, for "wniding" read -- winding --; column 8, line 29, for "bore" read -- core --.

Signed and sealed this 8th day of April 1958.

(SEAL)
Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

U. S. DEPARTMENT OF COMMERCE

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