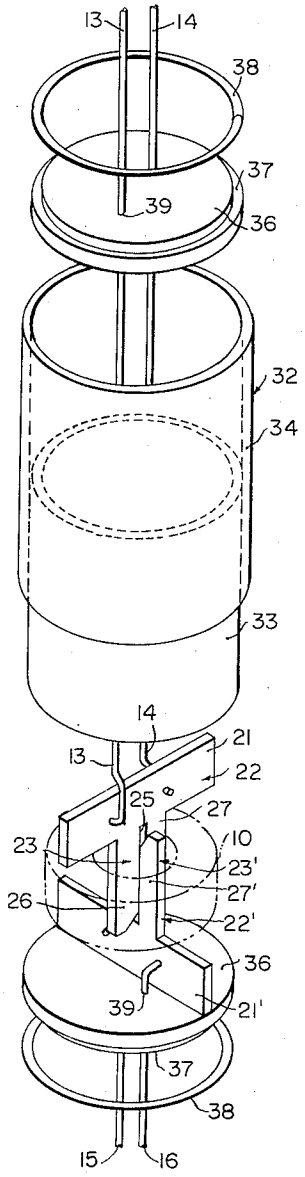
Dec. 20, 1960 L. T. LA PATKA ET AL 2,965,864

MAGNETIC CORE ASSEMBLY

Filed Oct. 26, 1956 2 Sheets-Sheet 1

Fig. 1



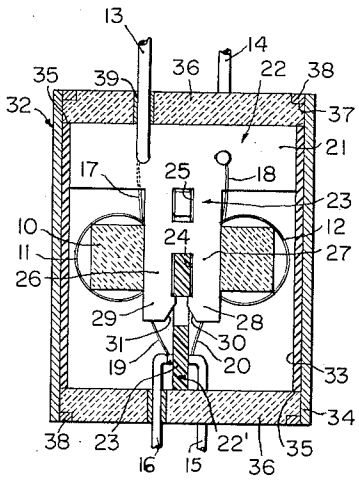


Fig. 2

Fig. 3

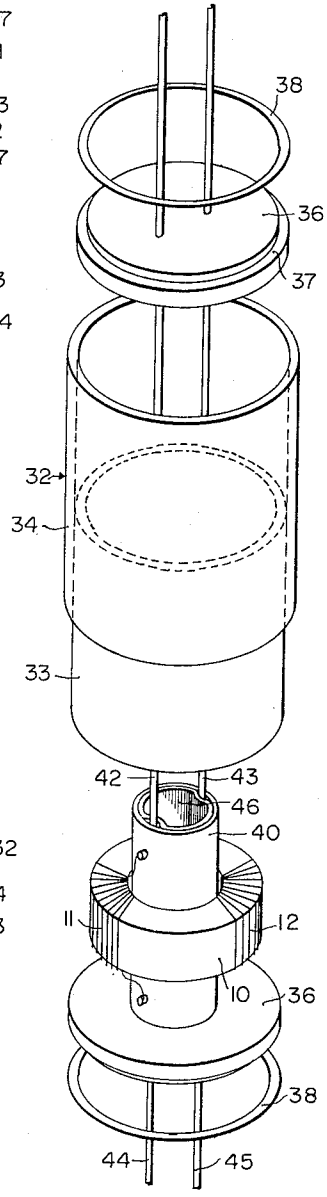
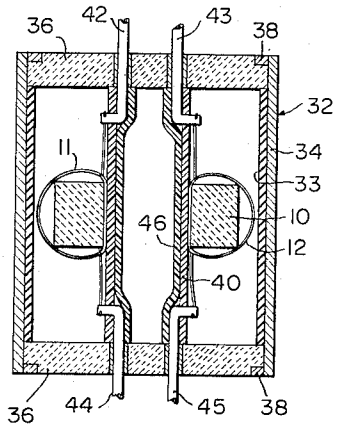


Fig. 4



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Dec. 20, 1960 L. T. LA PATKA ET AL 2,965,864

MAGNETIC CORE ASSEMBLY

Filed Oct. 26, 1956 2 Sheets-Sheet 2

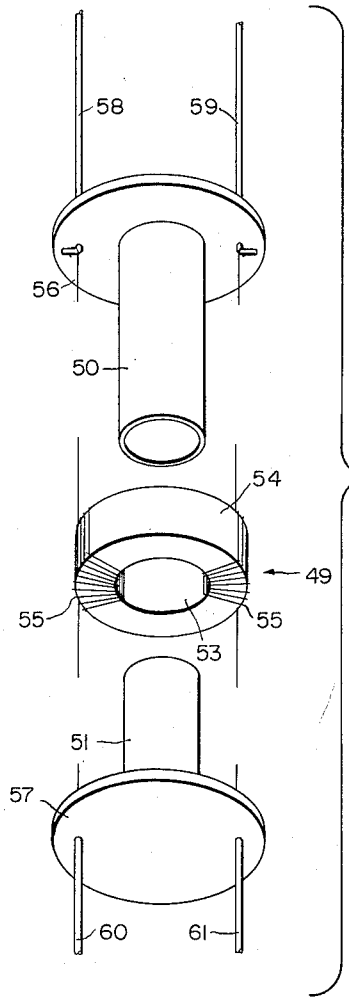


Fig.5

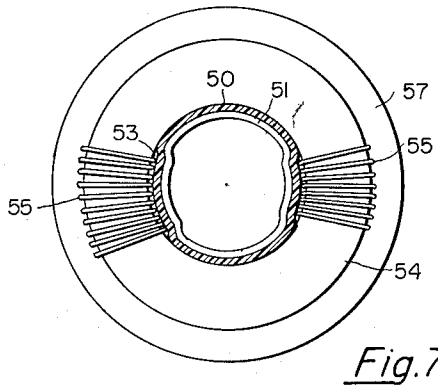


Fig.7

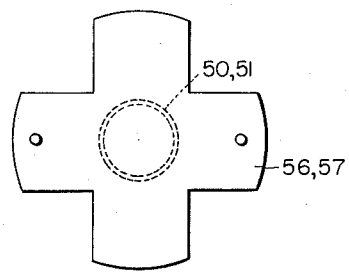


Fig.8

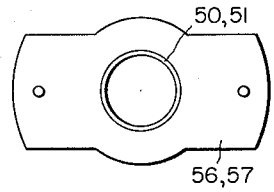


Fig.9

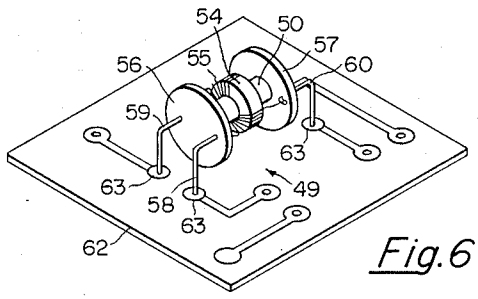


Fig.6

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MAGNETIC CORE ASSEMBLY

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6 Claims. (Cl. 336—92)

The present invention relates to toroidal magnetic cores and more particularly to unit assemblies of such core structures.

In magnetic core assemblies as heretofore fabricated, cost and time factors have presented problems seriously handicapping their production on an economical basis and thereby necessitating undesirably high prices for equipment requiring such units. Time factor problems are primarily caused by the required hand manipulation of the exceptionally small parts used in their manufacture and the tedious interconnection of elements to assemble operative units. High cost naturally follows from the multiplication of man hours necessary for production, a factor heretofore found to be an obstacle to commercial marketing.

An object of the present invention is to provide a magnetic core assembly wherein the foregoing problems have been solved.

Another object is to provide a core assembly involving a minimum of parts which can be quickly and easily put together to form a compact core unit, effectively shielded from associated circuits, such as those used in electrical computer systems.

Another object is to provide a core asembly wherein a magnetic toroidal wound core is supported between lead wires of input and output circuits, and in a manner shielded against local interference.

In carrying out the object of the invention, an exemplary assembly would include a magnetic core having windings connected to lead wire terminals supported by insulating elements extending into and supporting the core. If desired, the assembly may be housed within an insulating cylinder telescoped within a metal shell having its ends sealed by a suitable material through which the lead wires project for circuit connection.

Various other objects, advantageous and meritorious features of the invention will become more fully apparent from the following specification, appended claims and accompanying drawings, wherein:

Figure 1 is an exploded perspective view of one form of the invention;

Figure 2 is a transverse sectional view of the unit of Figure 1, when assembled;

Figure 3 is an exploded perspective view of a modified form of the invention, now forming the subject matter of the co-pending divisional application in the same names and same title as the present invention and bearing Serial No. 461 (1960 series) filed December 21, 1959, and assigned to the same assignee as the present invention;

Figure 4 is a sectional view similar to Figure 2, but of the modified form;

Figure 5 is an exploded perspective view of another modification of the invention;

Figure 6 is a perspective view of the modification shown in Figure 5 showing it mounted on a printed circuit panel;

Figure 7 is a transverse sectional view of the modification shown in Figures 5 and 6; and

Figures 8 and 9 are plan views illustrating how certain elements of the invention may be modified.

Referring to Figures 1 and 2 of the drawings, the preferred form of the invention is shown comprising a magnetic core **10** of the solid toroidal or ring type having, in the present instance, two windings **11** and **12** wound thereon, the respective ends of which are bonded to two pairs of conducting wires, rods, or pigtails **13**, **14** and **15**, **16**, as indicated in Figure 2 by the reference characters **17**, **18**, **19** and **20**. The pair of wires **13** and **14** function as one part of an electrical circuit and the pair of wires **15** and **16** serve as a part of another circuit, each pair being suitably supported in insulated condition upon associated structure such as a panel, base or other mounting, not shown. One pair can be the input of a signal transmitted to its winding on the core and the other pair can be the output from its signal induced winding, for example, a read-out or memory storage of electrical computers.

In order to mount the extended core winding wires in non-conducting relation and for quick inexpensive assembly as a unit, wires **13** and **14** are attached respectively to opposite sides of the cross-head **21** of one of a pair of similar T-shaped flat planar retainers **22** and **22'** of insulating and non-magnetic material. The shanks **23** and **23'** of each of the retainers is formed with a pair of medially disposed and aligned slots **24** and **25** the latter of which terminates just short of the head **21** of the retainer. The width of the slots is substantially equal to the thickness of the retainer material. Slot **24** divides the outer end of shank **23** into somewhat flexible fingers **26** and **27** having hooked end portions **28** and **29** formed with tapered edges **30** and **31** respectively to guide the fingers **26'** and **27'** of the correspondingly shaped member **22'** into engagement therewith, which engagement is effected with the plane of the retainers angularly displaced relative to each other with the angle of displacement preferably 90°. Wires **15** and **16** are similarly attached to opposite sides of the cross-head **21'** of the second retainer **22'**. When fully engaged with each other the hooked end portions **28** and **29** of each retainer is engaged in slot **25** of the other.

Thus it is seen that the bifurcated shanks **23** and **23'** permit the retainers to be interlocked with the respective retainer planes at right angles to each other. Furthermore, it should be noted that the width of each retainer shank is dimensioned to fit relatively snugly into the bore of the magnetic core **10** which is to be mounted. Also the length of the interlocked retainer shanks is such as to comfortably receive the thickness of the selected core between the two angularly disposed T-heads **21** and **21'**. Preferably there may be, as shown in Figure 2, a slight clearance between the core and the heads for more ready bonding of the core winding ends to the pairs of lead wires **13—14**, and **15—16**.

It should be understood that the assembly as described thus far, forms a complete usable core assembly and it is contemplated that it will be so used where a housing is not considered necessary. A feature of the presently illustrated assembly, however, is that the two cross-heads of the retainers are equal in length but preferably greater than the diameter of the core which is mounted between them, thus to provide the necessary spacing for telescopically inserting the assembly within a housing **32**. The housing may conveniently comprise a cylinder **33** of insulating, non-magnetic material having a length sufficient to encircle the mounted core assembly while leaving the pairs of lead wires projecting from its opposite ends. When so placed an outer cylindrical shell **34** of metal or other sufficiently rigid material is slipped over cylinder **33** with its ends projecting beyond both ends of cylinder **33**, thus to provide seats **35** at both ends of the

housing to receive closure members in the form of insulating non-magnetic disks 36 preferably of a ceramic material. Each disk is provided with a peripheral recess 37 to receive a split expansible ring 38 which in compressed condition is snapped into the recess 37 and allowed to expand against shell 34, thus to retain the closure disks seated against the ends of cylinder 33. Leads 13 through 16 pass through spaced apertures 39 in the disks and may be sealed thereto in any suitable manner. The rings are now soldered in place thereby to encapsulate and hold the elements of the assembly against displacement. If desired, ring 38 may be eliminated and recess 37 filled with solder.

In the modified form of the invention shown in Figures 3 and 4, and forming the subject matter of the above-identified divisional application, the core sub-assembly is adapted to be telescopically encased within a housing similar to that shown in Figures 1 and 2. In this form a tube 40 of insulating, non-magnetic material, such as nylon, is positioned through the bore of the core 10, with its ends projecting at opposite sides of the toroid to support the inner ends of pairs of lead wires 42, 43 and 44, 45. As shown, each wire enters the tube end with its end bent radially outward through the tube wall thus to provide a terminal to which an end of one core winding is attached. For retaining each pair of wires in the ends of tube 40, a resilient tube 46 of insulating, non-magnetic material is inserted within a tube 40, with a snug fit so that each wire is insulated from the other by the internal tube. Tube 40 may, if desired, be formed of resilient material. With both tubes of resilient material and the outer tube of slightly less diameter than the bore diameter of the core but slightly larger than the dimension between wires passing through the core on opposite sides thereof, the windings on the core are pressed against the core and held by the expanding pressure of the tubes which thus function as positive retainers for both the core and the wires.

With reference to Figures 5 through 9 it will be seen that features of both previously described forms illustrative of the invention, may be combined in one unit identified by the numeral 49. That is, the resilient tubes of the modification shown in Figures 3 and 4 may be combined with rigid heads similar to those illustrated in Figures 1 and 2.

With reference to Figure 5 it will be understood that outer and inner tubes 50 and 51 respectively are similar in construction both as to shape and material as are tubes 40 and 46 of Figures 3 and 4, except as described below. Figure 7 illustrates how the telescoped resilient tubes assume the shape of bore 53 of core 54 and the wires 55 passing therethrough, thus to press against both in a manner holding the wrapped core firmly on the tube assembly.

Returning to Figure 5 it is seen that tubes 50 and 51 are provided with transverse heads 56 and 57 of substantially rigid material either molded integrally therewith or formed separately and secured to the tube ends in some suitable manner. Passing through and secured to heads 56 and 57 are lead wires 58 through 61 which preferably are of the self supporting, easily bent type in common use on electrical components, such as resistors.

The above described assembly, as shown in Figure 6, lends itself well to automatic assembly processes whereby the component is positioned over a printed circuit panel 62 with its leads extending parallel with its axis whereby automatic machinery can bend the leads toward the panel and into apertures 63 provided therefor and in which they are secured as by bending over the ends of the leads on the other side of the panel. A feature of this modification is that heads 56 and 57 may be so postioned relative to each other that leads 58 through 61 are aligned thus to facilitate such panel assembly.

Heads 56 and 57 are disk shape as shown in Figures 5, 6 and 7, but it is understood that they may be formed in other suitable shapes, for example, such as those shown in Figures 8 and 9. Of course, where desirable, the whole assembly may be housed in a manner similar to those shown in Figures 1–4.

It will now be apparent that a magnetic core unit has been devised which is simple in construction and of few parts, all readily assembled as a compact assembly providing for attachment to associated apparatus.

We claim:

1. A magnetic core unit assembly comprising: a magnetic toroidal core; a pair of windings on said core; a retainer of insulating material extending through the bore of said core, said retainer comprising a pair of similarly shaped planar T-shaped insulating non-magnetic members each including a head and a bifurcated shank, said shanks extending through the bore of said core from opposite sides thereof with their planes angularly displaced and with said shanks interlocked thereby to support said core between said heads; an open ended inner insulating non-magnetic tubular casing having an internal diameter substantially equal to the transverse dimension of said head and encircling said heads; an open ended outer casing having an inner diameter substantially the same as the outer diameter of said inner casing whereby the latter may be telescopically inserted within said outer casing; insulating non-magnetic means seated against said heads and the ends of said inner casing and sealing the ends of said outer casing; and a pair of lead wires extending through each of said sealing means with their inner ends turned through the adjacent retainer head and bonded to the ends of one of said windings, and with their outer ends exposed for connection to associated apparatus.

2. A magnetic core unit assembly comprising: a magnetic toroidal core; a pair of windings on said core; a retainer of insulating material extending through the bore of said core, said retainer comprising a pair of similarly shaped planar T-shaped insulating non-magnetic members each including a head and a bifurcated shank; said shanks extending through the bore of said core from opposite sides of said core with their planes angularly displaced and with said shanks interlocked, thereby to support said core between said heads; an open ended inner insulating non-magnetic tubular casing having an internal diameter substantially equal to the transverse diameter of said heads and extending from the top of one head to the top of the other; an open ended outer casing having an inner diameter substantially the same as the outer diameter of said inner casing whereby the latter may be telescopically inserted in said outer casing; insulating non-magnetic means seated against said heads and said inner casing and sealing the ends of said outer casing; and a pair of lead wires extending through each of said sealing means with their inner ends turned through said heads and bonded to the ends of one of said windings and their outer ends exposed for connection to associated circuitry.

3. A magnetic core assembly comprising, a magnetic toroidal core, windings on said core, a retainer formed of two slidably interfitting planar parts of insulating material extending through the bore of said core with their ends extending beyond the sides thereof, said retainer parts being similarly T-shaped, and said interfitting parts thereof comprising bifurcated legs which are inserted through the bore of said core respectively from opposite sides thereof and from different radial angles, and means interlocking said interfitting parts.

4. A construction according to claim 3 and including a tubular housing for said core and retainer, insulating means sealing the ends of said housing, and a pair of lead wires extending through each of said sealing means with their inner ends attached to the adjacent end of said retainer ends and bonded to ends of said windings.

5. A magnetic core assembly according to claim 4, wherein the tubular housing for said core and retainer comprises a pair of telescoped tubular elements, the in-

terior element of which is formed of insulating material and the outer element of which forms a metallic casing, and wherein the length of each retainer has a head portion of a dimension equal to the interior diameter of said insulating tubular element whereby said retainer is received snugly within said insulating element with the overall length of the retaining means being of substantially the same length as said insulating tubular element, and wherein said metallic tubular element extends beyond the ends of said insulating tubular element, and said insulating means sealing the ends of said housing are disk-like members having the same diameter as the interior diameter of said metallic housing and when inserted within said housing seat upon the ends of said insulating tubular element, thus to enclose the core assembly.

6. A magnetic core unit assembly comprising, a magnetic toroidal core, windings on said core, a core retainer formed by two slidably interfitting planar parts of insulating material extending through the bore of said core with their ends extending beyond the sides of the core,

each of said interfitting parts including a slot forming bifurcated legs by which they are interfitted with each other from different radial angles, and an inwardly extending portion on the ends of said bifurcated legs for engaging a complementary portion on the other of said planar parts and aligned with said slot on said part thereby to interlock said parts against undesired relative movement.

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