

United States Patent

[11] 3,602,912

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[54] **MAGNETIC HEAD WITH CONNECTOR BLOCKS**
2 Claims, 13 Drawing Figs.

[52] U.S. Cl. **340/174.1 F,**
 29/603, 179/100.2 C

[51] Int. Cl. **G11b 5/16,**
 G11b 5/20

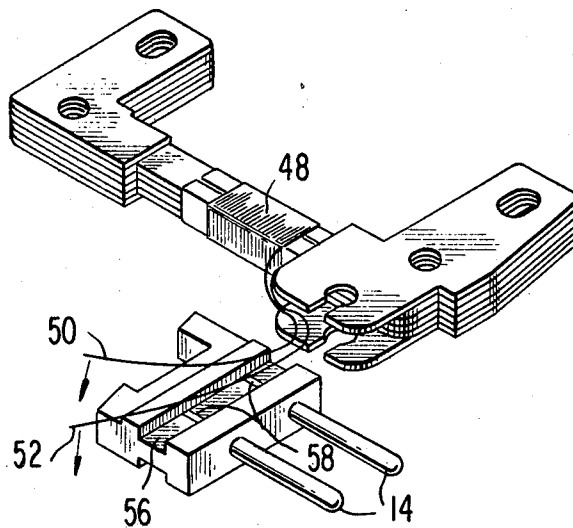
[50] Field of Search 179/100.2
 C; 340/174.1 F; 346/74 MC

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ABSTRACT: A tape head module is formed from two elements: (1) a prewound magnetic core and coil assembly and (2) a connector block in which are embedded projecting connector pins. A flattened portion of each connector pin is exposed in a channel formed in the block. The core and block are placed in a mold cavity shaped to receive them. The extremely fine leads of the coil are pulled through the channel and welded to the exposed pin portions. The corner of the channel is used as a snubbing point so that the leads are taut when they are welded. A liquid encapsulating compound is then forced under relatively low pressure through the channel and into the spaces of the mold cavity not filled by the assembly and connector block. The compound flows in a direction generally along the length of the leads to prevent breakage of the leads. The compound fills the channel and cavity spaces to encapsulate the assembly and connector block. After the compound has set, the assembly and connector block are firmly bonded together to form a rigid tape head module.



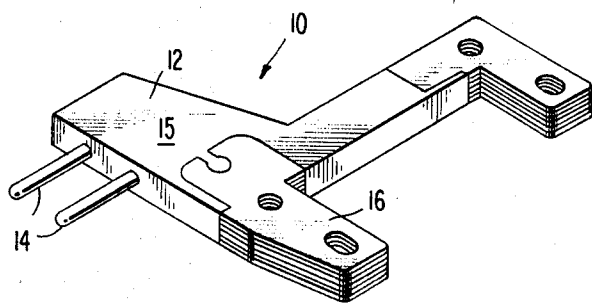


FIG. 1

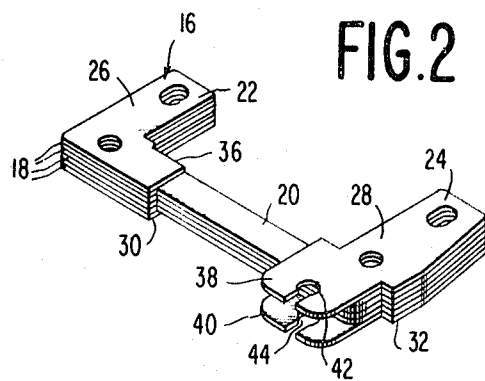


FIG. 2

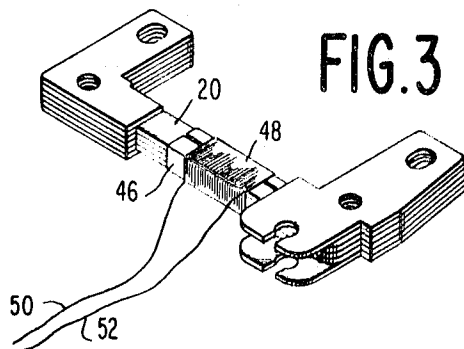


FIG. 3

FIG. 5

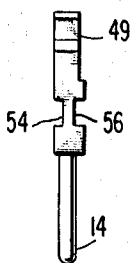


FIG. 4

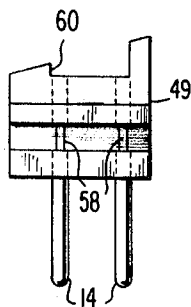


FIG. 6

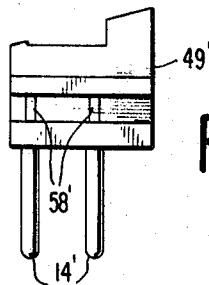


FIG. 4A

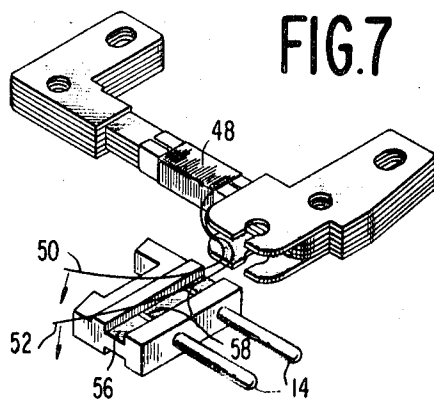


FIG. 7

FIG. 10

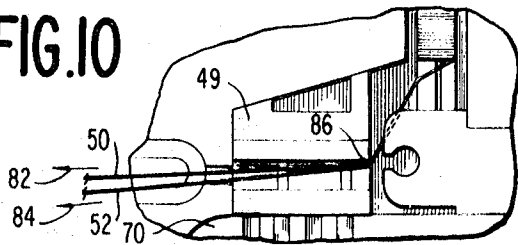


FIG. 8

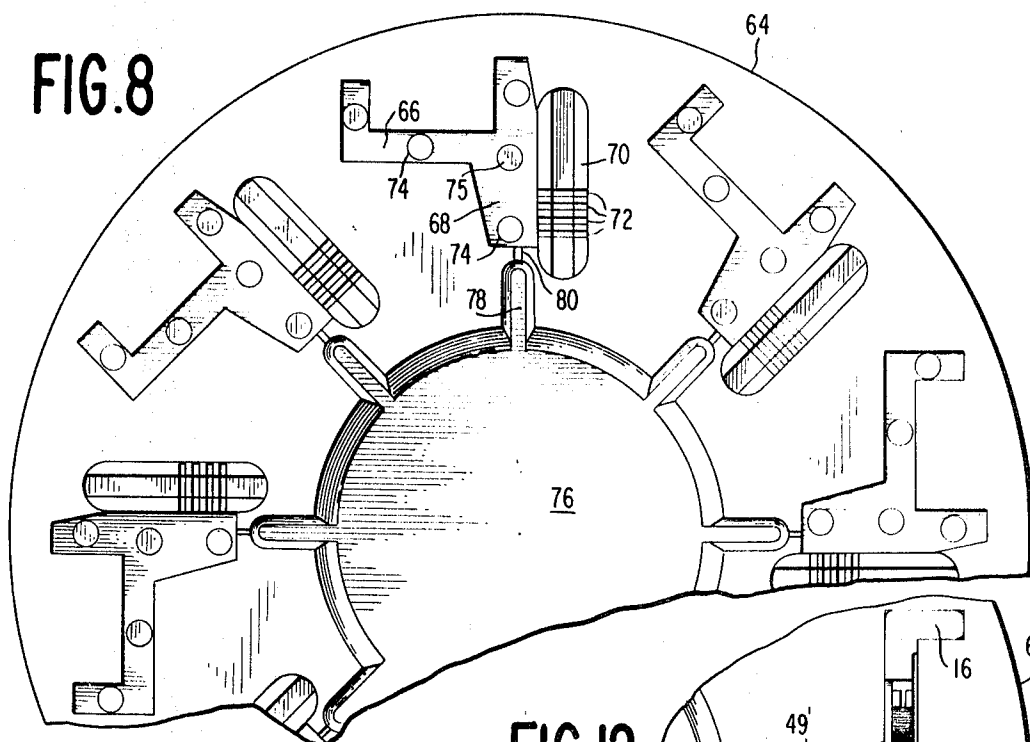


FIG. 12

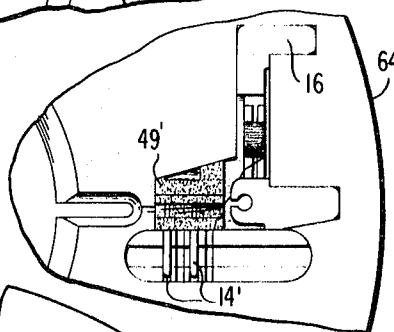


FIG. 9

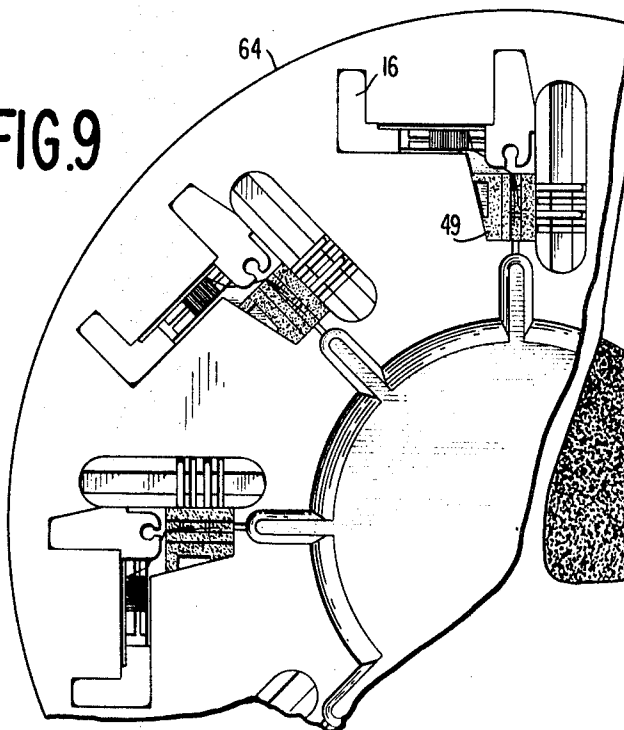
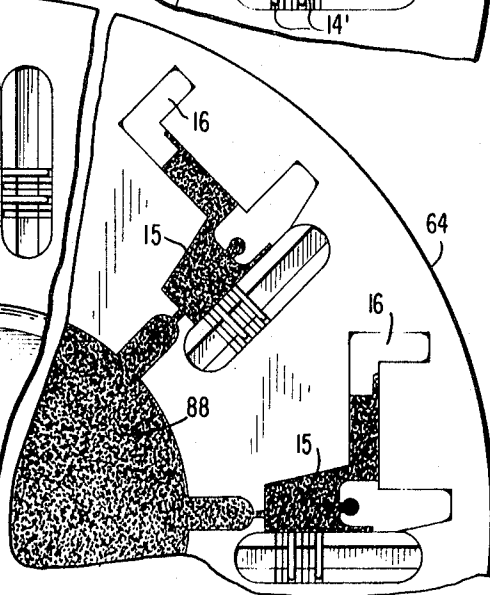


FIG. 11



MAGNETIC HEAD WITH CONNECTOR BLOCKS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a molded one-piece tape head module and a method of making the same from component parts.

2. Description of the Prior Art

In the prior art, a prewound core assembly and connector pins were placed in a fixture. The pins were temporarily held in a Teflon plastic holder so that a portion of each pin projected from the holder to provide a pin portion to which the coil leads could be welded. However, when the leads were pulled over the pin portions and welded, considerable slack always remained in the leads. When an encapsulating compound was poured over the core assembly and pins, the leads would float to the top where they often were broken or short-circuited together by subsequent sanding or grinding of the tape head to finished dimensions. Furthermore, since the pins were cantilevered in the holder and the projecting pin portions were not otherwise supported, it was difficult for the operator accurately to position a welding tool on the projecting pin portions to weld the leads to the exposed pin portions.

SUMMARY OF THE INVENTION

An object of the invention is to provide an encapsulated module made from an electrical element and a premolded connector block containing conductive terminals. The terminals are embedded in the block, and a portion of each terminal projects from the block. The block contains a channel in which another portion of each terminal is exposed to permit a connection thereto of an electrical lead from the electrical element.

Another object is to provide an improved method of making an encapsulated module wherein the element and the connector block are placed in a mold cavity which supports the projecting portions of the terminals to facilitate welding of the leads to the exposed portions of the terminals. The element and block are positioned in the mold such that each lead may be drawn taut during welding. Molding compound is forced under low pressure along the channel generally along the length of the leads to prevent breakage of the leads and to encapsulate the leads in the channel. The compound also flows into empty spaces in the mold cavity to encapsulate portions of the element the elements and firmly to bond together the element and the connector block to form a rigid encapsulated module with projecting terminal portions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the molded tape head module;

FIG. 2 is a perspective view of the laminated core construction per se;

FIG. 3 is a perspective view of the laminated core construction with the insulated coil wound thereon;

FIG. 4 is a side elevational view of the connector block;

FIG. 4A is a side elevational view of another form of the connector block;

FIG. 5 is an elevational view of the connector block shown in FIG. 4;

FIG. 6 is a top plan view of the connector block shown in FIG. 4;

FIG. 7 is a perspective view of the core and connector block showing the electrical connections therebetween prior to encapsulation thereof;

FIG. 8 is a partial top plan view of the mold cavities into which assemblies such as shown in FIG. 7 are placed for subsequent encapsulation;

FIG. 9 is a view similar to FIG. 8 showing the component parts of FIG. 7 located in the mold cavities;

FIG. 10 is an enlarged view of a portion of FIG. 9 showing the manner in which the coil leads are drawn taut for welding;

FIG. 11 is a partial top plan view of the mold showing the areas filled with encapsulating compound; and

FIG. 12 is a top plan view of one mold cavity containing the modified connector block of FIG. 4A and a core.

DESCRIPTION OF THE PREFERRED EMBODIMENT

This molded tape head module 10 of the present invention is shown in its completed final form in FIG. 1 of the drawings. The module 10 is comprised of a connector portion 12 having a pair of connecting pins 14 protruding therefrom and a magnetic core 16. The two portions are formed into an integral rigid construction by a molded plastic encapsulating material indicated by the reference numeral 15.

The magnetic core 16 is shown in detail in FIG. 2. A plurality of intermediate laminations 18 having a C-shaped configuration form a bight portion 20, a first leg portion 22 and a second leg portion 24. An outer lamination is comprised of two separate portions; a first portion 26, which is coextensive with the first leg portion 22 and one end of the bight portion 20, and a second leg portion 24. An outer lamination is comprised of two separate portions; a first portion 26, which is coextensive with the first leg portion 22 and one end of the bight portion 20, and a second portion 28 which is coextensive with the second leg portion 24 and the other end of the bight portion 20. Outer laminations 30 and 32, similar to the laminations 26 and 28, respectively, are applied to the opposite side of the core 16. Therefore, the central portion of the bight portion 20 has a thickness which is reduced by the thickness of two laminations from the thickness of the leg portions of the core. Furthermore, the intermediate laminations 18 are narrower than the bight portion of the outer laminations, and the lamination 26 is narrower at 36 to match the narrower intermediate laminations.

The outer laminations 28 and 32 on the second leg portion 24 extend beyond the bight portion 20 to provide a pair of spaced, parallel flanges 38 and 40 which are of the same size. A pair of notches 42 and 44 are formed in the edges of the flange portions 38 and 40, respectively.

In FIG. 3, an insulating sheath 46 of any suitable material has been wrapped around the reduced portion of the bight 20 of the C-shaped magnetic core 16 and a plurality of turns of insulated wire prewound thereon to form a coil 48. The wire is of extremely fine diameter on the order of 0.002 inch.

A connector block 49, which is contained in the connector portion 12, is shown in detail in FIG. 4 prior to its being integrally molded with the laminated magnetic core 16. The block is comprised of a molded plastic body having a pair of connector pins 14 suitably embedded therein. The opposite sides of connector block 49 are provided with channels 54 and 56 which are of sufficient depth to expose portions 58 of the connector pins which provide areas to which the leads 50 and 52 of coil 48 may be welded. The channels are much deeper than the diameter of the lead wires to permit encapsulation of the leads as will be explained later. The arrows 51 and 53 in FIG. 7 indicate that leads 50 and 52 are to be drawn taut through and downwardly into the channel 56 to engage the exposed pin portions 58. The connector block is formed with a notch 60 in the upper edge thereof and a notch 62 along one side thereof to assist in providing a mechanical interlock between the encapsulating plastic and the premolded connector 49. Another form of connector block 49' is shown in FIG. 4A with the sole difference between the blocks 12 12' residing in the location of the pins 14 and 14', respectively.

In order to join the core 16 and connector block 49 together into an integral one-piece module, the individual cores and connector blocks are disposed in complementary shaped cavities in a die member 64 as shown in FIGS. 8 and 9. FIG. 8 shows the die member 64 without the component parts of the module inserted in their complementary cavities. The cavities for each module are identical and only one will be described in detail. The portion 66 of the mold cavity is designed for the reception of the C-shaped magnetic core 16 and the portion 68 of the mold cavity is designed for the reception of the con-

nector 49 or 49'. An additional cavity 70 is provided with four parallel grooves 72 for the reception of the connector pins 14 or 14' depending upon which connector block is being utilized. The grooves 72 are cut to a depth such that the buttons of the grooves will support the projecting portions of the pins when the connector block is in the cavity. Cavity 70 and grooves 72 also permit one of the two electrodes of a welder to engage the pin projections when the coil leads are welded to the exposed pin portions 58 or 58'.

A plurality of bores 74 are provided within the cavities 66 and 68 which are plugged during the molding process by ejection pins whose top surfaces are indicated by the reference numeral 75. These pins will subsequently be utilized for forcing the finished module out of the mold plate 64 upon completion of the molding operation. A central supply cavity 76 is formed in the plate 64 and a plurality of injection passageways 78 extend radially outwardly therefrom and through gates 80 into communication with the cavity portion 68. Each gate 79 is located so that it will be aligned with the channels 54 and 56 in a connector block 49 or 49'. A flat cover plate (not shown) will be placed in superimposed abutting relation with the upper surface of the plate 64 to close the cavities for the transfer molding process.

FIG. 9 shows the die half 64 after magnetic cores 16 and the connectors 49 have been placed within the respective cavities. As best shown in the enlarged view of FIG. 10, the leads 50 and 52 are pulled taut in the direction of arrows 82 and 84 with the corner 86 of channel 56 acting as a snubbing point. The leads 50 and 52 are then welded to the respective connector pins 14 at the exposed areas 58. In welding the wires, the operator places one welder electrode on a coil lead and area 58 and a second electrode on the portions of pins 14 which extend into the groove in cavity 70 which is made large enough to receive the second electrode.

The transfer molding process takes place under low pressure so as not to cause breakage of the extremely fine lead wires 50 and 52. A liquid encapsulating compound is injected by a means not shown into center cavity 76 from where it flows through channels 78 and gates 80 to the connector block channels 54 and 56 which are aligned with gates 80. The compound flows through both channels 54 and 56 filling the channel themselves and all unoccupied spaces in the mold cavity. More specifically, it flows into notch 60, into the channel formed by flanges 38 and 40, into the flange notches 42 and 44 and into the area around the reduced bight portion 20 of core 16.

It is an important feature of the invention that the compound always flows generally parallel to the direction in which leads 50 and 52 extend. The compound flows along the length of the leads in channel 56. Even where the leads fan out between snubbing point 86 (FIG. 10) and coil 48, the compound will flow generally parallel to the leads while filling the space between block 49 and core 16. This feature reduces the possibility of the leads 50 and 52 being broken by the flowing compound.

The areas covered by the encapsulating compound are in-

dicated in FIG. 11 by the darkened areas labeled 15 and 88. Since leads 50 and 52 were drawn taut when they were welded, they cannot float to the top surface of the encapsulating compound. The notches 42 and 44 form a mechanical lock between core 16 and block 49 after the compound has hardened.

After hardening of the compound, the modules are ejected from the mold by the pins 75 which rise up through bores 74. The compound may be sanded or ground to produce a uniformly even surface on both sides of the module. The thickness of the module is uniform throughout and is equal to the thickness of the laminated core leg portions. The various grooves, notches and channels in the magnetic core and the connector block all lend themselves to providing a positive mechanical interlock with the plastic compound which has been molded thereabout to provide a strong module.

FIG. 12 illustrates a mold cavity containing the modified connector block 49' illustrated in FIG. 4A. When several of the modules are stacked to form a tape head assembly, adjacent modules have different types of connector blocks. Since the pairs of pins 14 and 14' are staggered relative to each other, the distance between pins is increased in the head assembly as compared to an assembly in which all modules contain the same type of connector block. The greater pin separation facilitates the connection of the pins to other electrical elements.

While the invention has been particularly shown and described in reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A magnetic transducer comprising:

- a. an electrical element having at least a pair of leads,
- b. a connector block of insulating material having a channel in one surface thereof and mounted in substantially the same plane as said electrical element and offset with respect to said element in said plane,
- c. a pair of conductors adapted to make an external connection embedded in said block and extending in a directing generally orthogonal to said leads, a portion of each conductor being exposed in said channel,
- d. said leads being snubbed on a surface of said block and each being connected to a different one of said leads to be taut between their connections and said elements, and
- e. insulating means encapsulating said element, said connector block and said leads to form a rigid electrical module.

2. A magnetic tape head transducer as defined in claim 1 wherein said magnetic transducer comprises a magnetic core and coil wound thereon forming a component of a magnetic tape head, extensions of said coil forming said leads, said core having a pair of spaced flanges which form a channel through which said leads pass, each of said flanges containing a notch for providing a mechanical interlock between said core and said encapsulating means.