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MAGNETIC HEAD FOR RECORDER AND REPRODUCER

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Fig. 1

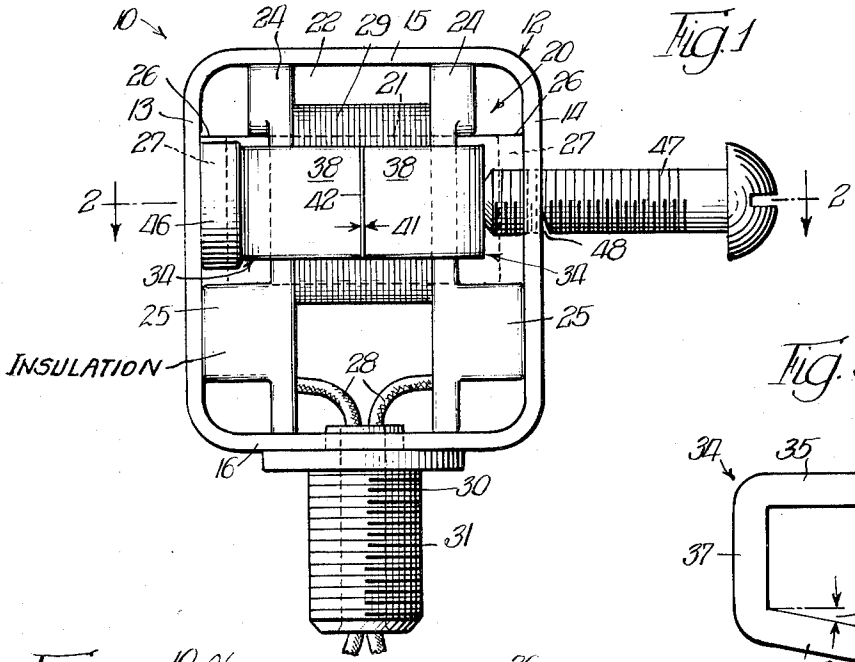


Fig. 3

Fig. 2

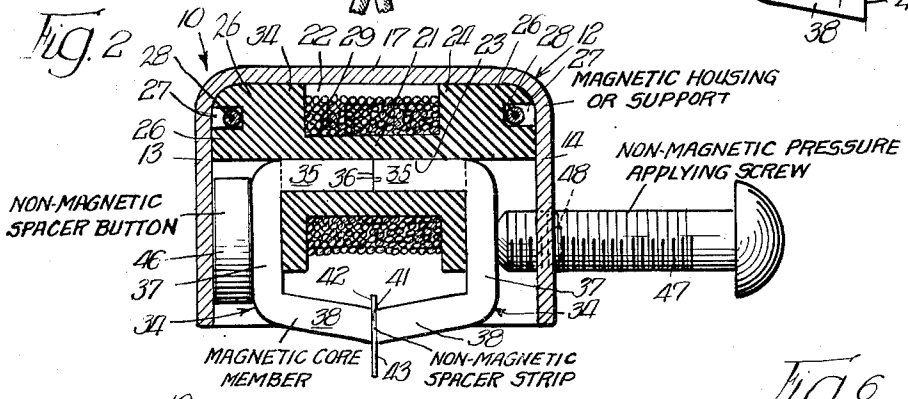


Fig. 6

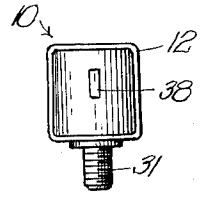
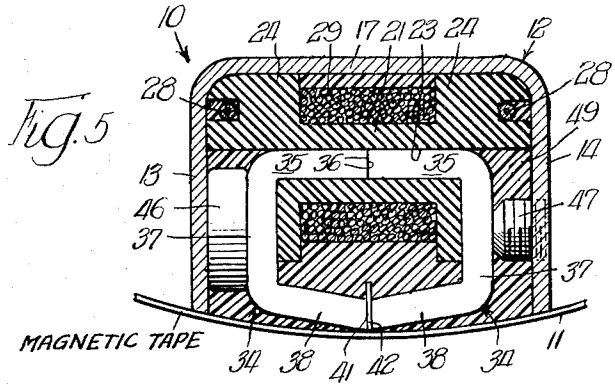


Fig. 5



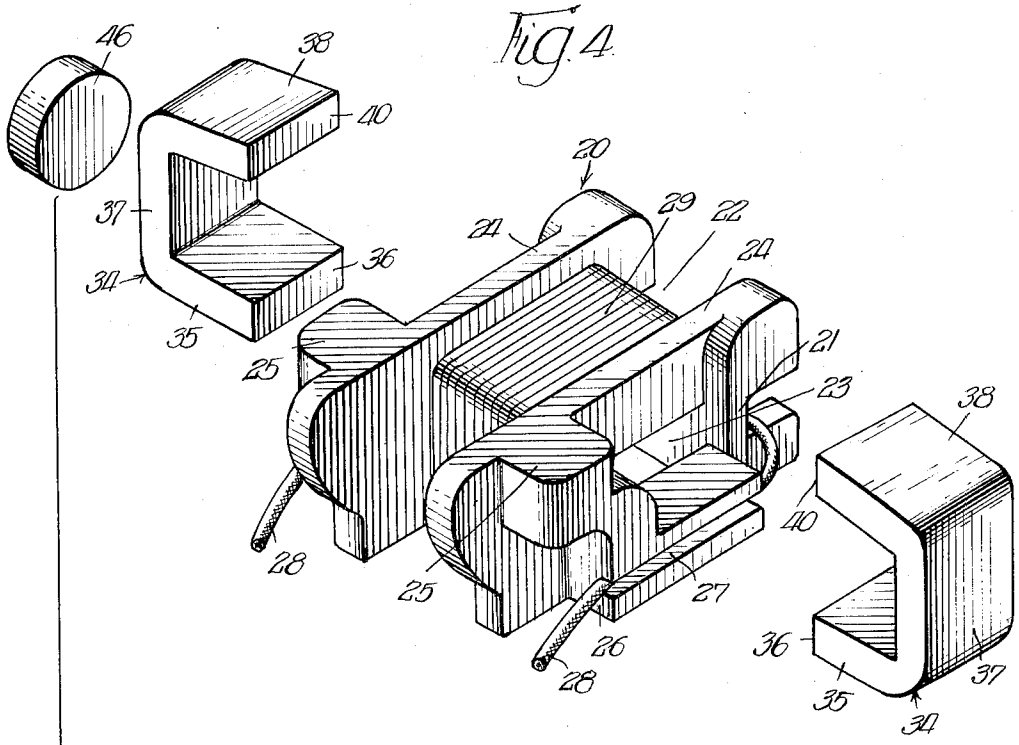
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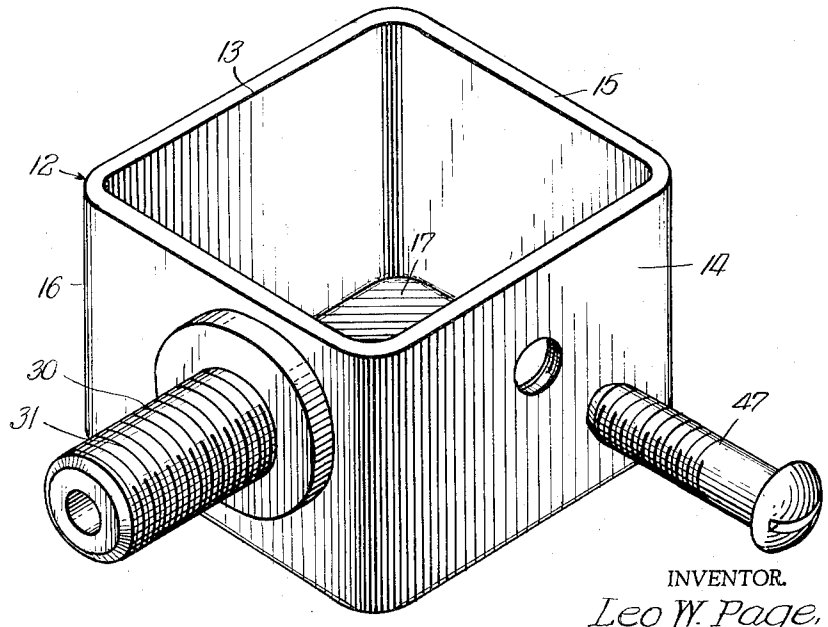
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MAGNETIC HEAD FOR RECORDER AND REPRODUCER

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Fig. 4





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MAGNETIC HEAD FOR RECORDER AND REPRODUCER

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Filed Apr. 16, 1962, Ser. No. 187,861
5 Claims. (Cl. 179—100.2)

This invention relates, generally, to magnetic tape recorders and reproducers and it has particular relation to the construction and assembly of magnetic transducers for applying information to or obtaining information from a magnetic tape. Magnetic transducers of the class or type to which the present invention relates are, for example, shown and described in U.S. Patent No. 2,835,742, issued May 20, 1958, to W. D. Moehring and Charles F. Murphy.

Among the objects of this invention are: To provide for holding C-shaped magnetic core members in place in a magnetic transducer in a new and improved manner while providing a gap between juxtaposed end surfaces thereof of predetermined length and uniformity when the transducers are manufactured on a mass production basis; to form the gap by introducing a thin strip or foil of non-magnetic material between these end surfaces and to insure that the strip is uniformly flattened by the application of predetermined measured force applied endwise of the end portions of the C-shaped core members and to opposite sides of the strip with the force applied being insufficient to change substantially the magnetic characteristics of the core members; to mount the C-shaped core members in a bobbin carrying a winding, then inserting the subassembly into a magnetic housing in the form of a box, and thereafter applying compressive force to one of the core members by a screw threaded through a side wall of the box thereby urging the other core member toward the opposite side wall, the screw being tightened to the same extent for successive assemblies and, as stated, the extent being such as not to alter substantially the magnetic characteristics of the core members; and to mount the core members within a unitary frame and to apply the aforesaid predetermined force therebetween by a screw or other means in such manner as to place the core members in compression and the surrounding frame in tension thereby providing a self contained stressed construction.

In the drawings:

FIG. 1 is a plan view of a transducer constructed in accordance with this invention showing the relationship of the various components before they have been potted and before the force applying screw has been cut off.

FIG. 2 is a horizontal sectional view taken generally along the line 2—2 of FIG. 1.

FIG. 3 is a view, in side elevation, of one of the C-shaped core members two of which are employed.

FIG. 4 shows in perspective and in disassembled relation the transducer which is shown in assembled relation in FIG. 1.

FIG. 5 is a view, similar to FIG. 2, but showing the force applying screw broken off and the assembly potted by filling the housing with non-shrinking plastic material.

FIG. 6 is a plan view of one of the transducers shown in FIGS. 1–5 after it has been potted and ground and polished.

It will be understood that the several views in the drawings are shown on enlarged scale. For illustrative purposes it is pointed out that the constructions shown in FIGS. 1–5 are at eight times full size, while FIG. 6 is twice full size.

Referring now particularly to FIG. 1 of the drawings, it will be observed that the reference character 10 designates, generally, a transducer embodying the present invention. It will be understood that the transducer 10 is intended for use with a magnetic tape 11, FIG. 5, for the purpose of either imparting information to the tape or for removing it from the same as the case may be.

The transducer 10, FIG. 1, includes a support that is shown, generally, at 12 and preferably it is in the form of a rectangular box having side walls 13 and 14 and interconnecting end walls 15 and 16 all joined by a bottom wall 17. The side walls 13 and 14, end walls 15 and 16, and the bottom wall 17 preferably are of one piece construction with the side and end walls forming a relatively rigid unitary frame extending from the bottom wall 17 in which certain stresses to be described are self contained. The support or box 12 is formed of magnetic material, in accordance with conventional practice, and functions as a magnetic shield for the transducer components within it.

Located within the support or box 12 is a bobbin, shown generally at 20, and formed of insulating material, such as nylon. The details of construction of the bobbin 20 will be apparent on consideration of FIGS. 1 and 4 of the drawings. Here it will be observed that the bobbin 20 includes a tubular central section 21 which provides a winding space 22 therearound that is located generally in the plane of the frame formed by the side walls 13 and 14 and end walls 15 and 16. Within the tubular central section 21 there is a core space 23 for receiving the ends of core members to be described hereinafter. Formed integrally with the bobbin 20 are end flanges 24—24 which extend transversely of the tubular central section 21. The end flanges 24—24 serve, as shown in FIG. 1, to locate the bobbin 20 and parts associated therewith between the end walls 15 and 16. Bosses 25—25 formed integrally with and extending laterally from the end flanges 24—24 serve to properly locate the bobbin 20 within the support or box 12 and between the side walls 13 and 14.

Also formed integrally with the end flanges 24—24 are laterally extending flanges 26—26 which extend along the inner surface of the bottom wall 17 as shown more clearly in FIG. 2. The lateral flanges 26—26 are provided with grooves 27—27, respectively, through which conductors 28—28 extend to provide the necessary connections to a winding 29 which is located in the winding space 22 and around the tubular central section 21 of the bobbin 20.

It will be observed that the conductors 28—28 extend toward each other from the grooves 27—27 and that they extend outwardly through the end wall 16. As shown here the conductors 28—28 extend through a tubular fitting 30 which is secured by suitable means to the end wall 16 and extends laterally therefrom. The fitting 30 is threaded at 31 in order to facilitate mounting the transducer 10 on a suitable support as will be understood.

The magnetic circuit for the transducer 10 is provided by a pair of C-shaped core members 34—34 which are positioned opposite each other and generally transversely of the plane of the frame provided by the side walls 13 and 14 and end walls 15 and 16. The core members 34—34 are of identical construction and they are formed of suitable magnetic material, such as Mu-metal, having the desired characteristics from a magnetic and mechanical standpoint to perform their intended function in the transducer 10. Each core member 34 includes one end portion 35 which has an end surface 36 that is finished, as by lapping, so as to provide a surface in a plane 36', FIG. 3, which extends transversely of the one end portion 35. As shown in FIGS. 2 and 5 these end surfaces 36—36 are located in abutting relation when the end portions 35—35 of the core members 34—34 are telescoped within the tubular central section 21 of the bobbin 20 into the core space 23 therein. Each core member 34 is provided with an intermediate portion 37 and these inter-

mediate portions 37—37 extend generally parallel to and in spaced relation with the side walls 13 and 14 respectively in a manner that will be described presently. Each core member 34 also includes an outer end portion 38 which, as shown in FIG. 3, is inclined at a small acute angle 39 out of parallelism with respect to the end portion 35, the arrangement being such as shown in FIGS. 2 and 5 that the distal parts of the end portions 38—38 extend beyond a plane containing the margins of the side walls 13 and 14 and end walls 15 and 16. It will be apparent that the purpose of this arrangement is to permit placing the transducer 10 in proper operative relation with respect to the magnetic tape 11.

The outer end surface 40 of each of the other end portions 38 is finished, as by lapping, and the arrangement is such that the surface 40 is located in the plane indicated at 36' in which the end surface 36 also is located.

While the end surfaces 36—36 of the end portions 35—35 are located in mutual abutting surface contact engagement as shown in FIGS. 2 and 5, it is necessary to space the end surfaces 40—40 apart to provide a gap 41 therebetween. It will be understood that the gap 41 is shown at a greatly exaggerated scale and that in actual practice the width of the gap 41 is a small part of a thousandth of an inch. However, it is highly desirable that the width of the gap 41 be uniform and it is desirable to provide a construction which can be manufactured on a mass production basis.

In order to provide the gap 41 a strip of non-magnetic material 42 is employed. For example the strip 42 can be formed of aluminum foil or other similar non-magnetic material which can be manufactured with a high degree of accuracy as to its thickness. In order to facilitate handling of the non-magnetic spacer or strip 42 it initially includes an excess portion 43, FIG. 2, which is removed as a result of a subsequent finishing operation which will be described presently.

Referring now particularly to FIG. 4, it will be observed that the winding 29 is wound in the winding space 22 on the bobbin 20. This is accomplished by conventional coil winding means. The conductors 28—28 are connected to the ends of the winding 29 and then are located in the grooves one of which is indicated at 27. Next a sub-assembly is made by inserting the end portions 35—35 into the core space 23 within the bobbin 20. As shown in FIG. 4 the core members 34—34 are located on opposite sides of the bobbin 20 carrying the winding 29 and then the end portions 35—35 are inserted until the end surface 36—36 are in abutting engagement as shown in FIG. 2. As the core members 34—34 are inserted there is inserted between the end surfaces 40—40 the strip 42 of non-magnetic material such as very thin layer of aluminum foil to provide the necessary gap between the end portions 38—38. The dimensions of the core space 23 are such that the end portions 35—35 are frictionally held therein with the strip 42 of non-magnetic material in the position shown in FIG. 2. Now the sub-assembly is inserted in the support or box 12 until the bobbin 20 rests on the inner surface of the bottom wall 17. Then a spacer 46 in the form of a button of non-magnetic material is inserted between the side wall 13 and the intermediate portion 37 of the adjacent core member 34. The purpose of the spacer 46 is to center the core members 34—34 within the support or box 12 and to provide for magnetically insulating it therefrom and at the same time providing means for resisting compressive stress applied to the other core member 34 by a screw 47 of non-magnetic material that is threaded through the opposite side wall 14. The screw 47 then is tightened under carefully controlled conditions to a predetermined extent for the purpose of moving the core member 34 whose intermediate portion 37 is engaged by the distal end of the screw 47 toward the other core member 34 which reacts against spacer button 46. In doing this the core members 34—34 are placed in compression while the frame formed by the side walls 13 and 14 and end walls 15 and 16 interconnected by the bottom wall 17 is placed in tension.

The screw 47 is tightened sufficiently to cause the end surfaces 36—36 to engage over their entire surface areas while the end surfaces 40—40 have similar engagement with opposite sides of the strip 42 of non-magnetic foil. It will be understood that the strip 42 of non-magnetic foil is of such a degree of thinness that its presence does not substantially change the contact engagement between the surfaces 36—36. Moreover, there is sufficient resiliency in the core members 34—34 that the force applied by the screw 47 is sufficient to flex them to the extent necessary to cause the desired surface engagement. Also the force exerted is sufficient to flatten any irregularities that might be present in the strip of non-magnetic foil 42. Any suitable means can be employed for tightening the screw 47. For example, conventional torque measuring equipment can be provided and the screw 47 tightened to the extent that experience indicates is necessary to achieve the results above outlined but is insufficient to cause any change in the magnetic characteristics of the core members 34—34 due to the stress applied for the purposes indicated.

After the screw 47 has been tightened in the manner described, the core members 34—34 are permanently held under compression while the surrounding frame remains in tension as a result of the force transmitted through the spacer button 46 and the portion of the screw 47 extending through the side wall 14. Since the portion of the screw outside of the side wall 14 no longer is necessary, it is broken off or otherwise removed. For example, a notch 48 can be provided as shown in FIG. 1 to facilitate breaking off that portion of the screw 47 outside of the side wall 14.

It will be understood that, when the sub-assembly, above referred to, is inserted in the support or box 12, the conductors 28—28 are inserted in the tubular fitting 30 so that they extend therethrough as indicated in FIG. 1.

After the compressive force has been applied to the core members 34—34, as described the assembly is potted by filling the vacant spaces within the support or box 12 with a plastic material 49 in a liquid form that is self-setting preferably and non-shrinking. The plastic material 49 extends slightly out of the support or box 12 as shown in FIG. 5 and over the outer portions of the end portions 38—38 of the core members 34—34. Then this bottom surface is ground or otherwise machined so as to provide a smooth surface over which the magnetic tape 11 can pass in conventional manner. When this operation is performed, the excess portion 43 of the strip 42 of non-magnetic foil is removed. Thereafter the extending portion of the screw 47 can be broken off and the remaining surface ground down to the plane of the outer surface of the side wall 14, if desired.

A number of changes may be made in the foregoing embodiment of the invention. Instead of using individual screws 47, an elongated piece of screw stock, notched at suitable intervals, may be used with each segment being used for producing one transducer or magnetic head. It will be apparent that magnetic pick-up heads having two or more transducers may be made according to this invention by elongating the mounting bobbin 20 to provide space for additional sets of core members 34 and windings 29. Additional clamping screws 47 and buttons 46 would be used and the case 12 would be correspondingly elongated.

Instead of using aluminum foil for the strip 42 in the gap 41 other non-magnetic foils may be used such as foils formed of silver, gold or copper, or thin plastic films. If desired a thin layer of non-magnetic metal may be electroplated on one or both of the pole tips.

It will be appreciated that these and certain other changes may be made in the foregoing illustrative construction and embodiment without departing from the

spirit of the invention or the scope of the appended claims.

What is claimed as new is:

1. A magnetic transducer for use with a magnetic tape comprising, in combination, a relatively rigid unitary frame, a bobbin of insulating material within said frame having a core space in the plane of said frame and a surrounding winding space; a pair of generally C-shaped oppositely disposed magnetic core members with one pair of end portions extending into said core space from opposite ends and the end surfaces thereof in intimate juxtaposition, the intermediate portions extending along opposite walls of said frame, and the other pair of end portions extending outwardly of said frame and having their end surfaces in spaced relation; a strip of non-magnetic foil between the last mentioned end surfaces, a winding on said bobbin in said winding space, means spacing the intermediate portion of one of said C-shaped core members from the adjacent frame side wall; and screw means threaded into the opposite frame side wall and reacting between it and the intermediate portion of the other C-shaped core member with a predetermined force whereby said frame is tensioned, said core members are compressed and urged toward each other, said end surfaces of said one pair of end portions are held in engagement under predetermined pressure, and said end surfaces of said other pair of end portions are held in engagement with opposite sides of said strip of non-magnetic foil under predetermined pressure.

2. The invention, as set forth in claim 1, wherein the bobbin has laterally extending grooved flanges underlying the means spacing the intermediate portion of the one of

the C-shaped core members from the adjacent frame side wall and the screw means respectively, and conductors connected to the winding extend along the grooves of said flanges and through a wall of the frame.

3. The invention, as set forth in claim, wherein a tubular fitting is secured to the wall of the frame through which the conductors extend and they extend therethrough, and the fitting is externally threaded to facilitate mounting of the transducer with respect to the magnetic tape.

4. The invention, as set forth in claim 1, wherein a wall joins the frame walls and forms therewith a box having therein the bobbin, winding and core members, the latter being held under compression and the frame in tension as aforesaid, and plastic material filling the vacant spaces within said box with the outer margin of the strip of non-magnetic material and adjacent parts of the other pair of end portions exposed.

5. The invention, as set forth in claim 4, wherein the box is formed of magnetic material and acts as a shield around the contents thereof, and the means spacing the intermediate portion of the one core member and the screw means are formed of non-magnetic material.

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IRVING L. SRAGOW, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,207,856 September 21, 1965

Leo W. Page

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

Column 6, line 5, after "claim" insert -- 2 --.

Signed and sealed this 19th day of July 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents