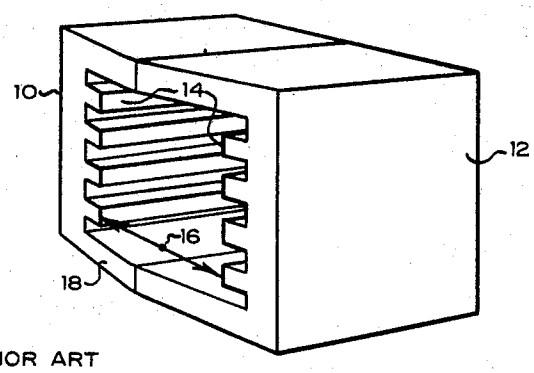
Nov. 4, 1969 W. I. GIRDNER 3,475,815

METHOD OF MAKING AN ELECTROMAGNETIC TRANSDUCER

Original Filed June 14, 1965 2 Sheets-Sheet 1



PRIOR ART

Figure 1

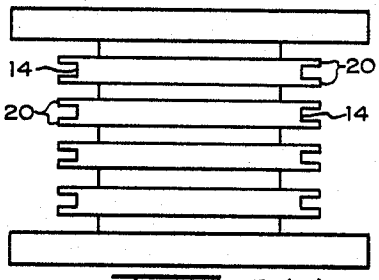


Figure 3 (a)

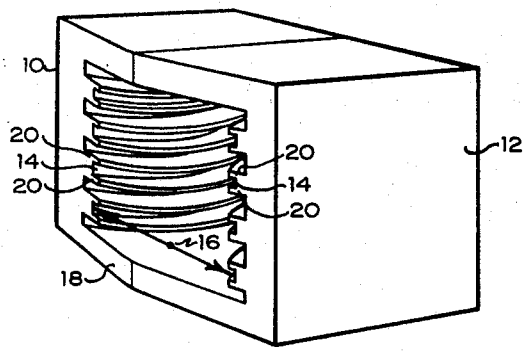


Figure 2

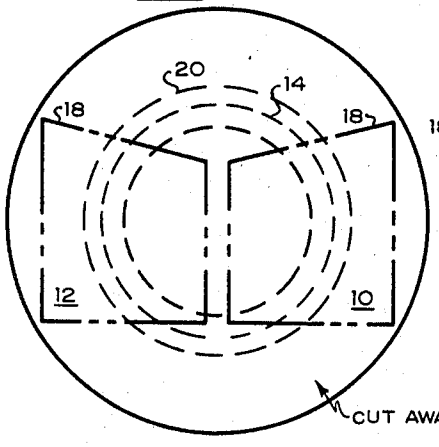


Figure 3(b)

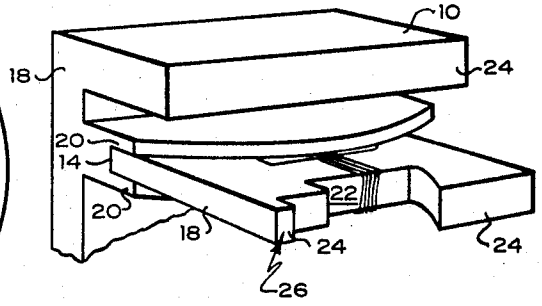


Figure 3(c)

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METHOD OF MAKING AN ELECTROMAGNETIC TRANSDUCER

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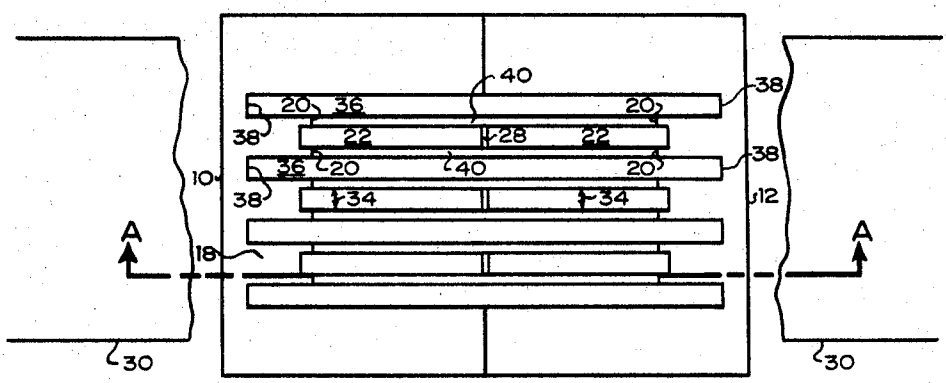


Figure 4(a)

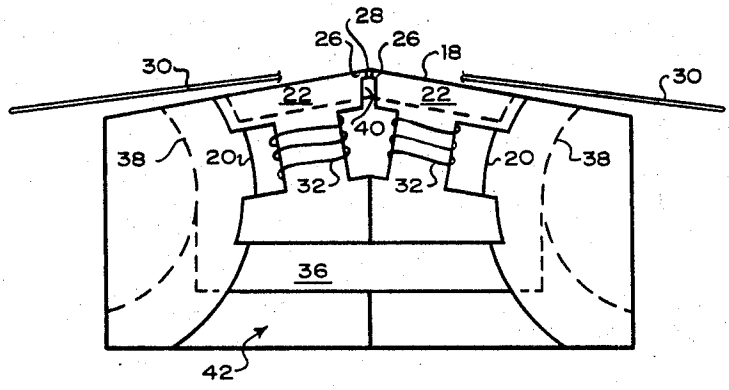


Figure 4(b)

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METHOD OF MAKING AN ELECTROMAGNETIC TRANSDUCER

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Original application June 14, 1965, Ser. No. 463,496, now Patent No. 3,404,242, dated Oct. 1, 1968. Divided and this application May 13, 1968, Ser. No. 728,435
Int. Cl. H01f 7/06; G11b 5/42
U.S. Cl. 29—603 11 Claims

ABSTRACT OF THE DISCLOSURE

A generally-spool-shaped member is formed from a body of nonmagnetic material. Circular shoulders are formed around the central portion of this spool-shaped member. A pair of matching bracket-shaped side frames are then formed from portions of the spool-shaped member on opposite sides of a plane containing its longitudinal axis. These matching side frames are joined together to provide a pair of spaced, oppositely facing, convexly arcuate inner surfaces having pairs of spaced, oppositely facing, transversely aligned shoulders. An electromagnetic transducer is fixedly engaged between each of these pairs of shoulders, and a shielding element is fixedly positioned on each side of each transducer between the oppositely facing, convexly arcuate inner surfaces of the side frames.

CROSS-REFERENCE TO RELATED APPLICATION

This is a divisional application of patent application, Ser. No. 463,496 entitled Magnetic Element and Method for Making the Same and filed June 14, 1965 by William I. Girdner.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to magnetic transducer heads and methods for making the same.

The principal object of this invention is to provide an improved magnetic transducer head and an inexpensive method for making the same.

Other and incidental objects of this invention will become apparent from a reading of this specification and an inspection of the accompanying drawing in which:

FIGURE 1 shows the side frame of a magnetic transducer head of the prior art;

FIGURE 2 shows the side frame of a magnetic transducer head in accordance with this invention;

FIGURE 3 shows the method of making a magnetic transducer head in accordance with this invention; and

FIGURE 4 shows a completed magnetic transducer head made in accordance with the method of FIGURE 3.

Referring to FIGURE 1, there is shown the side frame of a conventional magnetic transducer head comprising two generally bracket-shaped matching halves **10** and **12** which are fastened together face-to-face. Each half is made of a nonmagnetic material such as aluminum. The flat vertical inner surface of each half is interrupted by a plurality of rectilinear shoulders **14** for supporting the magnetic elements (not shown) of the transducer head. It is important that the distance **16** between opposite shoulders **14** be as large as possible at the contact surface **18** of the side frame. This distance **16** is limited by the requirement of a small side frame that is structurally rigid. For each half the shoulder pattern must be held to very close tolerances dimensionally and should be, insofar as possible, the mirror image of the shoulder pattern of the other half. Typically, the shoulders **14** are formed individually by a precision milling operation which is very costly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGURE 2, there is shown the side frame of a magnetic transducer head according to one embodiment of this invention comprising two generally bracket-shaped matching halves **10** and **12** of nonmagnetic material. These halves **10** and **12** have oppositely sloping front surfaces rounded to an appropriate radius at the apex thereof to provide the side frame with a generally convex contact surface **18**. Each half has an arcuate vertical inner surface interrupted by a plurality of arcuate shoulders **14**. The arcuate vertical inner surface of each half makes it possible to increase the distance **16** between opposite arcuate shoulders **14** at the contact surface **18** of the side frame without loss of structural rigidity because of the increased nonmagnetic material towards the center of each half. The shoulders **14** may be provided with a flat surface or with lips **20** as shown in the drawing to more rigidly support the magnetic elements of the transducer head. In either case the shoulder pattern of each half is formed by a method described below so as to be dimensionally stable and precise and substantially the mirror image of the shoulder pattern of the other half.

According to this invention, the magnetic transducer head may be made by the method indicated in FIGURE 3. In making the side frame a shaft of the desired nonmagnetic material is rigidly mounted for rotation about its longitudinal axis and is cut during such rotation to form the spool-shaped member shown in the elevational view of FIGURE 3(*a*). The plurality of circular shoulders **14** each having a pair of circular lips **20** is also formed during rotation of the shaft, for example, with a multi-element cutter adjusted to give the desired shoulder pattern. This operation may be simply performed with the required precision by a conventional screw machine. The spool-shaped member is next cut in half and machined to form the appropriately shaped halves **10** and **12** of the side frame as indicated in FIGURE 3(*b*) which is a top view of the spool-shaped member of FIGURE 3(*a*).

This method of making the side frame for the magnetic transducer head is more simple and substantially less expensive than the conventional method of precision milling the individual shoulders for each half of the side frame. Moreover, the reduction in cost is obtained without any sacrifice in dimensional precision, identity of the matched halves, and structural rigidity. In fact, there may be significant improvement in the first two of these features due to the concentricity maintained during simultaneous formation of the two halves and in the last feature due to the arcuate vertical inner surface of each half.

The transducer head is completed by rigidly positioning an electromagnetic element **22** between the lips **20** of each shoulder **14** of the matching halves of the side frame as indicated in FIGURE 3(*c*). These matching assemblies are then lapped to provide each with a smooth mating face **24**. The lapped pole tip **26** of each electromagnetic element is next coated with a nonmagnetic material, and the matching assemblies are joined together at the mating faces **24** thereof. Shielding elements **36** and **40** (shown in FIGURE 4) are then firmly positioned on either side of each electromagnetic element **22**. Finally, the contact surface **18** of the completed magnetic transducer head is provided with a smooth finish.

Referring to FIGURES 4(*a*) and (*b*) there is shown a front elevational view and a sectional view respectively of a completed magnetic transducer head. Two matching electromagnetic elements **22** are firmly positioned between the lips **20** of opposite shoulders of the matching halves **10** and **12**. These electromagnetic elements **22** are generally I-shaped and are made of a transformer iron core material. The pole tips **26** of the matching electromagnetic elements define a narrow gap **28** (shown greatly

exaggerated in the drawing) which is filled with a nonmagnetic material. If the magnetic transducer head is operated as a recording head, the input signals to be recorded are fed to one or more coils **32** wound around the electromagnetic elements **22** as the record medium **30** is moved past this narrow gap **28**. If it is operated as a playback head, the movement of the record medium **30** past the gap **28** causes output signals to be generated in the coils **32** wound on the electromagnetic elements. Shielding plates **36** made of a mixture of magnetic and nonmagnetic materials are firmly positioned between the opposite surfaces **38** to prevent cross-talk between the signals associated with each electromagnetic element **22**. Additional shielding strips **40** are firmly positioned at the contact surface **18** in the space between the opposite lips **20**. These shielding strips **40** and the corresponding lips **20** are made sufficiently thick to provide clearance between the coils **32** and the adjacent shielding plates **36** so as to permit the leads from the coils to be brought out the back side **42** of the magnetic transducer head.

I claim:

1. A method for making a transducer head, said method comprising the steps of:

forming a pair of matching, generally bracket-shaped side frame sections each having a convexly arcuate inner surface;

joining these side frame sections together in face-to-face relationship with their convexly arcuate inner surfaces in spaced, oppositely facing, transverse alignment; and

mounting a transducer between the oppositely facing, convexly arcuate, inner surfaces of the side frame sections.

2. A method as in claim **1** wherein said forming step comprises:

forming a generally spool-shaped body having a pair of generally circular end portions and a generally circular intermediate portion of smaller diameter than the end portions; and

forming the side frame sections from portions of this spool-shaped body on opposite sides of a plane of symmetry containing the longitudinal axis of the spool-shaped body, whereby the convexly arcuate inner surface of each side frame section comprises part of the periphery of the intermediate portion of the spool-shaped body.

3. A method as in claim **2** wherein said joining step comprises:

transposing the side frame sections with respect to the positions they occupied while part of the spool-shaped body; and

joining the transposed side frame sections together at a plane of symmetry with their convexly arcuate inner surfaces in spaced, oppositely facing, transverse alignment.

4. A method as in claim **1** wherein:

said forming step includes forming at least one convexly arcuate shoulder on the convexly arcuate inner surface of each side frame section; and

said joining step comprises joining the side frame sections together at a plane of symmetry with their convexly arcuate shoulders in spaced, oppositely facing, transverse alignment.

5. A method as in claim **4** wherein said forming step comprises:

forming a generally spool-shaped body having a pair of generally circular end portions and a generally circular intermediate portion of smaller diameter than the end portions;

forming at least one generally circular shoulder on the periphery of the intermediate portion of the spool-shaped body; and

forming the side frame sections from portions of the spool-shaped body on opposite sides of a plane of symmetry containing the longitudinal axis of the spool-shaped body, whereby the convexly arcuate shoulder of each side frame section comprises part of the shoulder on the periphery of the intermediate portion of the spool-shaped body.

6. A method as in claim **5** wherein:

said forming step further comprises severing the spool-shaped body along the plane of symmetry containing its longitudinal axis and forming the side frame sections from the severed portions of the spool-shaped body; and

said joining step comprises transposing the side frame sections with respect to the positions they occupied while part of the spool-shaped body and joining the transposed side frame sections together with their convexly arcuate shoulders in spaced, oppositely facing, transverse alignment.

7. A method as in claim **6** wherein:

said mounting step comprises mounting a transducer element on the convexly arcuate shoulder of each side frame section before said joining step; and

including the additional step of lapping faces of the side frame sections and faces of the transducer elements to be mated in a plane of symmetry during the joining step.

8. A method as in claim **7** wherein:

said joining step further comprises joining the lapped faces of the side frame sections together at a plane of symmetry; and

said mounting step comprises joining the lapped faces of the transducer elements together between the spaced, oppositely facing, convexly arcuate shoulders and in the same plane of symmetry as the lapped faces of the side frame sections.

9. A method as in claim **1** wherein:

said forming step includes forming a plurality of convexly arcuate shoulders on the convexly arcuate inner surface of each side frame section; and

said joining step comprises joining the side frame sections together at a plane of symmetry with their convexly arcuate shoulders in spaced, oppositely facing, transverse alignment.

10. A method as in claim **9** wherein said forming step comprises:

forming a generally spool-shaped body having a pair of generally circular end portions and a generally circular intermediate portion of smaller diameter than the end portions;

forming a plurality of generally circular shoulders on the periphery of the intermediate portion of the spool-shaped body; and

forming the side frame sections from portions of the spool-shaped body on opposite sides of a plane of symmetry containing the longitudinal axis of the spool-shaped body, whereby the convexly arcuate shoulders of each side frame section comprise parts of the shoulders on the periphery of the intermediate portion of the spool-shaped body.

11. A method as in claim **10** wherein said joining step comprises:

transposing the side frame sections with respect to the positions they occupied while part of the spool-shaped body; and

joining the transposed side frame sections together with their convexly arcuate shoulders in spaced, oppositely facing, transverse alignment.

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C. E. HALL, Assistant Examiner

U.S. Cl. X.R.

29—463, 592