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2,522,530

ELECTROACOUSTIC TRANSDUCER

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FIG. 1

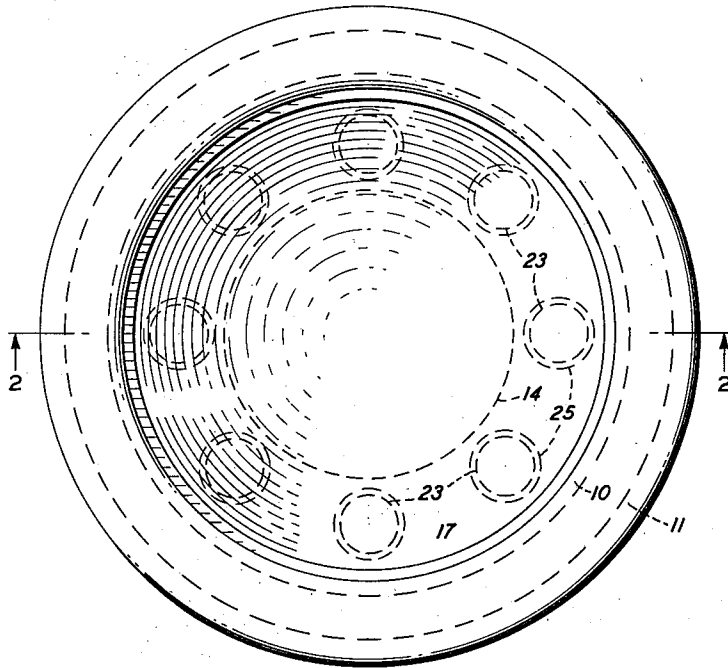
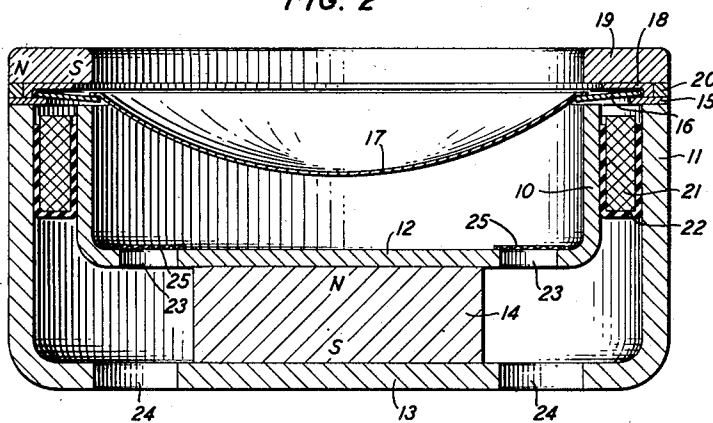


FIG. 2



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2,522,530

ELECTROACOUSTIC TRANSDUCER

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Application October 19, 1946, Serial No. 704,377

2 Claims. (Cl. 179-120)

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This invention relates to electroacoustic transducers and more particularly to magnetic structures especially suitable for ring armature type transducers, such as disclosed in patent 2,249,160, granted July 15, 1941 to Edward E. Mott.

Ring armature type transducers comprise, in general, a magnetic system including coaxial, inner and outer cylindrical pole members, an annular armature supported at or adjacent its periphery upon the outer pole member and having its inner marginal portion in juxtaposition to and defining an air gap with the inner pole member, and a diaphragm coupled to the armature. The magnetic system includes a permanent magnet which, in order to provide a high polarizing flux, advantageously is of a high remanence alloy such as "Alnico." Magnets of such an alloy are extremely hard and difficult to work.

The performance of such transducers is dependent to a large extent upon the air gap noted. Efficient operation requires that the length of this gap be small. Satisfaction of specified operating requirements entails accurate determination of the length of this gap. Also, attainment of similar performance characteristics for similar transducers requires that the air gaps in the several devices be of essentially the same length.

In constructions wherein a dimension of the magnet is an important parameter in the determination of the air gap between the armature and the inner pole member, working of the magnet, for example grinding of one face thereof, may be necessary. Such working, particularly if grinding to close tolerances is necessary, because of the character of the magnet material, is difficult and relatively expensive.

One general object of this invention is to simplify the construction of magnetic systems for electroacoustic transducers and thereby to facilitate the manufacture thereof in quantity and at relatively low cost.

More specifically, objects of this invention are to expedite the assembly of magnetic systems for electroacoustic transducers of the ring armature type and to enable the ready and economic determination of a prescribed air gap of accurate length in such devices.

In accordance with one feature of this invention, the magnetic structure of a ring armature transducer is constituted in part by a pair of cup shaped pole pieces mounted one within the other and a magnet disposed between the pole pieces and in contact therewith. The pole pieces are formed of a relatively easily workable material, for example an iron-nickel alloy known as "Per-

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malloy," and the rims or edges thereof are ground so that they are accurately coplanar, whereby the edge of the outer pole piece provides a reference surface for determining the normal length of the air gap between the armature and the inner pole piece. Thus, this air gap may be fixed accurately and readily without working of the magnet. Further, the magnet may be of simple form, for example a rectangular or circular block, easily cast and, hence, of relatively low cost.

The invention and the above noted and other features thereof will be understood more clearly and fully from the following detailed description with reference to the accompanying drawing in which:

Fig. 1 is a plan view of a ring armature type electroacoustic transducer illustrative of one embodiment of this invention; and

Fig. 2 is a sectional view of the transducer taken along plane 2-2 of Fig. 1.

Referring now to the drawing, the transducer therein illustrated, which may be utilized for either translation of sound into electrical signals or vice versa, comprises a pair of cup shaped pole pieces, for example of "Permalloy," mounted one within the other. The pole pieces comprise coaxial cylindrical portions 10 and 11 respectively and parallel base portions 12 and 13 respectively.

Disposed between the base portions 12 and 13 and secured thereto, as by soldering, is a block magnet 14, for example of "Alnico." The magnet may be circular as illustrated or of other form, e. g. rectangular, and is magnetized in the direction of its thickness, as indicated in Fig. 2, so that the two pole pieces are of opposite polarity.

In the fabrication of the device, after the pole pieces and magnet are assembled, the edges of the pole pieces, i. e., the upper faces or ends of the cylindrical portions 10 and 11 in Fig. 2, are ground simultaneously so that they are accurately coplanar.

Seated upon the outer cylindrical portion 11 is an annular magnetic spacer 15 of "Permalloy" for example, upon which the peripheral portion of an annular armature 16, coaxial with the pole pieces and for example of "Permalloy" rests. As shown clearly in Fig. 2, the inner marginal portion of the armature overlies the end face of the cylindrical portion 10 of the inner pole piece. The normal length of the air gap between the armature and the end face noted is fixed, as is apparent, by the thickness of the spacer 15.

The armature carries a dished non-magnetic

diaphragm 17 the periphery of which is secured to the armature as by a suitable cement.

A non-magnetic spacer 18 is seated upon the spacer 15, extends over the armature 16 and has seated thereon an annular, radially magnetized magnet 19. The magnet extends laterally over the pole piece portions 10 and 11 and, as indicated in Fig. 2, is so magnetized that each of its poles is of polarity opposite that of the pole piece face in juxtaposition thereto. Advantageously, the auxiliary magnet is of less strength than the main magnet whereby a partial unbalance in the magnetic circuit obtains at the armature.

Disposed between the spacer 15 and auxiliary magnet 19 is a magnetic annulus 20, which provides a low reluctance path between the pole piece portion 11 and the auxiliary magnet.

An annular signal coil 21 partly encased in an insulating jacket 22 is mounted between the cylindrical pole piece portions 10 and 11.

The base portions 12 and 13 of the pole pieces may be provided with a plurality of apertures 23 and 24 respectively, the former having thereover sheets 25 of acoustic resistance material, to provide in combination with the chamber between the diaphragm 17 and inner pole piece an acoustic network of mass, stiffness and resistance for controlling vibration of the diaphragm, specifically to damp the response peak due to the diaphragm resonance and to enhance the response at other frequencies.

Reference is made of the application Serial No. 704,483 filed October 19, 1946, of Edward E. Mott wherein certain features of the construction herein described are disclosed and claimed.

Although a specific embodiment of this invention has been shown and described, it will be understood that it is but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined in the appended claims.

What is claimed is:

1. An electroacoustic transducer comprising a first pole piece having a base and a cylindrical portion, a magnet seated upon said base and within said pole piece, a second pole piece within said first pole piece and having a base seated

upon said magnet and a cylindrical portion coaxial with and spaced from said first cylindrical portion, said magnet magnetizing said first and second pole pieces to opposite polarity, said cylindrical portions having coplanar pole faces, a spacer member seated upon the pole face of the cylindrical portion of said first pole piece, an annular armature coaxial with said pole pieces, seated adjacent its periphery upon said spacer member and extending therefrom over the pole face of the cylindrical portion of said second pole piece, and a diaphragm member coupled to said armature.

2. An electroacoustic transducer comprising a one piece, inner cup shaped pole piece having a base and a flat circular pole face, a dished diaphragm projecting into said pole piece and having its periphery in juxtaposition to said pole face, an outer one piece cup shaped pole piece having its base opposite the base of said inner pole piece and having also a flat circular pole face coaxial and coplanar with said pole face of said inner pole piece, a thin magnetic washer seated upon said pole face of said outer pole piece, a flat circular magnetic armature coaxial with said pole faces, seated adjacent its outer margin upon said washer and having its inner marginal part joined to the periphery of said diaphragm, and a block magnet between and joined to the bases of said inner and outer pole pieces.

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