

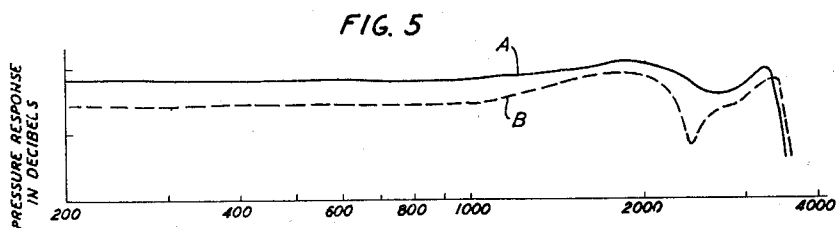
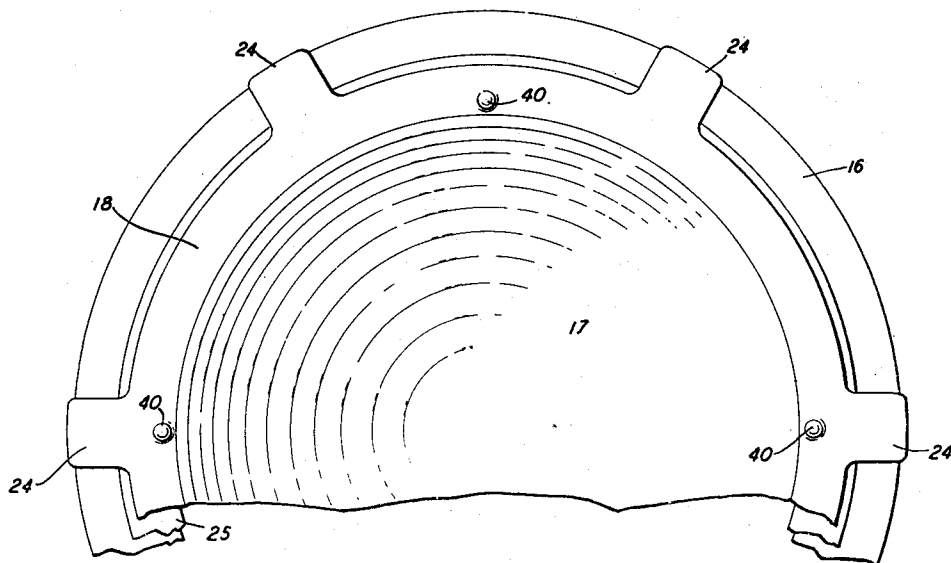
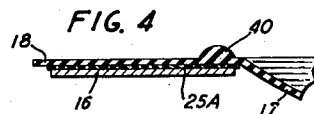
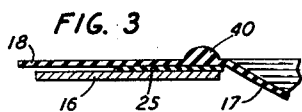
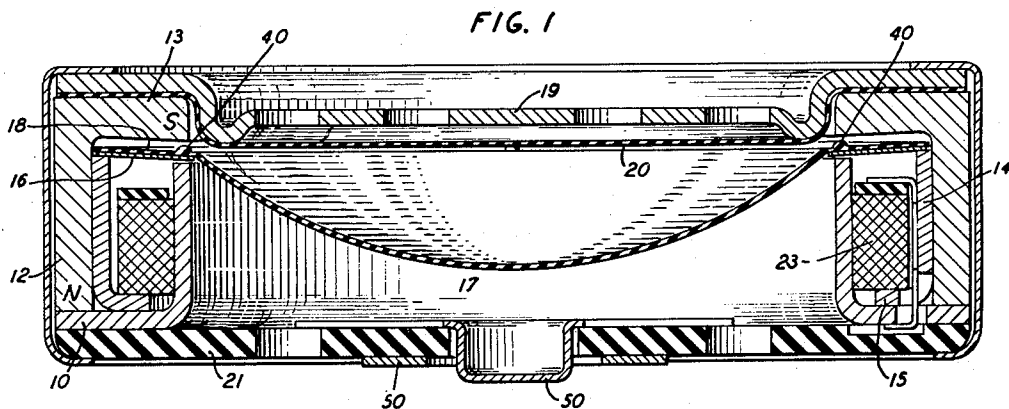
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ELECTROACOUSTIC TRANSDUCER

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ELECTROACOUSTIC TRANSDUCER

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This invention relates to electroacoustic transducers and more particularly to such devices of the ring armature type.

In ring armature type transducers, such as disclosed in Patent 2,249,160, granted July 15, 1941 to Edward E. Mott and the application Serial No. 755,397, filed June 18, 1947, now Patent No. 2,506,624, granted May 9, 1950, of Robert E. Wirsching, the vibratory element comprises a non-magnetic diaphragm joined at its periphery to the inner marginal part of an annular or ring armature which is supported adjacent its outer margin or periphery. Advantageously, in order that the restraint upon vibration of the element may be substantially a minimum, the armature is unclamped. In general, it is seated upon a support, for example, upon a part of the magnetic structure, and has its periphery adjacent and slightly spaced from a surrounding element which serves to prevent undue lateral displacement of the armature.

It has been found that in use of the transducer, for example as included in a telephone handset, lateral displacement of the armature-diaphragm unit may occur as a result of jars or mechanical shocks to which the transducer is subjected. As a consequence of such displacement, the armature contacts and may remain in edge contact with the surrounding element. This introduces frictional forces which produce a degradation of the performance of the device, specifically a decrease in efficiency and distortion of the frequency response characteristic.

One object of this invention is to prevent such degradation in performance.

More specifically, an object of this invention is to maintain the diaphragm-armature element at or substantially at its optimum position without imposing substantial additional restraint upon vibration of this element.

In accordance with one feature of this invention, in a ring armature transducer of the general construction described hereinabove, means are provided for minimizing or substantially preventing lateral displacement of the armature, the means being constructed and arranged to maintain the desired optimum position of the armature-diaphragm element without substantially affecting the vibratory characteristics of this element.

In one illustrative embodiment of this invention, the armature-diaphragm element is provided with thin, lightweight projections extending outwardly beyond the periphery of the armature into proximity to or in light contact with

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the element surrounding the armature. These projections, in one advantageous construction, may be narrow radially extending fingers integral with the diaphragm and widely spaced so that the mechanical restraint to armature-diaphragm vibration introduced by contact of the fingers with the surrounding element is negligible from a practical standpoint. These fingers may be affixed to the armature or free to flex independent thereof.

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 side sectional view of a telephone receiver illustrative of one embodiment of this invention;

Fig. 2 is a partial plan view of the armature-diaphragm element included in the receiver shown in Fig. 1;

Fig. 3 is an enlarged fragmentary view in section showing details of the armature-diaphragm element;

Fig. 4 is a view similar to Fig. 3 illustrating another embodiment of this invention; and

Fig. 5 is a graph illustrating certain substantive features of transducers constructed in accordance with this invention.

Referring now to the drawing, the nature of the degradation in performance of ring armature transducers which may result from lateral displacement of the armature therein is illustrated in Fig. 5. In this figure, curve A represents the response of a ring armature receiver wherein the periphery of the armature was spaced from the surrounding element and curve B represents the response of the same receiver when the diaphragm-armature unit therein had become displaced laterally so that a portion of the periphery of the armature was in contact with the surrounding element. It is evident that as a result of the contact between the armature and the surrounding member not only is the amplitude of the response decreased, several decibels in typical cases, over a wide range of frequencies, but also substantial non-uniformity or distortion is introduced at the higher frequencies, for example, particularly in the range between about 1500 and 2800 cycles per second.

In accordance with this invention, such degradation of performance is substantially prevented.

The telephone receiver, illustrative of one embodiment of this invention, shown in Fig. 1 includes a magnetic system comprising a pole-piece

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having an annular base or flange 10 and a cylindrical pole tip portion 11, the pole-piece being of a material having a high magnetic permeability. Associated with the pole-piece 10, 11 is an annular permanent magnet having a cylindrical portion 12 coaxial with the pole tip portion 11 and seated on the base 10, and an integral annular flange 13, the inner marginal part of which is opposite and coaxial with the tip of the pole-piece portion 11.

An annular non-magnetic support, for example of metal or plastic, comprises a cylindrical portion 14 fitted within the magnet portion 12 and an integral annular flange 15 seated upon and affixed to the base flange 10 of the pole-piece. Seated upon the support 14 and fitted freely within the cylindrical portion 12 of the magnet is an annular armature 16, of a material having a high magnetic permeability, which has its inner marginal portion coaxial with and in juxtaposition to the face of the pole tip portion 11. The armature is held in position upon the support by magnetic forces.

The armature 16 mounts a lightweight non-magnetic diaphragm, for example of a fabric impregnated with a phenolic condensation product, having a dished central portion 17 and an integral flange portion 18 which is formed with spaced protuberances 40 to prevent sticking of the armature to the magnet flange 13.

A centrally dished and apertured grid-ferrule 19 clamps a dust and moisture excluding membrane 20 against the flange 13, and also serves as a clamping band to hold firmly together the several parts of the structure in pile-up relation, specifically the magnet, pole-piece, and the insulating terminal plate 21. The ends of a cylindrical signal coil 23 are connected to terminals 50 which are mounted on the terminal plate.

In the construction of the sub-assembly of the pole-piece 10, 11 and the support 14, 15 the tip face of the pole-piece portion 11 is machined underflush with the plane defined by the free end of the support 14, so that a prescribed normal air gap is provided between the armature 16 and the pole tip face when the armature is seated upon the support 14.

As shown clearly in Fig. 2, the flange 18 is provided with a plurality of equal spaced projections or tabs 24 which extend radially outward beyond the periphery of the armature 16. These projections or tabs may terminate slightly short of the inner wall of the cylindrical magnet portion 12 or may make light contact with this portion. In either case, it will be appreciated that the tabs serve to position the armature laterally and to prevent contact between the armature and the magnet portion 12. The tabs are of thin flexible material and it is evident that the area of the contacts between the outer ends thereof and the magnet is small. Hence, the forces effective upon the diaphragm-armature vibration due to contact between tabs and magnet is very small and negligible for practical purposes. Thus, during use of the receiver and even if it is subjected to shocks and jars, the armature is maintained in proper position relative to the magnet and pole-piece, and this is realized without the imposition of substantial restraint upon vibration of the armature-diaphragm assembly or unit. Consequently, degradation of the performance of the receiver by mechanical shocks and jars is prevented.

The projections or tabs 24 may be free of the armature or may be affixed thereto throughout

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the major portion of their lengths. In the former case, as illustrated in Fig. 3, the flange 18 of the diaphragm is affixed to the armature by a thin layer or washer 25 of cementing material. In the latter case, illustrated in Fig. 4, the flange 18 and the tabs 24, except for the extreme outer portions thereof, are affixed to the armature by a layer or washer of cement 26A.

Although specific embodiments of the invention have been shown and described, it will be understood that they are 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 magnetic system including an annular armature, a support mounting said armature adjacent one of its margins, a retaining member adjacent and spaced from the other margin of said armature, said armature being held upon said support by magnetic forces, and means for preventing contact between said armature and said retaining member comprising spaced members coupled to said armature and projecting beyond said other margin toward said retaining member.

2. An electroacoustic transducer comprising a magnetic system including an annular magnetic armature, a support adjacent the periphery of said armature, said armature being seated upon said support and held thereon by magnetic forces, a fixed member disposed about said periphery and spaced therefrom, and means for preventing contact between said armature and said fixed member comprising laterally spaced flexible members connected to said armature and projecting outwardly beyond said periphery.

3. An electroacoustic transducer in accordance with claim 2 wherein said flexible members overlie and are spaced from one face of said armature.

4. An electroacoustic transducer comprising a support having a seating surface, a fixed member adjacent and disposed about the periphery of said surface, a diaphragm armature unit including an armature seated on said surface and having its periphery adjacent and spaced from said fixed member, and laterally spaced projections on said unit and engaging said fixed member.

5. An electroacoustic transducer in accordance with claim 4 wherein said unit includes a non-magnetic diaphragm and said projections extend from said diaphragm over one face of said armature.

6. An electroacoustic transducer comprising a support having a seating surface, a magnetic system including an annular armature seated upon said surface, a retaining member disposed about the periphery of said armature and spaced therefrom, a diaphragm mounted by said armature, and means for preventing contact between said armature and said retaining member comprising fingers projecting from said diaphragm adjacent one face of said armature and beyond the periphery of said armature.

7. An electroacoustic transducer comprising a support having a seating surface, a retaining member encompassing said support, and a vibratory element comprising an annular armature and a non-magnetic diaphragm affixed to the inner marginal part of said armature, said armature being seated, adjacent its outer margin, upon said surface and having its outer margin spaced from said retaining member, said diaphragm having portions projecting outwardly beyond said outer margin of said armature.

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8. An electroacoustic transducer comprising a support having a seating surface, a retaining member encompassing said support, a vibratory element comprising an annular armature and a non-magnetic diaphragm affixed to the inner marginal part of said armature, said armature being seated, adjacent its outer margin, upon said surface and having its outer margin spaced from said retaining member, and means for preventing contact between said armature and said retaining member comprising extensions of said diaphragm spaced circumferentially over and adjacent one face of said armature and projecting beyond said outer margin thereof.

9. An electroacoustic transducer in accordance with claim 8 wherein said extensions are narrow flexible fingers which are spaced from said one face of said armature.

10. An electroacoustic transducer in accordance with claim 8 wherein said extensions are narrow, flexible fingers secured to said armature.

11. An electroacoustic transducer comprising a magnetic system including a cylindrical pole-piece, a magnet having a cylindrical portion spaced from, encompassing and coaxial with said pole-piece and an annular magnetic armature having its inner margin adjacent said pole-piece and its periphery in juxtaposition to but spaced from said cylindrical magnet portion, means mounting said armature adjacent its periphery, said armature being held upon said mounting means by magnetic forces, and a non-magnetic diaphragm having a central portion the marginal part of which is affixed to said armature adjacent the inner margin thereof, said diaphragm

having integral flexible fingers extending adjacent one face of said armature and beyond the periphery of said armature.

12. An electroacoustic transducer comprising a support, a vibratile member including an annular armature, a magnetic system including said armature, said armature being seated upon said support, held thereon by magnetic forces and laterally displaceable upon said support, a retainer member encompassing said armature and normally spaced a preassigned distance from the periphery thereof, and means including cooperating portions of said vibratile and retainer members for limiting displacement of said armature toward said retainer member to an extent less than said preassigned distance.

13. An electroacoustic transducer in accordance with claim 12 wherein said portions of one of said members are fingers on said one member, extending toward the other of said members.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
1,220,669	Miller	Mar. 27, 1917
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Number	Country	Date
250,719	Great Britain	Apr. 22, 1926