

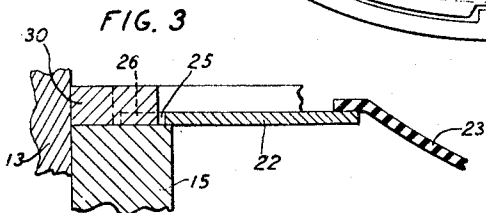
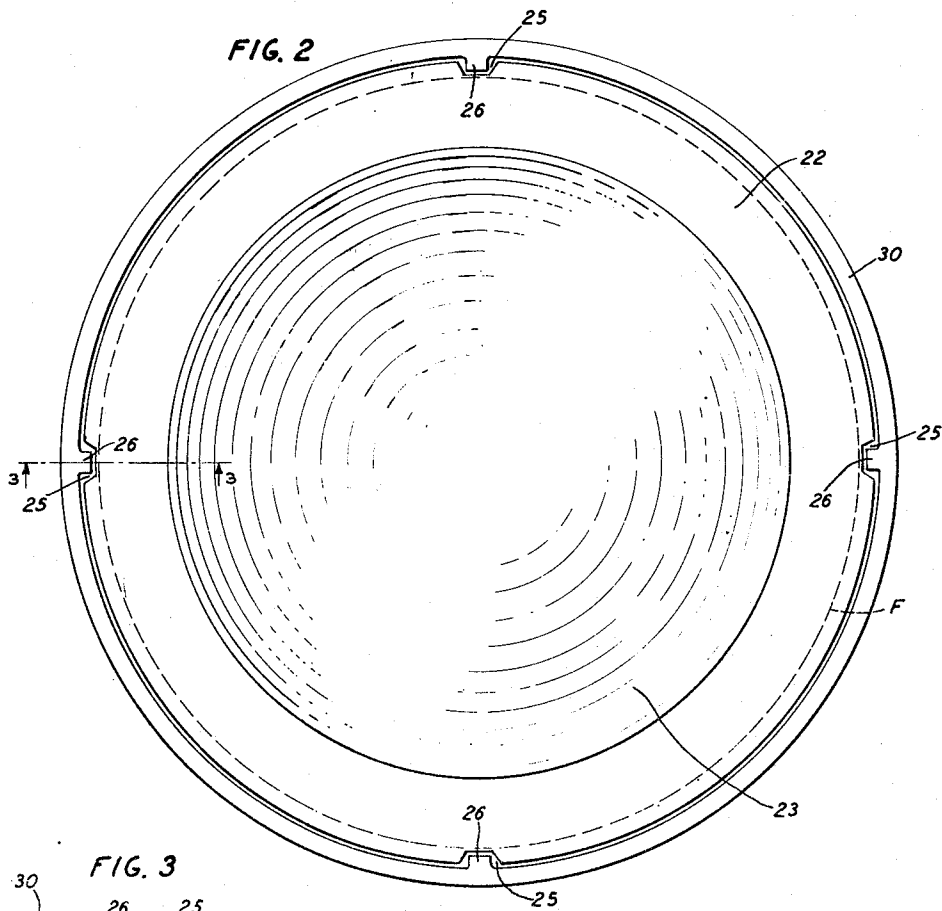
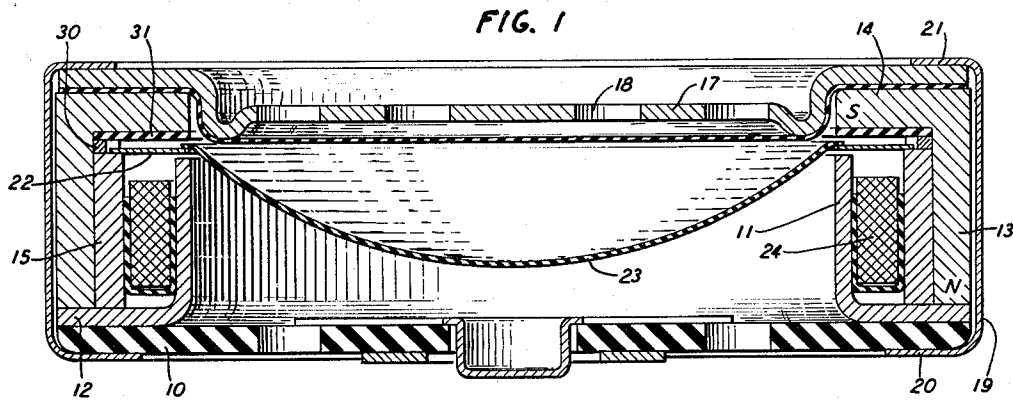
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ELECTROACOUSTIC TRANSDUCER

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ELECTROACOUSTIC TRANSDUCER

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9 Claims. (Cl. 179—115)

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This invention relates to electroacoustic transducers and more particularly to ring armature type telephone receivers.

In ring armature telephone receivers, such as disclosed, for example, in the application Serial No. 704,483, filed October 19, 1946, of Edward E. Mott, the vibratory member or element comprises an annular armature and a diaphragm joined to the armature. The latter is seated adjacent its periphery or outer margin upon a support and is held in position by magnetic forces so that the restraint upon vibration thereof is minimized. To prevent large amplitude transverse displacement of the armature-diaphragm element, the armature is encompassed by a retaining member having its inner annular wall spaced slightly from the periphery of the armature.

In use, the receiver may be subjected to jars or mechanical shocks such as to cause transverse displacement of the armature-diaphragm element. As a result of such displacement, the armature may be in such position that it is partly in edge contact with the adjacent wall of the retaining member. The consequent frictional forces brought into play by such contact deleteriously affect both the efficiency and frequency response characteristic of the receiver.

One object of this invention is to prevent degradation of the performance of ring armature receivers as a result of transverse displacement of the armature-diaphragm element therein.

In accordance with one feature of this invention, in a ring armature type transducer of the general construction described hereinabove, the armature and the surrounding member are provided with cooperating slots and projections constructed and arranged so that contact between the armature and member because of lateral displacement of the armature is confined to restricted areas, whereby the frictional forces resulting from contact between the armature and retaining member are reduced.

In accordance with another feature of this invention, the aforementioned slots and projections are associated so that the points of contact between the armature and the retaining member are immediately adjacent the line of support for the armature. At this line the amplitude of armature vibration is small so that the restraint upon armature vibration introduced by contact of the armature and retaining member is minimized.

The invention and the above noted and other features thereof will be understood more clearly

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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 plan view of the ring armature and retaining member included in the receiver shown in Fig. 1, the line of support for the armature being indicated; and

Fig. 3 is a fragmentary sectional view, taken along line 3—3 of Fig. 2 and to an enlarged scale, showing details of the armature and the retaining member.

Referring now to the drawing, the telephone receiver therein illustrated comprises an insulating base or foundation member 10, a pole-piece having a cylindrical portion 11 and an annular flange 12 which is seated upon the base 10, and a permanent magnet having a cylindrical portion 13 seated upon the flange 12 and coaxial with the pole-piece portion 11. The magnet has also an annular flange 14, the inner margin of which is coaxial with and opposite the tip of the pole-piece portion 11. The relative polarities of the ends of the magnet are as indicated in Fig. 1. Also seated upon the flange 12 and fitted within the magnet part 13 is a support 15, for example of non-magnetic material, the free end of which is slightly above the plane of the pole tip by a preassigned amount to determine the normal gap between the pole tip and the armature.

The magnet, pole-piece, foundation member and spacer, together with a multi-apertured cover 17 and moisture-proof membrane 18 and other elements described hereinafter are securely clamped in pile up and coaxial relation by a cylindrical metallic band 19 the ends 20 and 21 of which are bent over and bear against the foundation member and cover respectively.

An armature-diaphragm unit comprising an annular magnetic armature 22 and a dished non-magnetic diaphragm 23 is supported by the support 15 and encompassed by a retainer ring 30.

In response to signal currents supplied to the cylindrical coil 24 between the pole-piece and magnet, the armature vibrates and actuates the diaphragm, the inner edge of the upper face of the support 15 defining a line or fulcrum, indicated at F in Fig. 2, about which the armature rocks. Of course, the action is reversible, that is the diaphragm may be actuated by sound waves to drive the armature, thereby to induce signals corresponding to the sound waves in the coil 24.

Sticking of the armature to the magnet flange

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14 is prevented by a non-magnetic, e. g. insulating, washer or ring 31.

It is advantageous that the restraint upon vibration of the armature-diaphragm member be very small. To this end, the armature is held in place by magnetic attraction. As shown in Fig. 2, the outer diameter of the armature is made smaller than the inner diameter of the retainer 30. The difference in these diameters may be, for example, of the order of 0.016 inch. It will be apparent that if, as in prior constructions, the armature were displaced laterally, as a result of shocks or jars during use, edge contact between the armature and retainer 30 over a substantial arc of the periphery of the armature could obtain. Such contact introduces frictional forces which tend to impede vibration of the armature and, further, cause unbalanced or unsymmetrical vibration of the armature-diaphragm member. As a result, not only is the translating efficiency of the transducer reduced but also the frequency response characteristic of the device is altered objectionably.

In accordance with one feature of this invention, such degradation of the efficiency and response characteristic is prevented. As shown in Fig. 2, the armature is provided in its peripheral part with slots 25, for example four spaced 90 degrees from one another, the base of each slot being in immediate proximity to the line or fulcrum, indicated by the broken line F in Fig. 2, about which the armature rocks. The retainer 30 is provided with projections or keys 26 each of which extends into a respective slot 25 and normally terminates short of the base thereof. For example, the clearance between the inner end of each key 26 and the base of the respective slot 25 when the armature is in exact coaxial relation with the retainer may be of the order of 0.003 inch. The clearance between each side of a key and the juxtaposed side of the respective slot advantageously is somewhat greater, for example of the order of 0.01 inch.

If the armature is displaced laterally, it will be noted that contact thereof with the retainer 30 can occur only at one or two of the projections or keys 26. The area of contact is very small; for example, the keys may be of the order of .047 inch wide and .029 inch thick. Furthermore, the area or areas of contact are immediately adjacent the line F at which, obviously, the amplitude of armature vibration is small. Hence, it will be appreciated that if, during use of the device, the armature is displaced laterally as a result of shocks or jars, not only is the maximum possible displacement small but also the additional restraint to armature vibration resulting from contact between the armature and the retaining ring is so small as to be negligible for practical purposes. Hence, degradation in the efficiency and frequency response characteristic by jars and shocks to which the transducer may be subjected during use is prevented.

Advantageously, as shown in Fig. 2, the slots 25 are tapered so that contact between the keys 26 and the armature can occur only at or immediately adjacent the bases of the slots even if the armature should be displaced rotationally.

Reference is made of the application Serial No. 48,382, filed September 9, 1948, of Robert R. Kreisel wherein a related invention is 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

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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 support, an armature seated upon said support and laterally displaceable thereon, and retainer means adjacent one margin of said armature and normally spaced a preassigned distance therefrom, said armature and retainer means having cooperating projections and slots constructed and arranged to limit displacement of said armature toward said retainer means to an extent less than said preassigned distance.

2. An electroacoustic transducer comprising a magnetic system including an annular armature, a support upon which said armature is seated, and a retainer member disposed about the periphery of said armature and normally spaced a preassigned distance therefrom, said armature being movable laterally relative to said retaining member and said armature and retainer member having cooperating projections and slots for restricting displacement of said armature toward said retainer member to an extent less than said preassigned distance.

3. 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 and held thereon solely by magnetic attraction, and a fixed member encompassing said armature and normally spaced a preassigned distance from the periphery thereof, said fixed and vibratile members having cooperating projections and slots for restricting displacement of said armature toward said fixed member to an extent less than said preassigned distance.

4. An electroacoustic transducer comprising a support, an annular armature seated loosely upon said support, a retainer means disposed about the periphery of said armature and spaced a preassigned distance therefrom, said armature having spaced slots in its peripheral portion, and projections on said retainer means each extending into a respective one of said slots and spaced from the bounding walls thereof to restrict displacement of said armature toward said retainer means to an extent less than said preassigned distance.

5. An electroacoustic transducer comprising a support, an armature seated upon said support and movable laterally relative thereto, a retainer member encompassing said armature and having a wall in juxtaposition to and spaced from the periphery of said armature, said armature having spaced slots in the peripheral portion thereof, and means for restricting the contact area between said armature and said retaining member as a result of displacement of said armature, comprising fingers extending from said wall into said slots.

6. An electroacoustic transducer comprising a support having an annular seating surface, an annular armature seated upon said surface and projecting inwardly beyond the inner edge thereof, retaining means having a wall adjacent but spaced from the periphery of said armature, said armature having spaced slots in its peripheral portion, and projections on said retaining means each extending into a respective one of said slots, the spacing between the inner end of each of said projections and the base of the respective slot being less than that between said wall and the periphery of said armature.

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7. An electroacoustic transducer in accordance with claim 6 wherein the inner ends of said projections are immediately adjacent the inner edge of said seating surface.

8. An electroacoustic transducer in accordance with claim 6 wherein said projections are substantially rectangular and extend radially with respect to said armature and said slots taper inwardly from the periphery of said armature.

9. An electroacoustic transducer comprising a support having an annular seating surface, a vibratory member including an annular armature, a magnetic system including said armature, said armature being seated upon said surface, extending inwardly beyond the inner edge thereof and being held upon said surface by magnetic attraction, a retainer member having a cylindrical wall encompassing and normally spaced a preassigned distance from the periphery of said armature, said armature having spaced, radially extending slots in its peripheral portion,

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and radially extending keys in said slots, the normal clearance between the inner end of each key and the base of the respective slot being less than said preassigned distance and the inner ends of said keys being in proximity to said inner edge of said seating surface.

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

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