

Dec. 25, 1934.

J. R. ERICKSON

1,985,722

ACOUSTIC DEVICE

Filed March 10, 1932

2 Sheets-Sheet 1

FIG. 1

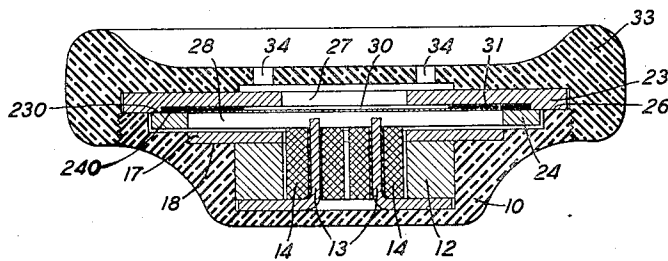


FIG. 2

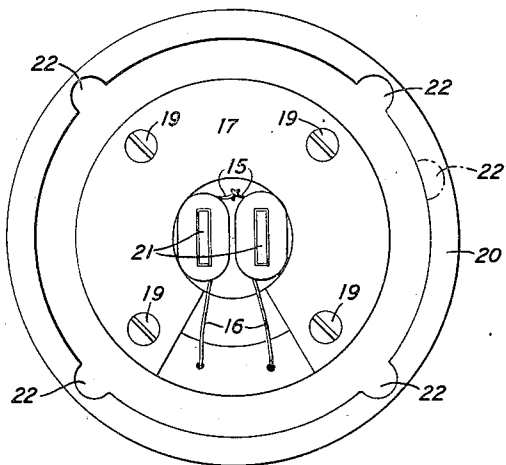
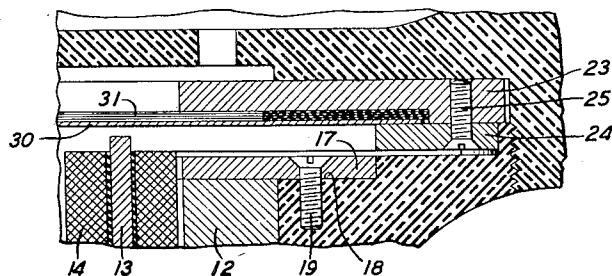


FIG. 3



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FIG. 4

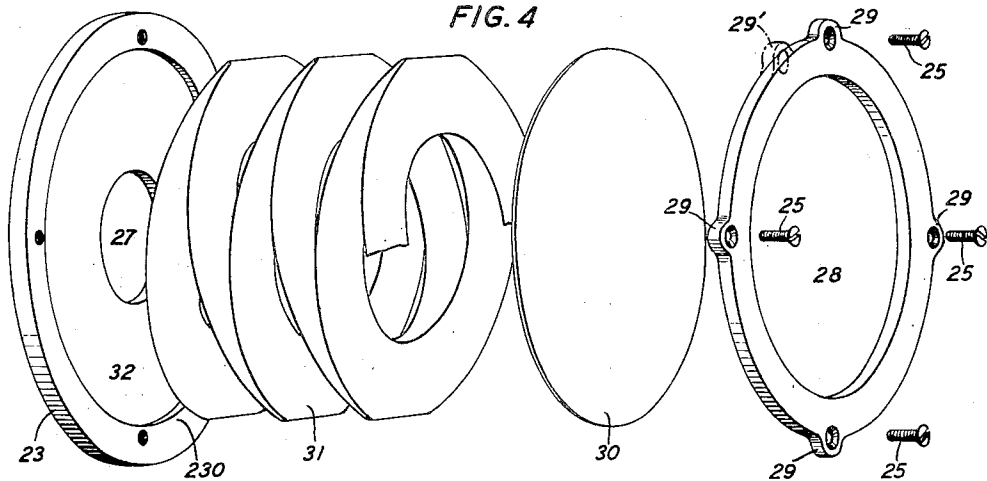


FIG. 5

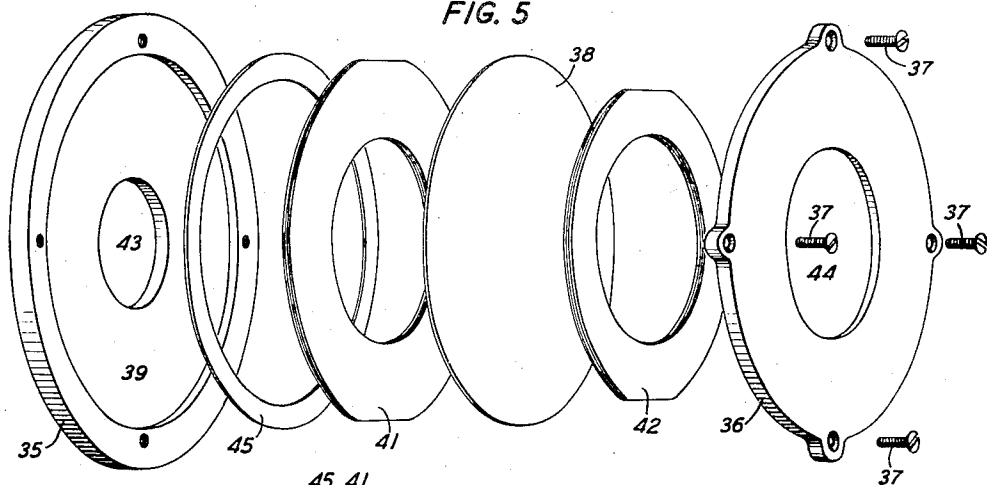


FIG. 6

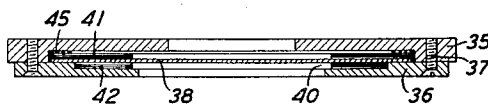
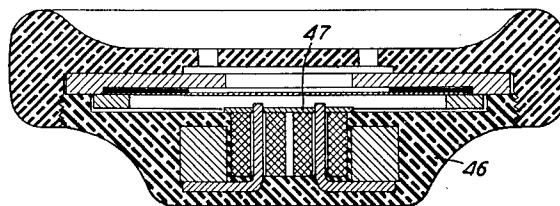


FIG. 7



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1,985,722

ACOUSTIC DEVICE

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Application March 10, 1932, Serial No. 597,879

9 Claims. (Cl. 179—181)

This invention relates to acoustic devices and more particularly to telephone receivers and mountings for the diaphragms thereof.

It is known that the diaphragm of the ordinary telephone receiver is a magnetic disc clamped tightly at its peripheral portion between the rim of the receiver case and an earpiece or cap. The faces of the pole pieces of the magnetic unit within the case are ground usually with reference to the rim of the receiver case so that the desired separation between the pole faces and the diaphragm may be obtained and maintained. A tightly clamped diaphragm, however, does not readily adjust itself to temperature changes, and undesirable strain conditions occur in the diaphragm which impair quality and efficient reproduction. Furthermore, a tightly clamped diaphragm cannot clearly reproduce the voice currents conducted to the receiver because of the restraint on its freedom of movement.

It has been proposed to provide a telephone receiver with a floating diaphragm and thereby overcome these objections. The diaphragm is mounted so as to be peripherally free between a plurality of metal or paper damping washers, these washers being disposed in an annular, U-section channel member. Such an arrangement, however, is not conducive to the obtaining and the maintenance of the proper and desirable spacing between the pole faces of the magnetic unit of the receiver and the diaphragm. Furthermore, such an arrangement, although readily detachable, is not convenient to manufacture or to assemble; nor may the diaphragm unit or assembly be used as an interchangeable unit in receivers of the same type because of the manner in which the diaphragm is mounted within the channel member and between the paper washers.

An object of this invention is to enable the use of a peripherally free diaphragm in a telephone receiver, and yet avoid undesirable variations in the spacing between the pole faces and the diaphragm.

Another object of this invention is to provide a telephone receiver with a readily assembled diaphragm unit or assembly comprising a peripherally free diaphragm, which unit or assembly is readily interchangeable in receivers of a similar type.

It has been found desirable sometimes, however, to hold the peripheral portion of a receiver diaphragm between clamping surfaces and to apply damping to one or each surface of the diaphragm. This invention may be employed with diaphragms so mounted, also.

Another object of this invention, therefore, is to support a peripherally constrained, damped diaphragm in a unit or assembly which is detachable as such from an acoustic device.

A feature of this invention comprises supporting or mounting a telephone receiver diaphragm so that it is peripherally free and yet has one surface separated a predetermined distance from a pole piece of the receiver.

Another feature of this invention comprises supporting or mounting a diaphragm, or a peripherally free diaphragm, or a peripherally free damped diaphragm, between a pair of flat plates, or disc members, each having a central opening and being secured together, the plane of one surface of the diaphragm being in a plane of one of the plate members, or in the plane of the adjacent surfaces of the plate members, or in the plane of the rim portion of the case of an acoustic device.

Still another feature of this invention comprises supporting or mounting a diaphragm between a pair of plate, flat, or disc members, each having a central opening and being secured together, the plate members being of different sizes to provide a ledge or rim portion for engagement with the rim portion of a case of an acoustic device.

A further feature of this invention comprises supporting or mounting a diaphragm between a pair of flat, plate or disc members, each having a central opening and being secured together, the plates being substantially annular and being of different outside diameters, so as to provide a ledge or rim portion for engagement with the rim portion of a receiver case, which case contains a pole piece whose face has been ground with reference to the case rim, one surface of the diaphragm being in the plane of the case rim.

One embodiment of this invention comprises a telephone receiver having a case, or casing, provided with a rim portion and containing a magnetic unit comprising a permanent magnet and a pair of pole pieces, each pole piece being surrounded by an energizing coil. The faces of the pole pieces are ground with reference to the rim of the receiver case so that a desired separation exists between the planes of the rim and of the pole faces. A diaphragm unit or assembly comprising a pair of flat plates, or disc members and a vibratable member or diaphragm is supported on the case rim. The plate members, preferably substantially annular in shape, have each a central opening, are of different outside diameters, and are secured together to provide a substantially annular rim or ledge portion engaging with

the rim of the receiver case. The rim of the case may be provided with spaced recesses and one of the plates with similarly spaced projections, which recesses and projections may be staggered so that they are in alignment in one position only of the diaphragm unit. The diaphragm, which may be peripherally free or restrained, or peripherally free and damped, or peripherally restrained and damped, is held between the plate members so that one surface of the diaphragm is in the plane of the adjacent surfaces of the plate members, or that of one surface of one of the plate members, or that of the rim of the receiver case. The diaphragm unit or assembly is held in the receiver case by a receiver cap or earpiece which is attached to the receiver case, preferably, by a threaded, flange portion engaging with a threaded portion of the receiver case.

A more complete understanding of this invention will be obtained from the detailed description which follows taken in conjunction with the attached drawings, wherein:

Fig. 1 is a sectional view of a telephone receiver embodying this invention;

Fig. 2 is a plan view of the receiver of Fig. 1 with the cap and diaphragm assembly unit removed;

Fig. 3 is an enlarged sectional view of a fragment of the receiver of Fig. 1;

Fig. 4 is an exploded view of the diaphragm assembly unit comprised by this invention and shown in the receiver of Fig. 1;

Fig. 5 is an exploded view of another form that the diaphragm assembly unit may take;

Fig. 6 is a sectional view of the unit of Fig. 5 when assembled; and

Fig. 7 is a sectional view of a telephone receiver embodying another form of the invention.

The telephone receiver of Figs. 1, 2, 3 and 4 comprises a case or casing 10 which may be of insulating material, such as hard rubber or a phenol plastic or canvas composition. The casing contains a permanent magnet 12, which may be annular in shape, and a pair of magnet pole pieces or cores 13. The horizontal extensions of the cores are secured to the magnet 12 in any suitable way, preferably, by welding. Each core is surrounded by an energizing coil 14. The leads 15 of the coils are connected together and the leads 16 are attached each to a suitable terminal (not shown). The magnet structure is maintained in position in the case by a C-shaped plate 17 of non-magnetic material which is secured to the case on the shelf portion 18 thereof by suitable fastening means, such as screws 19. A portion of the plate 17 overlaps the magnet 12 and clamps it securely in place. The case has a plane surface, rim portion 20 with reference to which the face 21 of each core is ground to a desired separation between the plane of the core faces and that of the rim. The rim 20 has a plurality of recesses or indentations 22 for a purpose hereinafter pointed out.

Supported by the rim 20 of the case is a diaphragm assembly unit comprising a pair of flat, plate, or disc members 23 and 24, which have a circular periphery to conform to the circular case. The member 23 is of greater diameter, preferably, than the member 24, and, when they are secured together, for instance, by the screws 25, or by rivets, they form an annular ledge or rim portion 26 adapted to rest on and conforming to the rim 20 of the case, the adjacent surfaces 230 and 240 being in the plane of the rim 20.

The members 23 and 24 have central openings 27 and 28, respectively, and are substantially annular in shape. The projections or extensions 29 of the member 24 are adapted to fit snugly into the recesses 22 and are in the same spaced relation. Although the extensions and cooperating recesses are illustrated here as equally spaced, it is apparent that an additional recess 22' and an additional extension 29' may be provided so that the assembly unit may occupy one position only in the receiver and in which position the recesses and projections are in alignment. Instead of providing an additional recess and cooperating extension, one of the recesses 22 and one of the extensions 29 could, of course, be changed in position to the same end.

Enclosed by the members 23 and 24 is a vibratile member or diaphragm 30. This diaphragm and diaphragm damping material 31 are positioned in a recess 32 of the member 23, the diaphragm at its rim portion resting on the depending member 24 and having its lower surface in the plane of the rim of the case as well as in the planes of the adjacent surfaces 230 and 240. The diaphragm is free at its periphery to allow it to adjust itself readily to varying atmospheric conditions. The damping material between the upper surface of the diaphragm and the upper assembly member comprises a plurality of washers, preferably of paper, which, preferably, are of the accordion pleated type as disclosed in E. Wensley Patent 1,752,515, issued April 1, 1930, although the annular type damping washer disclosed in C. R. Moore Patent 1,644,788, issued October 11, 1927, may be employed. A receiver cap or earpiece 33, having a plurality of sound vents 34, threadably engages the receiver case.

The receiver described above is compact, lightweight, and highly damped. The diaphragm unit therefor is readily constructed, easily adjusted, quickly fitted to the receiver, and is interchangeable in receivers of the same type. It permits, further, the employment of a diaphragm which is damped but otherwise unrestrained and yet insures that the predetermined separation between the diaphragm and the pole faces will be maintained.

The diaphragm assembly may also take the form illustrated by Figs. 5 and 6. Flat, plate, or disc members 35 and 36, which are secured together by screws 37 provide an enclosure and support for a vibratile member or diaphragm 38 whose rim portion rests on the lower and depending member 36, the lower surface of the diaphragm being in the plane of the adjacent surfaces of the plate members. The members 35 and 36 have recessed portions 39 and 40, respectively, in which diaphragm damping material 41 and 42, comprising each a plurality of paper washers, such as disclosed in E. Wensley Patent 1,752,515, issued April 1, 1930, are positioned. The members 35 and 36 have central apertures 43 and 44, respectively.

If it is desired that the receiver in which the assembly unit is used be moisture-proof, a gasket or washer 45, of rubber or other compressible material, may be provided between the member 35 and the damping material 41 preferably at the peripheral portion of the diaphragm.

In some instances, it may be desirable to utilize a damped diaphragm which is subject to some peripheral restraint. It is apparent that in the structures described above the diaphragm may be peripherally restrained, for instance, by the use of a water-proofing or other washer which

introduces a considerable compressive force at the peripheral portion of the diaphragm.

The receiver of Fig. 7 is similar to the receiver of Figs. 1 to 4, the permanent magnet and pole pieces or cores being molded integrally with the casing 46. The energizing coils are held on the cores by the non-magnetic plate 47.

Although the features of this invention have been disclosed with reference to various specific structures, it is understood, of course, that various modifications may be made in the details of construction without departing from the scope of the invention as defined in the appended claims.

15 What is claimed is:

1. A telephone receiver comprising a case having an open end defined by a rim portion, a diaphragm, and means enclosing said diaphragm, said means comprising a pair of plates of different sizes, said plates being secured together to form a ledge portion for engagement with the rim of said case, each of said plates having an opening therein and one of said plates being located within said case and depending from the other plate.

2. A telephone receiver comprising a case having an open end defined by a rim portion, a diaphragm, and means enclosing said diaphragm, said means comprising a pair of plates of different sizes, and diaphragm vibration controlling means between one of said plates and the peripheral portion of said diaphragm, such plates being secured together to form a ledge portion for engagement with the rim of the case, each of the plates having an opening and said diaphragm being supported entirely inside of the rim of the case.

3. A telephone receiver comprising a case having an open end defined by a rim portion, a diaphragm, and means enclosing said diaphragm, said means comprising a pair of plates of different sizes, said plates being secured together to form a ledge portion for engagement with the rim of the case, one plate only engaging with said rim, the other plate being within said rim and depending from the first mentioned plate, each of said plates having an opening and one of said plates having a recess therein in which the diaphragm is positioned.

4. A telephone receiver comprising a case having an open end defined by a rim portion, an earpiece engaging with said case and covering said open end, a diaphragm, means between said earpiece and said case enclosing said diaphragm, said means comprising a pair of plates of different sizes, one only of said plates being held between the earpiece and case rim, the other of said plates depending from the first mentioned plate, each of said plates having an opening.

5. A telephone receiver comprising a case hav-

ing an open end defined by a rim portion, a diaphragm, and means enclosing said diaphragm, said means comprising a pair of plates of different sizes, said plates being secured together to form a ledge portion for engagement with the rim of said case, each of the plates having an opening, said diaphragm being smaller than the open end of said case and being supported so that one surface is in the plane of the case rim.

6. A telephone receiver comprising a case having an open end defined by a rim portion, a diaphragm, and means enclosing said diaphragm, said means comprising a pair of plates of different sizes, said plates being secured together and forming a ledge portion for engagement with the rim of said case, each of said plates having an opening, said rim having a plurality of spaced recesses therein and one of said plates having a like number of similarly spaced projections, the spacing of said recesses and projections being such that the plates must occupy a predetermined position in order for the recesses and projections to be in alignment.

7. A telephone receiver comprising a case, electromagnetic means comprising a pole piece therein, said case having a rim portion, the face of said pole piece having been ground with reference to said rim, a plate member having a central opening and having a peripheral portion supported on said rim, another plate member having a central opening and being secured to and depending from the first plate member, and a diaphragm between said plate members, said diaphragm being substantially free to move at its peripheral portion.

8. A telephone receiver comprising a case, a diaphragm, electromagnetic means in the case to actuate the diaphragm, and means to mount said diaphragm on said case, said means comprising a plurality of plate members, the peripheral portion of one of which rests on said case, each of said members having a central opening, one of said members having a recessed portion within which the diaphragm fits and within which it is substantially free to move, the other of said members being secured to and depending from the first and providing a support for the rim portion of the diaphragm.

9. A telephone receiver including a case having an open end defined by a substantially annular rim portion, a pole piece whose face has been ground with reference to said rim, a diaphragm, and a unitary assembly for said diaphragm comprising a pair of annular plate members of different diameters secured together with the diaphragm therebetween, a portion of one surface of the larger only of said plate members being adapted to engage with the case rim.

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