

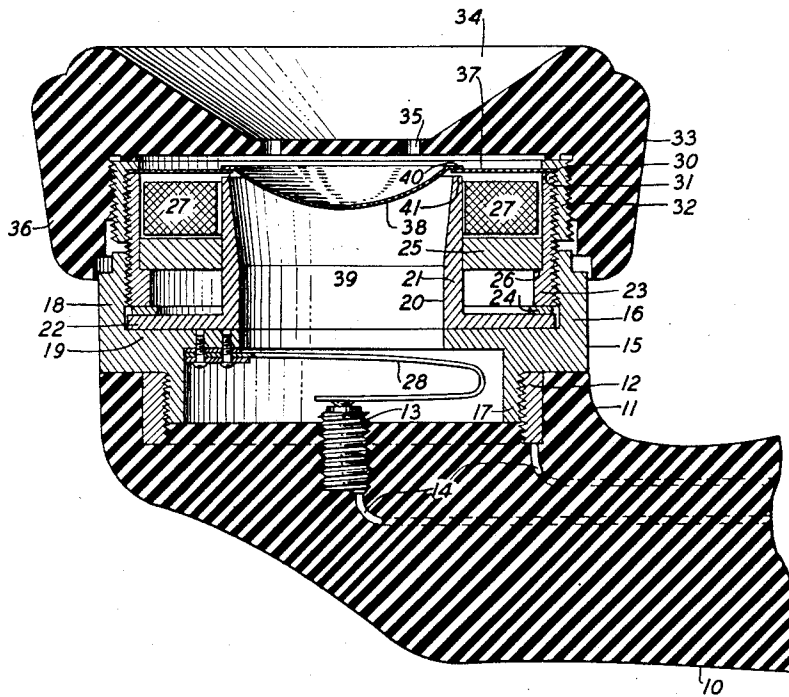
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ACOUSTIC DEVICE

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ACOUSTIC DEVICE

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5 Claims. (Cl. 179—119)

This invention relates to acoustic devices and, more particularly, to telephone receivers.

Objects of this invention are to improve the structure and increase the efficiency of telephone receivers, and to enable them to reproduce sound waves with greater fidelity to the original.

A feature of the invention comprises a diaphragm having an outer section or portion and a relatively thin central rigid portion.

Another feature comprises such a diaphragm in which the outer section is of magnetic material and the inner section is of a non-magnetic material.

Still another feature comprises a diaphragm having an annular planar section of magnetic material and a relatively thin rigid section closing the aperture in the planar section.

Still a further feature comprises a telephone receiver including a diaphragm having an outer section of magnetic material and magnetic structure having pole-piece means in spaced juxtaposition to the diaphragm at the inner boundary of the diaphragm's outer section.

Other and further features will be evident from the description hereinafter.

A more complete understanding of the invention will be obtained from the detailed description which follows, read in conjunction with the appended drawing, the single figure showing in cross-section and to an enlarged scale, a telephone receiver embodying this invention.

The drawing discloses a fragment of a hand telephone set or handset comprising a handle 10 of insulating material having a receiver or receiver unit supporting end portion 11, an internally threaded annular insert 12, and a contact stud 13, conductors 14 connected to the insert and stud being embedded therein. The receiver or receiver unit 15 comprises a metallic shell or case 16 having a downwardly extending, externally threaded annular flange portion 17 for engagement with the insert 12, an upwardly extending, internally threaded annular flange portion 18, and an intermediate planar shelf portion 19. A magnetic core or pole-piece 20, comprising a central annular portion 21 and a radially outwardly extending flange portion 22, rests on the shelf 19. The pole-piece is clamped against the shelf by an externally threaded annular member 23 of magnetic material that engages with the case portion 18, an annular shim or washer 24, which may be of a non-magnetic or a magnetic material, being interposed between the member 23 and the pole-piece. A rectangular-sectioned annular permanent magnet 25

is supported on the shoulder portion 26 of member 23 making a tight fit with the member 23 and the pole-piece. The magnet supports an energizing or signal-currents coil 27, the ends (not shown) of which are connected through the shell and the contact spring 28 with the stud and insert of the handle.

A diaphragm 30 is clamped at its peripheral portion to the upper surface or rim 31 of member 23 by an L-shaped externally and internally threaded clamping member 32 that engages with the member 23. A receiver cap or earpiece 33 having a central recess 34 and apertures 35 for the egress of sound waves, is coupled to the clamping means by the internally threaded flange portion 36. The diaphragm comprises an outer, annular section or member 37 of magnetic material and an inner or central, relatively thin, preferably stiffened, dome-shaped section or member 38. Section 38 projects into the substantially cylindrical air-space or chamber 39 and has a narrow, planar peripheral annulus 40 cemented, soldered, or otherwise fastened to the inner peripheral portion of the section 37. The pole face 41 is in spaced juxtaposition to the inner peripheral portion of the diaphragm outer section, separation being determined by the thickness of the shim 24.

The diaphragm is a composite structure. Section 37 may be of magnetic iron .010 to .015 inch in thickness with an inner diameter of $\frac{7}{8}$ inch and an outer diameter of $1\frac{1}{4}$ inches. Section 38 may be of a light-weight high-strength material such as duralumin or magnesium, about .001 inch in thickness. The simple disc type of armature of the ordinary telephone receiver serves both as a radiator of sound waves and as a driving armature. The composite diaphragm described separates these two functions. The light center section functions as a sound radiator; the relatively heavier outer section functions primarily as the armature, and is confined to the immediate vicinity of the pole-piece and associated magnetic structure. A sound radiating structure having a low mass in proportion to its area is obtained, together with a highly efficient magnetic circuit. The magnetic structure approximates a toroidal structure provided with an air-gap which has a very low leakage coefficient and a low percentage of leakage flux.

Certain features of acoustic devices of the type shown and described herein are claimed in the application Serial No. 167,546, filed October 6, 1937, of Albert L. Thuras.

While this invention has been disclosed with

reference to a single embodiment, it is to be understood that it is not limited thereto, but only by the scope of the appended claims.

What is claimed is:

- 8 1. A telephone receiver comprising a pole-piece member having an annular portion terminating in a pole face at one end and having an outwardly projecting flange portion at its other end, an
10 outer annular pole member, a diaphragm supported at its periphery at one end of said outer member and spaced from said pole face, and means for determining the separation between said pole face and diaphragm including a space member between the other end of said outer
15 member and the flange portion.
- 20 2. A telephone receiver comprising a pole-piece member having a substantially annular portion having a pole face at one end and an outwardly extending planar flange portion at its other end, a spacer member on the peripheral portion of said flange portion, an annular pole member resting at one end on said spacer member, and a diaphragm supported on the other end of said pole member and spaced from said pole face, the separation being determined by the thickness of the
25 spacer member.
- 30 3. A telephone receiver as claimed in the preceding claim, in which said pole member has a shoulder portion intermediate its ends, and including a permanent magnet supported on said shoulder portion and extending between said annular member and the pole-piece member.
4. An acoustic device comprising a magnetic

structure having coaxial inner and outer pole-pieces, means at one end of said pole-pieces spacing said pole-pieces longitudinally so that the other end of the inner pole-piece terminates in a plane a predetermined distance below the terminal plane of the corresponding end of the
5 outer pole-piece, said outer pole-piece having an internal seating surface intermediate the ends thereof, a magnet between said pole-pieces and seated on said surface, means clamping said pole-pieces, magnet and spacing means together, and a diaphragm having a magnetic portion in juxtaposition to said other end of said inner pole-piece.
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5. An acoustic device comprising a magnetic actuating structure including a pair of coaxial
15 annular pole-pieces mounted one within the other, the diameter of the inner pole-piece being substantially one-half the diameter of the outer pole-piece, means spacing said pole-pieces at
20 one end whereby the other end of the inner pole-piece terminates in a plane a predetermined distance below the terminal plane of the corresponding end of the outer pole-piece, and a diaphragm including a flat, flexible, annular magnetic portion having its inner edge in juxtaposition to
25 said other end of said inner pole-piece and having its outer edge portion seated on said corresponding end of said outer pole-piece, said diaphragm including also a non-magnetic rigid
30 dish central portion joined to the inner edge portion of said annular magnetic portion.

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