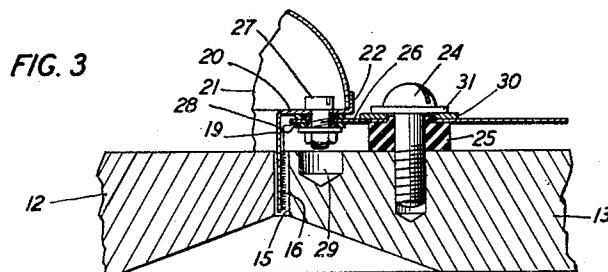
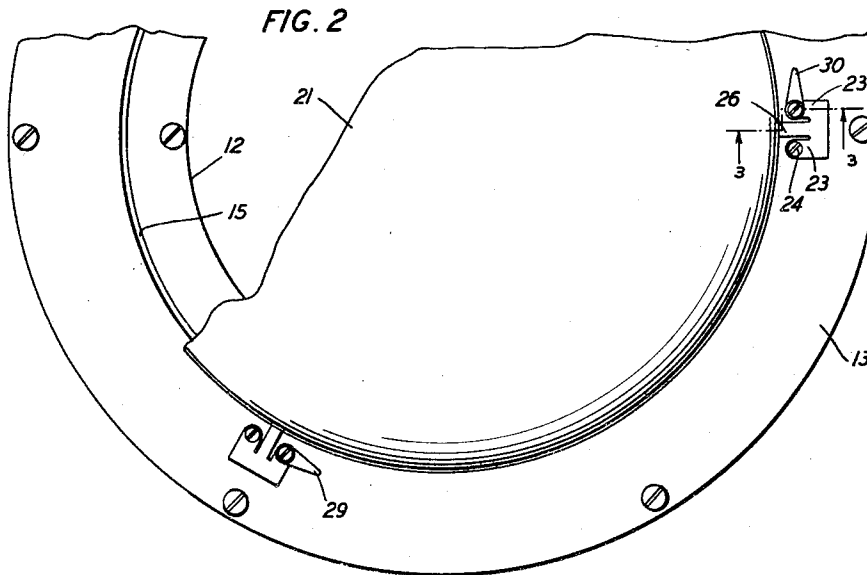
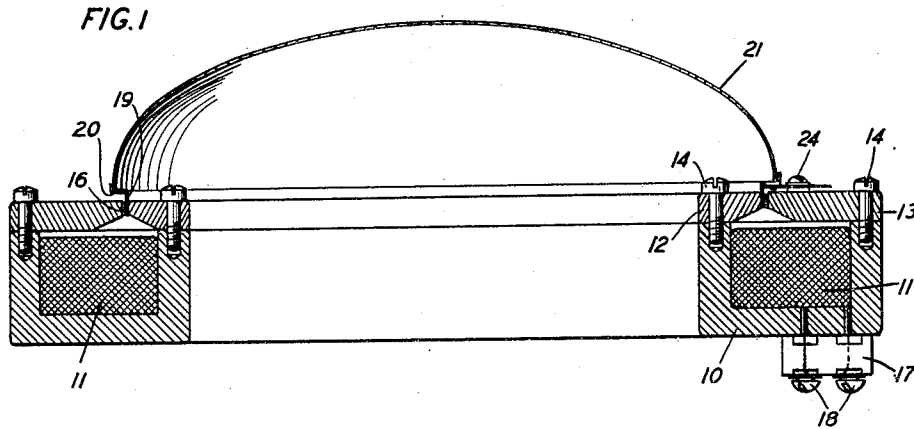


July 19, 1932.

L. G. BOSTWICK
SOUND TRANSLATING DEVICE
Filed Sept. 10, 1930

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SOUND TRANSLATING DEVICE

Application filed September 10, 1930. Serial No. 480,848.

This invention relates to sound translating devices and more particularly to electrodynamic loud speaking telephone receivers of the hornless type.

5 An object of this invention is to improve the frequency response characteristics and increase the efficiency of sound translating devices.

A further object of this invention is to 10 simplify the construction and assembly of electrodynamic loud speaking telephone receivers.

The loud speaking telephone receiver of this invention comprises a large direct acting 15 dome-shaped diaphragm, of paper, impregnated cloth, light metal, such as duralumin or some equally suitable material, the diametrical cross-section of which perpendicular to the base is substantially half of an ellipse. The diaphragm is actuated by a 20 driving coil mounted on a rigid ring of light material, such as aluminum, or the like attached about the periphery of the base of the diaphragm and disposed in a very narrow 25 air-gap between concentric pole pieces of an annular magnet having an annular trough in which a magnetizing winding is located. The diaphragm is flexibly supported from the outer of the pole pieces by a plurality of 30 flexible members which exert substantially no restraint upon the periphery of the diaphragm throughout the range of frequencies it is desired to reproduce and allow true linear displacement of the periphery of the 35 diaphragm.

The structural details and the various features of this invention will be more clearly understood with reference to the accompanying drawing in which

40 Figs. 1 and 2 are an elevational view in cross-section and a partial plan view respectively of the electrodynamic sound translating device of this invention; and

Fig. 3 is an enlarged cross-sectional view 45 on line 3—3 of Fig. 2 showing details of the mounting for the diaphragm and driving coil.

Referring now to the drawing, the electrodynamic device of this invention comprises a 50 relatively large ring 10 of magnetic material

having an annular trough in which a magnetizing winding 11 is disposed. A pair of ring pole pieces 12 and 13 are concentrically mounted one on each upright arm of the ring 10 by bolts 14 and form a narrow annular air-gap 15 in which a driving coil 16 is displaceably supported. An insulating block 17 carries external terminals 18 for the leading-in wires for the magnetizing coil 11.

The driving coil 16 consists, in the preferred form, of a number of turns of flat ribbon-like conductor coated with an insulating lacquer or the like to form a rigid cylindrical element and is attached in any suitable manner such as by an adhesive or mucilage to a cylindrical member 19 formed integrally with an L-shaped flange 20. The cylindrical member 19 and flange 20 should possess the qualities of rigidity and light weight so that they will vibrate uniformly and freely in response to signal currents in the driving coil 16; stamped members of aluminum or duralumin, for example, are very satisfactory.

A large direct acting dome-shaped diaphragm 21 of paper, impregnated cloth, duralumin or any other suitable light weight material is mounted within the portion or lip 22 of the flange 20 and held thereto by any suitable means such as by an adhesive. The diaphragm is so proportioned and dimensioned that its cross-section perpendicular to the base thereof is substantially half of an ellipse, the major axis of the ellipse being coincidental with a diameter of the base. In a preferred form the major and minor axes of the ellipse are in the ratio of 2 to 1. A satisfactory and convenient size diaphragm, for example, may have a major axis of approximately 8" and a minor axis of 4". It has been found that diaphragms so proportioned radiate sound efficiently through a comparatively large solid angle and have an improved frequency response characteristic.

It is desirable in electrodynamic sound translating devices that the diaphragm vibrate bodily after the manner of a piston and that no appreciable restraint be exerted upon the periphery thereof. To this end and also to allow true linear reciprocating 100

movement of the driving coil 16 in the air-gap 15, the vibratory element comprising the diaphragm 21, coil 16 and the member 19 is supported as a unit from the annular pole piece 13 by a plurality of flexible supporting members, each comprising a single piece metallic punching having three parallel prongs. In the specific embodiment shown in the drawing, three supporting members are employed. A larger number of supporting members may be used if desired. The outer prongs 23 are attached to the pole piece 13 by bolts 24 and spaced therefrom by insulating discs or spacers 25 and the center prong 26 extends inwardly beyond the ends of the prongs 23 and is attached to the ring member 20 by a bolt 27 extending through the flange 20, prong 26, and insulating eyelets 28 disposed one on each side of the prong 26. The prong 26 has soldered thereto an end of the driving coil 16 as shown in Fig. 3. The outer pole piece 13 is recessed at 29 to prevent contact between the bolt 26 and the pole piece 13. Two of the supporting members are provided with terminal prong 30 clamped adjacent one of the prongs 23 by the bolt 24 through an insulating washer 31 and serving as an external terminal for the coil 16. This construction provides a very yielding support for the diaphragm 21 and allows substantially true linear reciprocative movement of the coil 16 in the air-gap 15 without contact between the coil 16 and the pole pieces 12 and 13 and thereby enables the vibratory element to reciprocate as a whole and free of peripheral restraint.

In order to prevent interference between the sound waves, and particularly those of the lower frequencies, radiated from the inner and outer surfaces of the diaphragm and thereby improve the frequency response characteristic of the translating device, it is desirable to introduce an acoustic shield or baffle between the two surfaces. To this end the air-gap 15 is made as narrow as possible and the clearance between the coil 16 and the pole pieces 12 and 13 is made a minimum. This construction not only substantially prevents any slippage of air about the periphery of the diaphragm between the two bases thereof with the attendant loss in low frequency response but also provides an efficient air-gap of low reluctance and facilitates the attainment of a magnetic flux of high density with a minimum number of ampere turns magnetizing force and thereby improves the overall efficiency of the device and decreases the manufacturing cost thereof.

The entire unit may be mounted in a suitable frame or casing, or otherwise disposed in association with allied reproducing apparatus as desired.

What is claimed is:

1. A large direct acting acoustic dia-

phragm having a substantially semi-elliptical cross-section perpendicular to its base.

2. A large direct acting acoustic diaphragm whose cross-section perpendicular to its base is a half ellipse, the diameter of the base being the major axis of the ellipse.

3. A large direct acting acoustic diaphragm whose cross-section perpendicular to its base is a half ellipse, the axes of the ellipse having a ratio of substantially 2 to 1.

4. A sound reproducing device comprising a large direct acting diaphragm having a substantially semi-elliptical cross-section perpendicular to its base, and means attached to the periphery of said diaphragm for applying a uniformly distributed actuating force thereto.

5. A sound translating device comprising a curved diaphragm whose cross-section perpendicular to its base is half of an ellipse, means for flexibly supporting the diaphragm so that it is substantially free to move as a whole, and means connected to the base of the diaphragm for driving it.

6. A sound translating device comprising a curved diaphragm the base of which is circular and the cross-section of which perpendicular to its base is half of an ellipse, one entire surface of the diaphragm serving to radiate sound waves into the surrounding air.

7. A sound translating device comprising a supporting member, and a diaphragm mounted on said supporting member and curved outwardly therefrom, the base of the diaphragm being circular and the cross-section of the diaphragm perpendicular to its base being half of an ellipse, the entire outer surface of the diaphragm serving to radiate sound waves into the surrounding air.

In witness whereof, I hereunto subscribe my name this 5th day of September, 1930.

LEE G. BOSTWICK.