April 26, 1932. H. R. CLARKE 1,855,600

SOUND TRANSLATING DEVICE

Filed July 25, 1931

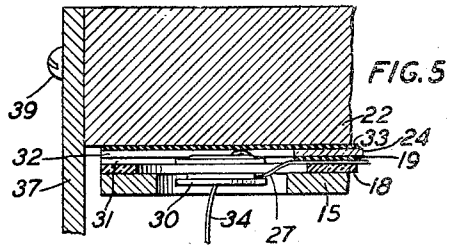

FIG. 5

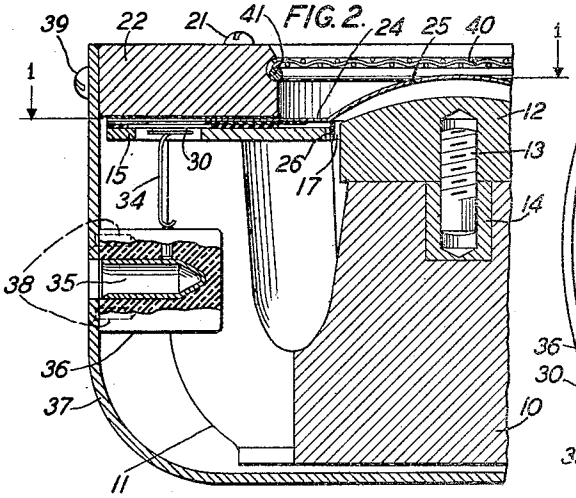

FIG. 2

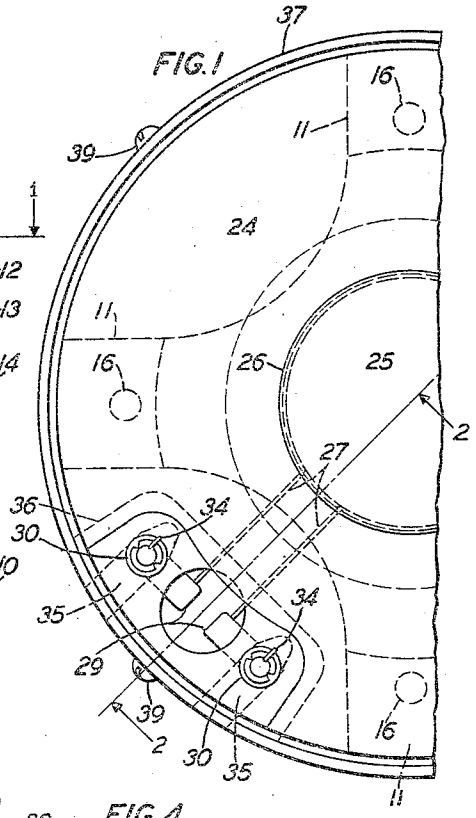

FIG. 1

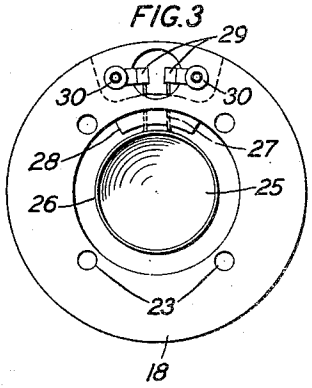

FIG. 3

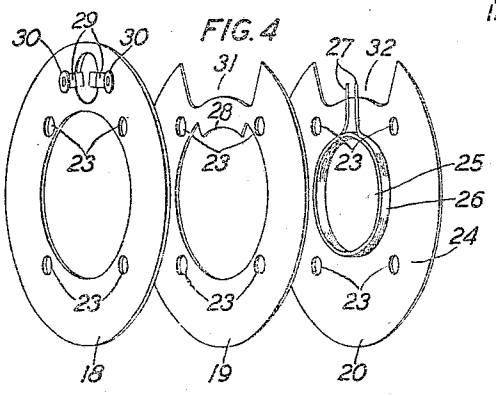

FIG. 4

INVENTOR
H. R. CLARKE
BY
Walter C. Kiesel
ATTORNEY

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UNITED STATES PATENT OFFICE

HARRY R. CLARKE, OF NEWARK, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

SOUND TRANSLATING DEVICE

Application filed July 25, 1931. Serial No. 553,101.

This invention relates to sound translating devices and more particularly to means for associating the driving coil in electrodynamic sound translating devices with an external electrical circuit.

Electrodynamic devices, such as telephone receivers and transmitters generally utilize a diaphragm and a driving coil which may consists of a plurality of turns of a lightweight fragile metallic conductor mounted on the diaphragm. Because of the frailty of leading-in conductors or wires for driving coils of this type, it has been found extremely difficult to maintain a satisfactory and permanent electrical connection between the coil and stationary terminals without shearing the leading-in wires. Furthermore, it is impracticable to solder the delicate leading-in wires because of subsequent corrosion and rupture thereof.

An object of this invention is to insure an efficient and facile connection between the leading-in wires for a driving coil in electrodynamic devices and an external circuit.

Another object of this invention is to simplify and to facilitate the assembly of electrodynamic devices.

The features of this invention are exemplified, in one embodiment, in an electrodynamic transmitter or receiver comprising a magnet structure having inner and outer concentric pole pieces defining a narrow annular air gap. Supported on the magnet structure is a unitary diaphragm assembly including a rigid annular insulating support and a diaphragm spaced from the annular support by a paper washer. An annular driving coil is secured to the diaphragm and is disposed in the annular air gap. The driving coil terminations serve as leading-in wires and extend outwardly from the coil and are held loosely between the insulating support and the washer. The annular insulating support carries oppositely arranged metallic connecting members which initially clamp the leading-in wires and offer a comparatively large surface for welding the wires to the members. The metallic connecting members are attached to terminals in the magnet structure which receive connections for associating the driving coil with an electrical circuit.

This construction enables the secure attachment of the fragile driving coil leading-in wires to stationary terminals thereby preventing excessive flexing of the wires with vibrations of the diaphragm and coil, and facilitates the handling of the diaphragm unit during the assembly of the device.

The invention will be more clearly understood from the following detailed description with reference to the accompanying drawings in which:

Fig. 1 is a partial plan view of an electrodynamic device constructed in accordance with this invention, with the cover plate removed to show details of the driving coil and terminal arrangement;

Fig. 2 is a cross-sectional view of the terminal assembly along line 2—2 of Fig. 1;

Fig. 3 is a plan view of the unitary diaphragm assembly in accordance with this invention showing the relationship of the driving coil leading-in wires and support for devices of the type shown in Figs. 1 and 2;

Fig. 4 is an exploded view of the unitary diaphragm assembly shown in Fig. 3; and

Fig. 5 illustrates in an enlarged fragmentary view in cross-section, the manner in which the leading-in wires for the driving coil are connected to the terminals on the insulating support.

Referring now to the drawing, an electrodynamic device, such as the transmitter comprises a permanent magnet structure including a central pole 10, and four equally spaced upturned radial arms 11, integral with the pole 10. A circular dome-shaped inner pole piece 12 is secured to the central pole 10 by a stud 13 threaded into the pole piece 12 and into a soft metal insert 14 in the pole 10. An annular outer pole piece 15 is seated on the ends of the arms 11 and is concentrically positioned about the pole piece 12 by dowel pins 16, to form a narrow annular air gap 17 between the dome-shaped pole piece 12 and the annular pole piece 15.

A unitary diaphragm assembly is mounted on the annular pole piece and comprises an annular rigid support 18 of insulating mate-

rial, such as a phenol condensation product, an annular washer 19, of light flexible insulating material, such as paper, secured to the support 18 in any suitable manner as by cement, and a diaphragm 20 suitably secured, as by cement, to the washer 19. This unit is positioned upon the outer pole piece 15, and clamped to the pole piece by bolts 21 (only one of which is shown) which extend through an annular cover plate or retaining ring 22 and through openings 23 in the support 18, washer 19 and diaphragm 20. The diaphragm 20 may be of a lightweight metal, such as duralumin, and comprises a flat, peripheral portion 24 and a dome-shaped portion 25 preferably, but not necessarily integral with the peripheral portion 24 and positioned concentrically with respect to the pole pieces 12 and 15. An annular ribbon-wound driving coil 26 which may be of the construction shown in U. S. Patent 1,707,544 issued April 2, 1929 to A. L. Thuras, is secured to the diaphragm at the base of the dome-shaped portion 25 and is disposed in the air gap 17. The terminations of the coil form leading-in wires 27 which extend outwardly from the coil and are held loosely between the washer 19 and the support 18. The washer 19 is also provided with an inwardly projecting tongue or extension 28 which insulates the leading-in wires from the peripheral portion 24 of the diaphragm.

Due to the frailty of these leading-in wires it has been extremely difficult to obtain permanent connection thereof to a stationary terminal. In accordance with this invention this difficulty is overcome by clamping the ends of the leading-in wires between folded portions of metallic terminal strips 29 and welding the fold of the terminal strip. The terminal strips 29 are secured to the rigid support 18 by metallic eyelets 30 The washer 19 and peripheral portion 24 of the diaphragm are provided with complementary cut-out portions 31 and 32, respectively, adjacent the eyelets 30 and terminal strips 29. An annular insulating washer 33 is placed between the peripheral portion 24 of the diaphragm and the cover plate 22 to insulate the eyelets 30 from the cover plate. Conductors 34 soldered or otherwise suitably secured to the eyelets 30 are connected to corresponding terminal sockets or jacks 35 mounted on an insulating block 36. The sockets or jacks 35 serve to receive other conductors for associating the driving coil 26 with an external circuit. The insulating block 36 is mounted within a casing 37 by screws 38. The casing 37 is of non-magnetic material and is secured to the cover plate 22 by screws 39.

This construction expedites the assembly of the diaphragm and driving coil in electrodynamic devices such as receivers and transmitters and enables the secure attachment of the leading-in wires for the driving coil to stationary terminals. The welding of the leading-in wires 27 to the terminal strips 29 overcomes the difficulties encountered heretofore in connecting the wires to terminals by soldering and clamping. Since the leading-in wires 27 extend loosely between support 18 and washer 19, rupture thereof by excessive flexing when the diaphragm 20 vibrates is prevented. The unitary assembly also expedites the handling of the thin fragile diaphragm and thereby facilitates the assembly of receivers and transmitters.

A protective screen 40 is seated in an annular recess in the cover plate 22 and is locked in place by a split ring 41. The mesh of the screen should be of sufficient size so that it does not materially impede the passage of sound waves to or from the diaphragm, although protecting the dome-shaped portion 25 of the diaphragm against damage from the exterior of the device.

Although an electrodynamic transmitter has been disclosed and described in detail, it is to be understood that the invention is not limited thereto and that many modifications may be made in the structural assembly of the device without departing from the scope of this invention as defined in the appended claims.

What is claimed is:

1. In a sound translating device, a unitary assembly comprising an insulating member, a vibratile member mounted on said insulating member, an actuating coil attached to said vibratile member, leading-in wires from said coil extending to said insulating member, and terminals on said insulating member connected to said leading-in wires.

2. In a sound translating device, a unitary assembly comprising an insulating member, a diaphragm having a peripheral portion mounted on said member, terminals mounted on said member, a driving coil secured to said diaphragm, and leading-in wires for said coil extending between said insulating member and said peripheral portion and secured to said terminals.

3. In a sound translating device, a unitary diaphragm assembly comprising a supporting member, a diaphragm and terminals mounted on said supporting member, an insulating member between said diaphragm and said supporting member, a driving coil secured to said diaphragm, and leading-in wires for said coil connected to said terminals and extending between said supporting and insulating members.

4. In a sound translating device, a unitary assembly including an insulating support, terminal strips mounted on said support, an insulating washer secured to said support, a diaphragm having a flat peripheral portion secured to said washer, said diaphragm and said washer having complementary cut-out portions adjacent said terminal strips, a driving coil carried by said diaphragm, and lead-

ing-in wires for said coil extending between said support and washer and welded to said terminal strips.

5. In a sound translating device, a unitary assembly comprising an annular supporting member of insulating material, terminals mounted on said supporting member, a diaphragm having a rim portion seated on said supporting member, a driving coil secured to said diaphragm within the boundary of said supporting member, and leading-in wires for said coil extending between said supporting member and said rim portion and connected to said terminals.

6. In a sound translating device, a unitary assembly comprising an annular supporting member, an annular insulating washer secured to said supporting member, terminal strips secured to said supporting member, a diaphragm including a central dome-shaped portion and a flat peripheral portion secured to said insulating washer, an annular driving coil secured to said diaphragm at the base of said dome-shaped portion, and leading-in wires for said coil extending loosely between said supporting member and said insulating washer and welded to said terminal strips.

7. A sound translating device comprising a magnet having inner and outer pole pieces defining an annular air gap therebetween, an annular supporting member mounted on said outer pole piece, terminals mounted on said supporting member, a diaphragm having a portion adjacent said supporting member, an annular driving coil affixed to said diaphragm and positioned in said air gap, and leading-in wires from said coil extending between said supporting member and said portion and secured to said terminals.

8. A sound translating device comprising a magnet having inner and outer concentric pole pieces defining an annular air gap therebetween, and a unitary diaphragm assembly mounted on said outer pole piece comprising an annular disc of insulating material, terminals secured to said disc, an annular insulating washer secured to said disc, a diaphragm having a flat portion secured to said washer, an annular driving coil affixed to said diaphragm and positioned in said air gap, and leading-in wires from said coil extending between said disc and said washer and connected to said terminals.

9. An electrodynamic device comprising a casing, a magnet within said casing having inner and outer pole pieces defining an air gap therebetween, a unitary diaphragm assembly mounted on said outer pole piece comprising an insulating support, a vibratile diaphragm having a portion seated on said support, a driving coil attached to said diaphragm and disposed in said air gap, metallic strips on said insulating support, continuations from said coil connected to said strips, rigid terminals insulatingly supported within said casing, and electrical connections between said strips and said terminals.

10. A sound translating device comprising a magnet having concentric inner and outer pole pieces defining an annular air gap therebetween, an apertured insulating support seated on said outer pole piece, a washer adjacent said support, a diaphragm having a flat peripheral portion adjacent said washer, a plate member clamping said support, washer and diaphragm to said outer pole piece, terminal strips mounted on said support and extending across the aperture therein, means for insulating said terminals from said plate member, and leading-in wires from said coil extending between said support and said washer and affixed to said terminal strips.

In witness whereof, I hereunto subscribe my name this 22nd day of July, 1931.

HARRY R. CLARKE.