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MICROPHONE WITH OPPOSITE ELECTRODES BEING
OF VARYING AND CONSTANT CURVATURE
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2,532,741

FIG. 1

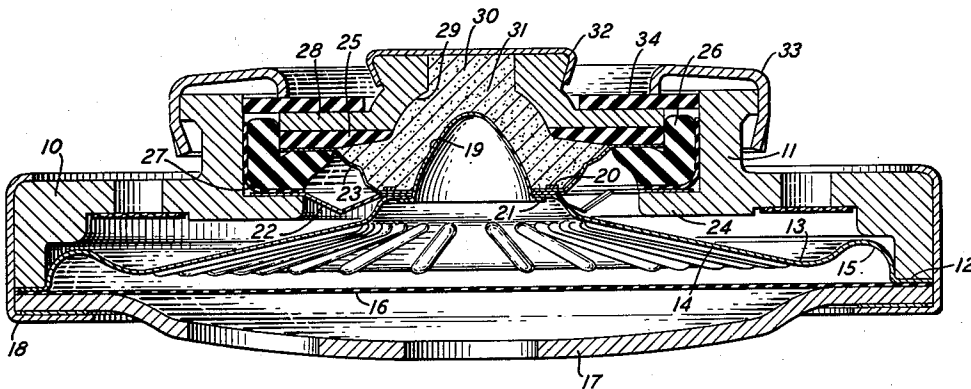
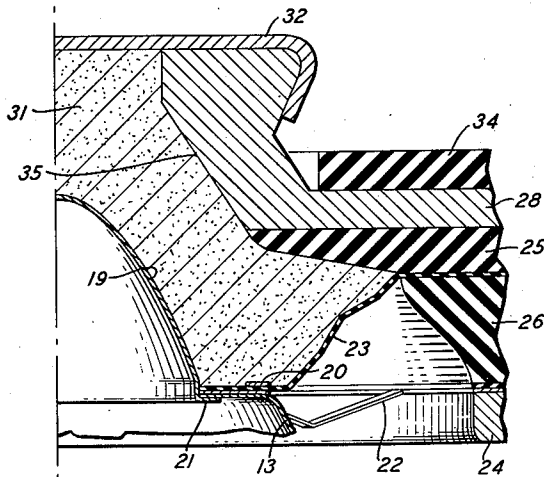


FIG. 2



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MICROPHONE WITH OPPOSITE ELECTRODES BEING OF VARYING AND CONSTANT CURVATURE

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8 Claims. (Cl. 179-122)

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This invention relates to telephone transmitters and more particularly to carbon granule type transmitter units especially suitable for use in hand telephones.

One general object of this invention is to improve the operating characteristics of telephone transmitters of the carbon granule type. More specifically, one object of this invention is to obtain substantially uniform performance of such transmitters for a wide variety of positions in which they may be held during use.

In one illustrative embodiment of this invention, a transmitter unit of the type and general construction disclosed in Patent 2,042,822 granted June 2, 1936 to Arthur F. Bennett and William L. Tuffnell comprises a pair of coaxial dished electrodes and associated elements bounding a carbon granule chamber, one of the electrodes being fixed and the other being coupled to a diaphragm to vibrate therewith.

In accordance with one feature of this invention, the surface of one of the electrodes is a surface of revolution the generatrix of which is of continuously varying curvature and the surface of the other electrode also is one of revolution having a generatrix of constant curvature. The two surfaces are coaxial and in juxtaposition and because of the difference in the configurations of these surfaces the gap therebetween varies continuously so that for each position in which the unit may be held an optimum or substantially optimum current path between the two electrodes obtains. Also because of the difference, the spacing between the two electrodes may be made quite small whereby improved modulation is obtained.

The invention and the above-noted and other features thereof will be understood more clearly and fully from the following detailed description with reference to the accompanying drawing in which:

Fig. 1 is a side view in section of a transmitter unit illustrative of one embodiment of this invention; and

Fig. 2 is a fragmentary sectional view illustrating a modification of the unit shown in Fig. 1.

Referring now to the drawing, the transmitter unit illustrated in Fig. 1 comprises an annular, metallic foundation member or frame 10 having a cylindrical portion 11 of reduced diameter and having also a plane face against which the annular peripheral portion 12 of a diaphragm is seated. The diaphragm, which may be formed in one piece of light weight metal, includes a central frusto-conical part 13 provided with

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stiffening corrugations or flutes 14 and connected to the peripheral portion 12 by an annular corrugated or trough portion 15 which is sufficiently flexible to allow bodily vibration of the central part 13. The diaphragm, together with a moisture-proof membrane 16 and a multi-apertured protective cover or screen 17, is secured to the frame by a clamping band 18.

Mounted by the diaphragm and vibratile therewith is an electrode 19 of paraboloidal form and having a flange 20 and tabs 21 between which the inner edge portion of the diaphragm is gripped. Also secured between the flange and tabs are the inner portions of a metallic spider 22 and an annular, flexible closure member 23, for example of silk. The arms of the spider, which serves as a lead in conductor to the electrode 19, extend to and contact an inner, annular flange 24 on the foundation member or frame. The outer portion of the closure member 23 is held between a pair of insulating rings 25 and 26 within the cylindrical portion 11 of the foundation member, the ring 26 being seated upon an insulating spacer 27 which in turn bears against the spider arms.

A fixed electrode is mounted upon the ring 25 and comprises an annular flange 28 seated on this ring, and a central domed part having a hemispherical surface 29 in juxtaposition to and coaxial with the paraboloidal electrode 19. The fixed electrode is provided with an aperture 30 through which a filling of carbon granules 31 is introduced into the chamber bounded by the electrode 19, closure 23, ring 25 and surface 29. A cap or cover 32 crimped over the fixed electrode closes the aperture 30.

The fixed electrode and rings 25 and 26 are securely held in position in pile-up relation and against the flange 24 by an annular clamping band 33 one edge of which bears against an insulating disc 34 seated upon the electrode flange 28.

It will be noted that because of the difference in the forms of the juxtaposed surfaces of the two electrodes, the spacing between these surfaces is continuously changing; specifically, in the construction illustrated, this spacing first increases, passes through a maximum, then decreases in the direction toward the diaphragm. The continuous change in curvature of the vibratile electrode surface, it has been found, substantially minimizes variations in the performance of the unit with changes in position in which the unit is held during use thereof. That is, the operating characteristics of the unit are

substantially independent of the position of the unit.

Furthermore, the difference in the configurations of the juxtaposed electrode surfaces allows close spacing of these electrodes and consequently high modulation, without packing of the carbon granules.

The exact configuration of the paraboloidal surface of the electrode 19 is of some moment. Specifically, the generatrix of the surface is of the form given by the equation $X^2 = ky$, where X is the coordinate normal to the common axis of the two electrodes, y is the coordinate parallel to this axis, and k is a constant. Values of k between 0.0563 and 0.169 have been found satisfactory.

The embodiment of this invention illustrated in Fig. 2 is similar to that shown in Fig. 1 and heretofore described. However, in the embodiment shown in the former figure, the surface 35 of the fixed electrode is frusto-conical. One slope which was found suitable for the generatrix of this surface was of the order of 45 degrees with reference to the common axis of the two electrodes.

Although specific embodiments of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined in the appended claims. For example, although in the embodiments illustrated the entire convex surface of the vibratile electrode is paraboloidal, a portion thereof adjacent the flange 20 may be cylindrical and the remainder paraboloidal.

Reference is made of the application Serial No. 783,324 filed October 31, 1947, of Herbert W. Bryant wherein a related invention is disclosed and claimed.

What is claimed is:

1. A telephone transmitter including a pair of electrodes having opposed surfaces bounding a chamber, comminuted resistance-varying material in the chamber and means for vibrating one of the electrodes relatively to the other, the opposed electrodes being respectively convex and concave toward the other and shaped in accordance with different geometrical formulae having different points of origin to provide a spacing between the opposed surfaces which varies continuously thereover in any phase of vibration of the one electrode.

2. A telephone transmitter comprising a fixed electrode having a plurality of surfaces of which one is a concave surface, a vibratile electrode having a convex surface of continuously changing curvature in juxtaposition to said concave surface, means including said concave and convex surfaces bounding a chamber, and comminuted resistance varying material in said chamber.

3. A telephone transmitter comprising a pair of electrodes having each a surface including a dished portion the dished portions being juxtaposed, coaxial and dished in the same direction,

one of said portions having a constant curvature and the other of said portions having a locus of continuously changing curvature, means for vibrating one of said electrodes relatively to the other thereof, means including said electrodes bounding a chamber of inner surface including said portions and comminuted resistance-varying material in the chamber.

4. A telephone transmitter comprising a first electrode having a concave dished portion, a second electrode having a convex surface extending toward and coaxial with said dished portion, diaphragm means coupled to the second electrode for vibrating it relatively to the first electrode, said surface and the concave face of said portion being shaped in accordance with different geometrical formulae having different points of origin to provide a spacing between said surface and said face varying continuously thereover in any phase of vibration of the second electrode, means including said surface and said face bounding a chamber and comminuted resistance-varying material in the chamber.

5. A telephone transmitter in accordance with claim 4 wherein said surface is paraboloidal and said face is substantially hemispherical.

6. A telephone transmitter in accordance with claim 5 wherein the generatrix of said surface is of the form $X^2 = ky$, where y is the coordinate parallel to the common axis of said face and surface, X is the other coordinate and k is a constant between about 0.0563 and 0.169.

7. A telephone transmitter in accordance with claim 4 wherein said face is frusto-conical and said surface is paraboloidal.

8. A telephone transmitter comprising a pair of electrodes bounded each by a surface including a dished portion, the dished portions of the two surfaces facing each other and dished in the same direction along a common axis of revolution but of differently varying steepness with respect thereto wherefore the spacing between said portions is a maximum over an intermediate zone between the portions and decreases therefrom toward each electrode, means including said portions bounding a chamber, comminuted resistance-varying material in the chamber and means for vibrating one of said electrodes.

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