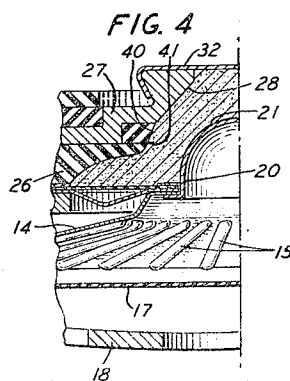
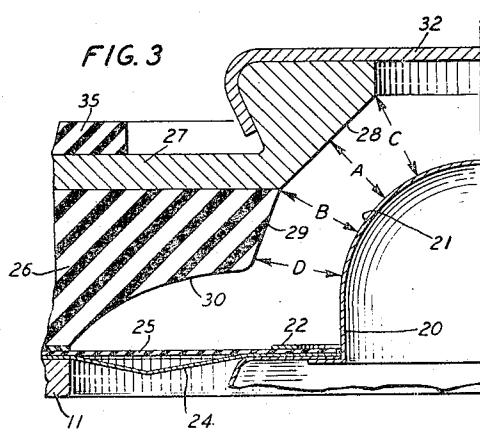
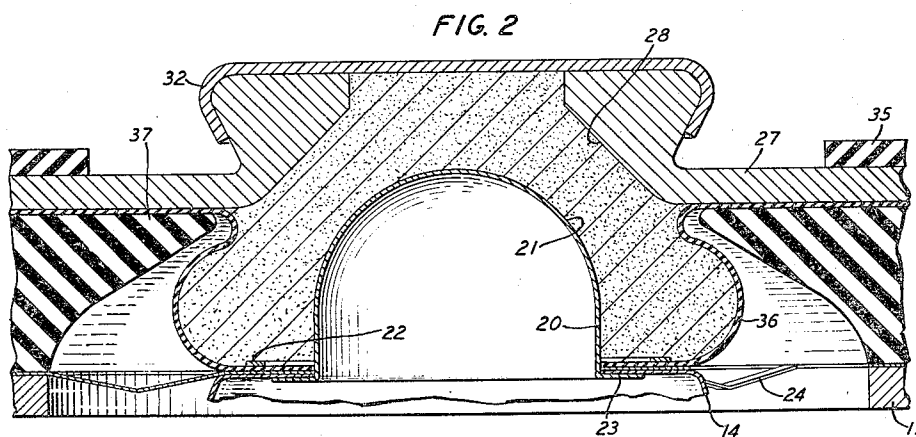
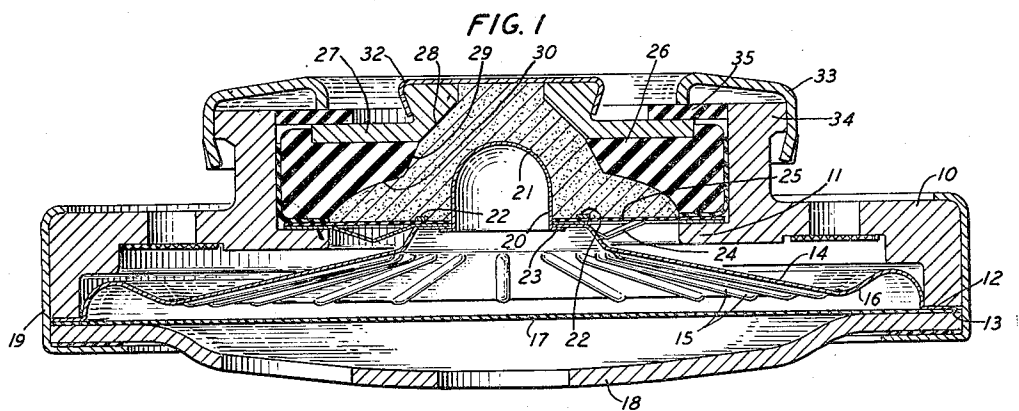


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H. W. BRYANT  
TELEPHONE TRANSMITTER HAVING FRUSTO-CONICAL  
BACK ELECTRODE  
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## UNITED STATES PATENT OFFICE

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TELEPHONE TRANSMITTER HAVING  
FRUSTOCONICAL BACK ELECTRODE

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12 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.

Transmitter units of the type to which this invention pertains comprise, in general, a carbon granule filled chamber bounded in part by a pair of electrodes one of which is coupled to a diaphragm to vibrate therewith in accordance with speech or other sound waves effective upon the diaphragm. The operating characteristics of such units are dependent upon the resistance of the current path, through the carbon granules, between the two electrodes and the manner in which this resistance varies in response to vibrations of the diaphragm.

In order to obtain high modulation, it is desirable that the electrodes be relatively closely spaced. However, as the electrode spacing is reduced, the tendency of the carbon granules to pack increases, with consequent degradation in the performance of the unit.

Further, transmitter units when included in hand telephones are subject to operation in a variety of positions. The gravitational forces upon the granules tend to vary the effective pressure between the carbon granules and the electrodes with difference in position of the unit, so that the operating characteristics of the unit may vary considerably with position in which the hand telephone is held.

One general object of this invention is to improve the operating characteristics of carbon granule type telephone transmitters.

More specifically, objects of this invention are to improve the modulation in, prevent packing of the carbon granules in, and obtain improved non-positional performance characteristics for telephone transmitter units of the carbon granule type.

In accordance with one feature of this invention, the electrodes are provided with juxtaposed dished surfaces of such configuration that a portion of the space therebetween is restricted and the forces effective upon the carbon granules during operation of the unit are such as to maintain the carbon in a free state. In one illustrative embodiment of this invention, the vibratile electrode has a substantially hemispherical convex surface and the other or fixed electrode has a frusto-conical concave surface coaxial with and in close proximity to the hemispherical surface.

In accordance with another feature of this invention, a portion of the granule chamber is

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bounded by a frusto-conical wall encompassing the hemispherical surface and in juxtaposition thereto, this wall extending from the frusto-conical electrode surface and being of greater slope than this surface, thereby to produce a restriction in the chamber adjacent the hemispherical surface. As a result, the gravitational forces effective upon the granules when the unit is held in such position that the granules would tend to fall away from the electrodes, are such as to urge the granules toward the vibratile electrode.

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;

Fig. 2 is a view similar to Fig. 1 of a transmitter unit illustrative of another embodiment of this invention;

Fig. 3 is a diagram showing to an enlarged scale, the configuration of the carbon granule chamber bounding elements in the unit illustrated in Fig. 1; and

Fig. 4 is a fragmentary sectional view illustrating a modification of the transmitter unit shown in Fig. 1.

Referring now to the drawing, the transmitter unit illustrated in Fig. 1 comprises a circular frame or foundation member 10, for example of metal, having an internal annular flange 11 and a flat annular seating surface 12. Seated upon the surface 12 is the peripheral portion 13 of a lightweight metallic diaphragm which includes a central, shallow frusto-conical part 14 provided with stiffening corrugations or ribs 15 and includes also an annular corrugation or trough portion 16 sufficiently flexible to permit bodily vibration of the central part 14. The diaphragm, together with a moisture resistant screen or membrane 17 and a multi-apertured protective cap or cover 18, is secured to the frame or foundation member 10 by an annular band 19.

Affixed centrally to the diaphragm and vibratile therewith is a metallic electrode having a short cylindrical base portion 20 and a hemispherical portion 21, the electrode having also a flange 22 and integral tabs 23 between which the inner edge of the diaphragm part 14 is clamped. Also clamped between the flange 22 and tabs 23 are a metallic spider 24, which serves as a lead-in conductor for the electrode, and a flexible, annular, insulating closure member 25, for

example of silk, the spider and closure member extending to the flange 11 and being held thereagainst by an insulating ring 26 having a frusto-conical surface 29 coaxial with the vibratile electrode, and an arched surface 30.

A back or fixed electrode 27 is seated upon the ring 26 and is provided with a frusto-conical surface 28 coaxial with the hemispherical surface 21 and in proximity thereto. The larger end of the surface 28 is coincident with the smaller end of the surface 29 and the slope of the former surface is less than that of the latter.

The rear opening in the back electrode, through which carbon granules 31 substantially filling the chamber bounded by the two electrodes, the ring 26 and closure member 25 are introduced, is closed by a metallic cap 32 crimped over the back electrode. This electrode together with the ring 26 is locked firmly in position against the flange 11 by a clamping band 33 which is crimped over a flange 34 on the frame and bears against an insulating ring 35 seated against the back electrode.

In order to obtain high modulation, the electrodes are placed in close proximity to one another. For example, in an illustrative construction, the minimum distance between the surfaces 21 and 28 may be substantially .069 inch. As is apparent from Fig. 3 particularly, because of the configuration and relation of the surfaces 21 and 28, the gap between these surfaces is restricted at the region A and enlarges in both directions, i. e. toward regions B and C, from the region A. This, it has been found substantially prevents packing of the carbon granules between the electrode surfaces despite the close spacing thereof. Thus, the granules are maintained in a free state and this, together with the close spacing, assures the realization of high modulation. Also, of course, the maintenance of the carbon in a free state prevents sharp changes in the mean resistance of the transmitter unit.

As is apparent also, particularly from Fig. 3, because of the configuration of the insulator surface 29, the carbon chamber is restricted adjacent the region D. Because of this, the granules are urged toward the vibratile electrode whereby good contact between the granules and this electrode is maintained for all positions of the unit. This effect is of particular importance in assuring good performance of the unit when, during use, it is held in such position that the diaphragm faces upwardly and is horizontal or substantially so.

It will be noted further that because of the configuration of the surfaces 21, 28 and 29 and of the fact that the surface 29 is insulating, the major portion of the current between the electrodes is directed along paths at and adjacent the region A in the gap between the electrodes. At these paths the forces, due to vibration of the diaphragm, for agitating the carbon granules are most effective, and distortion by current modulation in the transverse direction, i. e. substantially normal to the direction of diaphragm motion, is minimized.

Distortion by such transverse modulation may be further reduced, as illustrated in Fig. 4, by heightening the frusto-conical insulating surface, thereby in effect blocking the major part of the current path normal to the axis of alignment of the two electrodes. In the construction illustrated in Fig. 4, this is effected by an insulating insert 40, having a frusto-conical surface 41, in the back electrode, the surface 41 being coaxial with the surface 21.

The transmitter unit illustrated in Fig. 2 is similar to that shown in Fig. 1 and described hereinabove. However, a portion of the carbon granule chamber is bounded by a formed annular member 36, S-shaped in section and of flexible insulating material, such as silk. One end of this member is clamped between the electrode flange 22 and the diaphragm and the other end is fixed between the back electrode 27 and the annulus 37. Because of the construction and configuration of the member 36 it will be appreciated that in use of the unit, forces tending to urge the granules into engagement with the vibratile electrode and toward the restricted space between the two electrodes are produced.

In the constructions illustrated it is to be noted that the current path between the two electrodes is of relatively small cross-section. Hence, a relatively high resistance may be obtained despite the close spacing of the electrodes.

Reference is made of the application Serial No. 783,239, filed October 31, 1947, of Ralph R. Stevens wherein a related invention is disclosed.

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.

What is claimed is:

1. A telephone transmitter comprising a fixed and a vibratile electrode having juxtaposed dish-shaped surfaces one of which is convex and substantially hemispherical and the other of which is frusto-conical and has its larger end toward the hemispherical surface, means including said surfaces bounding a chamber, and comminuted resistance varying material in said chamber.

2. A telephone transmitter in accordance with claim 1 wherein said means comprises an insulating member having a frusto-conical surface encompassing said hemispherical surface and extending from and having its small end adjacent said first frusto-conical surface, the slope of said second frusto-conical surface being greater than that of said first frusto-conical surface.

3. A telephone transmitter comprising means including a pair of electrodes having juxtaposed surfaces, defining a chamber, comminuted resistance varying material in said chamber, and means for vibrating one of said electrodes, one of said surfaces being convex and domed and the other of said surfaces being frusto-conical and having its larger end nearer said one surface.

4. A telephone transmitter in accordance with claim 3 wherein said chamber defining means comprises an insulating member encompassing said domed surface and having a frusto-conical surface in juxtaposition thereto and inclined in the same direction as and of greater slope than said concave surface.

5. A telephone transmitter in accordance with claim 3 wherein said chamber defining means comprises an annular flexible insulating member, substantially S-shaped in section, encompassing said domed surface and extending from the larger end of said concave surface.

6. A telephone transmitter comprising a diaphragm, an electrode coupled to said diaphragm and vibratile therewith, said electrode having a convex substantially hemispherical surface, a fixed electrode having a frusto-conical surface coaxial with said hemispherical surface and in juxtaposition thereto, the smaller end of said frusto-conical surface being away from said hem-

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ispherical surface, means including said hemispherical and frusto-conical surfaces bounding a chamber, and comminuted resistance varying material in said chamber.

7. A telephone transmitter in accordance with claim 6 wherein said chamber bounding means comprises a frusto-conical insulating wall coaxial with, encompassing and spaced from said hemispherical surface, said wall being of greater slope than said frusto-conical surface and having its smaller end coincident with the larger end of said frusto-conical surface.

8. A telephone transmitter in accordance with claim 6 wherein said chamber bounding means comprises an annular flexible member of S-shaped section, coaxial with said hemispherical surface and extending between the said diaphragm and the larger end of said frusto-conical surface.

9. A telephone transmitter comprising means including a pair of electrodes and an insulating member between and spacing said electrodes, bounding a chamber, one of said electrodes having a domed portion and the other of said electrodes having a dished surface in juxtaposition to the convex face of said domed portion and having its base toward said domed portion, comminuted resistance varying material in said chamber, means for vibrating one of said electrodes, and an annular insulating insert in said dished surface adjacent the end thereof nearest said domed portion.

10. A telephone transmitter comprising a first electrode having a convex substantially hemispherical surface, a second electrode having a frusto-conical surface coaxial with and in juxtaposition to said hemispherical surface, the

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larger end of said frusto-conical surface being toward said hemispherical surface, means including said surfaces bounding a chamber, comminuted resistance varying material in said chamber, means for vibrating one of said electrodes, and an annular insulating insert in said second electrode adjacent the larger end of said frusto-conical surface, said insert having a frusto-conical surface coaxial with and opposite said hemispherical surface.

11. A telephone transmitter in accordance with claim 10 wherein the slope of said surface of said insert is greater than that of the frusto-conical surface of said second electrode.

12. A telephone transmitter comprising a pair of electrodes having juxtaposed surfaces, means including said surfaces bounding a chamber, comminuted resistance varying material in said chamber, and means for vibrating one of said electrodes, said surfaces being dished in the same direction and of different configurations such that the spacing between said surfaces is a minimum at an intermediate region and increases in both directions from said region.

HERBERT W. BRYANT.

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