Feb. 1, 1944. H. H. STANLEY 2,340,777

THROAT MICROPHONE

Filed Aug. 21, 1940

Fig. 2.

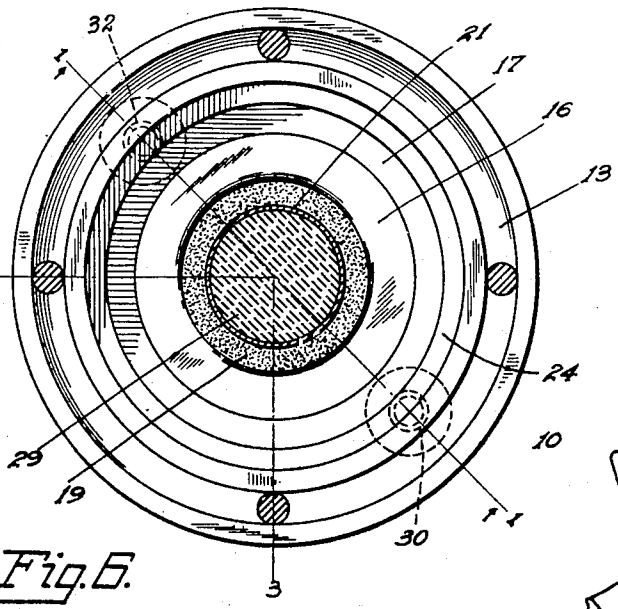

Fig. 6.

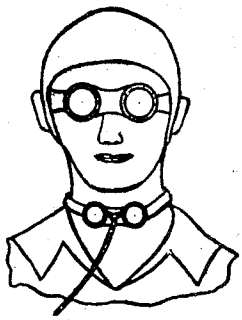

Fig. 5.

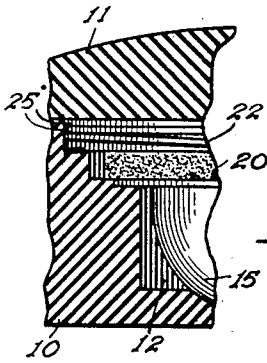

Fig. 3.

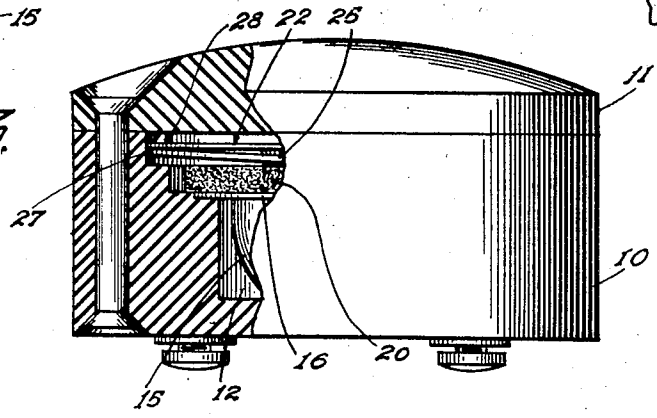

Fig. 1.

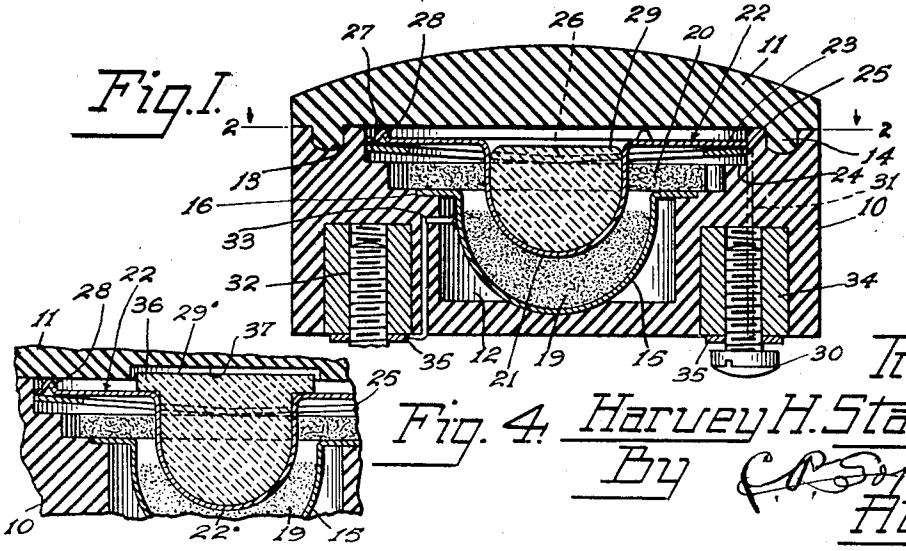

Fig. 4.

Inventor:
Harvey H. Stanley
By
Atty.

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UNITED STATES PATENT OFFICE

2,340,777

THROAT MICROPHONE

Harvey H. Stanley, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill., a corporation of Illinois

Application August 21, 1940, Serial No. 353,497

10 Claims. (Cl. 179—126)

This invention relates to telephone instruments in which an electric current is modified by passing through a pair of relatively movable electrodes connected by granular microphonic material, such as carbon, the resistance of which is variable under the influence of relative movement of the electrodes which is effected by sound vibrations.

The invention relates more particularly to telephone transmitters for use as throat microphones.

Conversation between pilots and observers in airplanes has been consistently difficult because of the headsets and helmets on the one hand and the interference with breathing on the other.

One object of the present invention contemplates avoidance of the aforementioned difficulties and the provision of a throat microphone capable of inexpensive commercial manufacture.

Another object of this invention is to provide a microphone which is sealed within a housing so that the housing moves relatively with respect to the movable electrode.

A further object is to provide a microphone having a housing which precludes direct mechanical or direct air wave actuation.

A further object is to provide a throat microphone of high sensitivity and simple construction.

Further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawing.

In the accompanying drawing, wherein like reference characters indicate corresponding parts in the various figures, and in which all the figures are on an enlarged scale, Fig. 1 is a diametral cross-section showing a device incorporating features of this inventive concept.

Fig. 2 is a transverse section taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is an elevational view partly broken away showing a partial section along the line 3—3 of Fig. 2.

Fig. 4 is an enlarged detail view showing a variation in the construction.

Fig. 5 shows device applied to a human throat.

Fig. 6 shows a further variation in certain details.

Considering the drawing in greater detail, in Fig. 5 the device is shown in use. In Fig. 1 a throat microphone or transmitter is shown comprising, preferably, a sealed casing forming a base part 10 and a throat engaging part or cover 11. The base part 10 contains a hollowed central portion 12 for receiving the electrodes. The casing is shown with inter-engaging, annular grooves and flanges 13 and 14 which, by the aid of a sealing medium, can effect a substantially air-tight joint.

Fixed electrode 15 has a substantially flat, annular portion 16 and is arranged to rest on a shoulder 17 of the supporting base. The central portion of this electrode comprises a semi-spherical microphone chamber and may have its inner surface coated with gold or other good conducting material. The semi-spherical chamber is filled with a microphonic material 19 comprising granular carbon positioned between the two electrode members of the microphone. A felt ring or washer 20 rests upon the annular portion of the fixed electrode and has a central aperture for receiving the semi-spherical portion 21 of the movable electrode or diaphragm 22. This latter is provided with a flat disc-like part 23 which is resiliently supported upon shoulder 24 by spring washer 25, the latter having portions 26 bent to rest upon the shoulder 24 and the portions 27 supporting the electrode.

The upper surface of the movable electrode 22 may be resiliently supported from the casing by spring washer members 25' as in Fig. 6 or it may be preferably positioned by means of spaced protuberances 28 as seen in Figs. 1 and 3. The relatively movable electrode 22 in Fig. 1 is weighted by an appropriate weighted mass 29, which may, for example, consist of a body of lead supported by beeswax, so as to provide a relatively greater inertia to the movable electrode. The effect of this mass and the resulting increased inertia is to cause the casing to move due to sound vibrations, and more especially voice vibrations from the human throat wearing the microphone, and causes relatively movable electrode 22 to remain stationary in space. The result of the relatively fixed position of the electrode 22 and the movement of the casing and its relative movement to the fixed electrode 15, causes a relative movement between the electrodes, and a variation in the electrical resistance of the circuit passing through the granular carbon, whereby current through the device is regulated in accordance with the sound or voice vibrations transmitted.

Terminal 30 is connected by conductor 31 to the movable electrode 22, and the second terminal 32 is connected to electrode 15 by means of a conductor 33. The bushing 34 may serve to provide a threaded socket for the terminal member 30 and the conductors 31 and 33 may be connected to conducting washers 35 to complete the conducting path.

In the preferred embodiment, the fixed electrode 15 has its semi-spherical portion seated in a socket in the casing.

In operation, the entire casing will be vibrated by contact with the outer walls of a person's throat and the consequent transmission of voice or other sound through the walls of the throat. The inertia of the mass 29 sets up a tendency for the movable electrode to resist motion. This results in relative movement between the electrode members 22 and 15 and a consequent change in the circuit resistance, as is well known in the art. In Fig. 4, a slight variation in the microphone construction is illustrated wherein the mass 29' extends above, and to a limited degree upon the flat, annular portion of the movable electrode 22', as shown at 36. The upper element of the casing is provided with a recess 37 to receive this enlarged mass.

The transmitter depends upon the vibration of the object with which it is in contact for its actuating force. The weighted diaphragm avoids recording of fluctuations at low frequencies, but the weight aids in recording minute vibrations at frequencies throughout the voice range. The spring washer tends to hold the diaphragm or load of the transmitter housing while at the same time acting in unison with the diaphragm to add to its resilience.

Other uses of the device will be apparent however.

Although a preferred embodiment of this invention is illustrated and described, variations within the true spirit and scope of the invention are to be determined by the appended claims.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a microphone transmitter, a supporting casing member, a fixed electrode, a shoulder on said casing member receiving the marginal part of said electrode, a flexible diaphragm, a movable electrode carried by said diaphragm and located adjacent the first electrode, microphonic material between said electrodes, a gasket closing the marginal space between said electrodes, a second and a third shoulder on said casing member, a casing cover fixedly abutting the third shoulder and sealing the microphone, and an annular spring lying on said second shoulder and effective to hold the periphery of the diaphragm against the cover.

2. A throat microphone comprising an enclosing casing including a cover forming a surface adapted to be pressed against the throat of the operator, means for holding said cover and casing together in fixed sealing engagement, an electrode supported in said casing, a flexible diaphragm in said casing, another electrode in said casing comprising the central portion of said diaphragm, microphonic material interposed between said electrodes, and spring means in said casing urging the peripheral portion of said diaphragm against said cover.

3. A throat microphone comprising a sealed casing composed of rigid insulating material, relatively movable electrodes mounted in said casing, one of said electrodes being rigidly in contact with said casing for vibration therewith, the other electrode being weighted and maintained free from rigid contact with the casing, microphonic material interconnecting said electrodes, said electrodes and microphonic material being sealed in by said casing, and a pair of lead-in wires extending through said sealed casing and connected respectively to said electrodes, said structure providing a rugged hermetically sealed housing of insulating material for the contained electrodes and interconnecting microphonic material.

4. In a microphone including a casing having an electrode-receiving chamber therein, a cover plate adapted to be placed on the casing to hermetically seal said chamber, said chamber being surrounded by a shoulder facing said cover plate, an electrode fixedly supported in said casing in firm contact therewith, a movable electrode lying between the fixed electrode and said cover, a diaphragm in said casing, said movable electrode being supported centrally on said diaphragm and having sufficient weight to cause relative movement of said electrodes to result from vibration of the casing as a whole along the axis of said diaphragm, the peripheral portion of said diaphragm lying between said cover plate and said shoulder, and an annular spring resting on said shoulder and urging the peripheral portion of said diaphragm into firm contact with said cover plate.

5. In a microphone including a casing having an electrode-receiving chamber therein, a cover plate adapted to be placed on the casing to hermetically seal said chamber, said chamber being surrounded by a shoulder facing said cover, an electrode fixedly supported in said casing in firm contact therewith, a movable electrode lying between the fixed electrode and said cover, a diaphragm in said casing, said movable electrode being supported centrally on said diaphragm and having sufficient weight to cause relative movement of said electrodes to result from vibration of the casing as a whole along the axis of said diaphragm, said cover and said shoulder defining an annular recess, the peripheral portion of said diaphragm lying within said recess, and an annular spring resting on one side of said recess and urging the peripheral portion of said diaphragm into firm contact with the other side thereof.

6. In a microphone of the contact type adapted to be placed into contact with a vibratory body to vibrate as a whole in response to vibrations of such body, said microphone containing a pair of separated electrodes with microphone material lying between them, one of said electrodes being maintained in firm contact with the vibrating structure of the microphone, the other of said electrodes being yieldably supported on a diaphragm, said other electrode comprising a raised hollow portion of said supporting diaphragm, formed integrally therewith, the hollow portion of said other electrode having material secured therein to weight such electrode so as to increase relative movement between the electrodes when the structure as a whole is vibrated.

7. In a diaphragm for use within a contact type of microphone in which the microphone as a whole is vibrated in response to vibrations imparted thereto by a vibratory body with which the microphone is in contact, said diaphragm having a raised hollow central portion adapted to form a movable electrode within the microphone to cooperate with an electrode fixed therein, said diaphragm being adapted to be retained in position by contact therewith around its periphery, the hollow part of said raised portion having heavy material fixed therein to weight the electrode portion of the diaphragm, whereby such electrode portion has a greater tendency

to remain stationary as the remaining portion of the microphone vibrates as a whole.

8. In a contact microphone, an enclosing rigid casing including a rigid cover adapted to be placed in contact with the body of the user to impart sound vibrations to the casing as an entirety, an electrode supported within said casing in contact with the portion thereof opposite said cover, a second electrode within said casing between the cover and the first-named electrode, said second electrode being yieldably supported in the casing and being weighted to cause it to remain relatively stationary as the first-named electrode vibrates with the casing, microphonic material lying between said electrodes, and electrical connections with said electrodes passing through the portion of said casing opposite said cover.

9. In combination, a microphone casing and an electrode adapted to be fixed in said casing, said electrode having the general form of a hollow hemisphere formed of sheet material and provided with an outwardly turned peripheral flange, the interior of said casing having a cylindrical recess therein surrounded by a counterbore, said electrode being positioned within said casing with the hemispherical portion thereof within said recess and contacting the bottom thereof, and with said peripheral flange lying within said counterbore.

10. In combination, a microphone casing, an electrode member of generally circular outline adapted to be fixed in said casing, the central and peripheral portions of said electrode member being maintained in contact with said casing, said casing being relieved, or cut away, in the region thereof intermediate said contact portions to confine the contact between said parts to the stated portions of said electrode member.

HARVEY H. STANLEY.