Jan. 19, 1926. 1,570,120

A. F. BENNETT

TELEPHONE DEVICE

Filed Dec. 6, 1923

Fig. 1

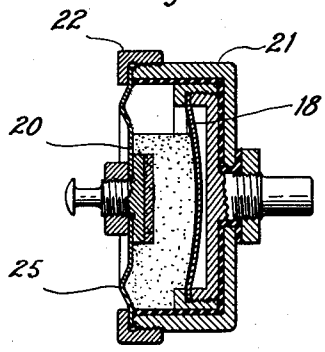


Fig. 3

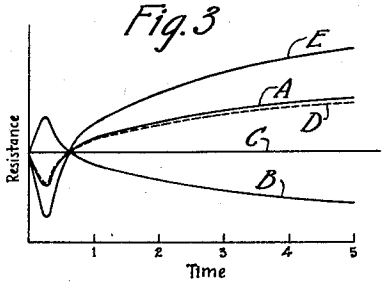
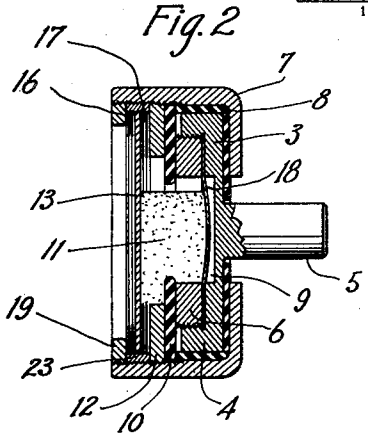


Fig. 2



Inventor:
Arthur F. Bennett.
by E. W. Adams Atty.

Patented Jan. 19, 1926. 1,570,120

UNITED STATES PATENT OFFICE.

ARTHUR F. BENNETT, OF RICHMOND HILL, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE DEVICE.

Application filed December 6, 1923. Serial No. 678,941.

To all whom it may concern:

Be it known that I, ARTHUR F. BENNETT, a citizen of the United States of America, residing at Richmond Hill, Long Island, in the county of Queens and State of New York, have invented certain new and useful Improvements in Telephone Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone devices and particularly to microphone devices employing comminuted material.

The object of the invention is to provide a telephone transmitter with means for automatically controlling the electric resistance of the microphone.

In accordance with the general features of the invention, a chamber containing a comminuted material has a thin dish-shape wall which operates by moving away from and toward the comminuted material to control in any predetermined manner the pressure changes caused by the heat generated by the current through the comminuted material.

In its preferred embodiment, the invention provides a microphone device in which the rear wall of the chamber for the granular material, is made of thin metal outwardly dished and has a lower thermal capacity and preferably a lower coefficient of expansion than the marginal walls so that under the initial heating of the comminuted material it will move outwardly and as the marginal walls become heated and expand, it will be caused to move inwardly, thus maintaining a pressure on the granular material such as will give the desired resistance versus time characteristic.

Referring to the drawing:

Fig. 1 is a longitudinal sectional view of a microphone embodying the invention in which the electrodes are disposed in opposite walls.

Fig. 2 is a longitudinal sectional view of a microphone embodying the invention in which the electrodes are disposed in the marginal walls.

Fig. 3 shows curves illustrating the operation of the invention.

Referring particularly to Fig. 2, this invention is shown applied to a transmitter of the type disclosed in the application of H. F. Dodge, Serial No. 525,898, filed December 30, 1921, which discloses a small vibratory diaphragm loosely supported between banks of paper rings. A metal cup 7, the walls of which are partially lined with a suitable insulating material 8 to insulate therefrom a circular plate 3, which is provided with an internally threaded flange 4 at its periphery, and a stud 5, which may be used for mounting the device, extending through an aperture in the base of the cup 7. The plate 3 is provided with a depression 9 across which is disposed a thin metal disk 18 shown dished slightly toward depression 9 and secured in place by means of an externally threaded annular electrode 6 engaging the flange 4. Against the electrode 6 is disposed an annular insulating member or barrier 10 secured in place by a second annular electrode 12 having threaded engagement with the cup 7, which serves as a chamber for the comminuted material 11 and the electrodes 6 and 12. The cup 7 is provided with a diaphragm closure 13 loosely supported between banks of washers 16 and 17 and held in place by means of the threaded ring 19, engaging the cup 7. A spacer ring 23 is provided between the electrode 12 and the ring 19. This spacer ring is sufficiently wide to prevent the diaphragm 13 from being clamped tightly between the washers 16 and 17.

The operation of the invention may be more readily understood by referring to Fig. 3, in which curve A represents the change in the resistance of the microphone due to the heating of the granular carbon and the marginal walls without the disk 18. Curve B represents the resistance changes due to the heating of the compensating disk 18 of a material such as iron or steel having a lower coefficient of expansion than the marginal walls which are preferably of brass. Curve C represents the resultant, and in this case the normal resistance of the microphone. It will be noted that in the case of curve A there is an initial negative change in the resistance. This is due to the fact that the resistance of the granular carbon decreases with its rise in temperature and the carbon expands faster than the walls expand to relieve the pressure and increase the resistance. However, as the walls gradually heat up and expand, the resistance change becomes positive as shown. In the case of curve B there is an initial increase in the resistance. This is due to

the outward bending of the compensating disk 18 which has a lower thermal capacity than the marginal walls and, therefore, heats up more rapidly. This outward bending causes a decrease in the pressure on the carbon with a consequent increase in the resistance, but as the walls heat up, the disk 18 tends to flatten under the stretching action of the marginal walls causing an increase in pressure with a corresponding decrease in resistance. By making the disk 18 completely compensate for the changes in the resistance indicated by the curve A the normal resistance of the transmitter will remain substantially constant as shown by the curve C.

In some systems, however, the initial resistance is of very short duration and relatively unimportant, whereas the final resistance is a dominating factor. In this case it may be desirable to have either a resultant decrease in resistance or a resultant increase in resistance and it is obvious from the curves that this may be accomplished by making the compensating disk 18 more or less responsive to the heat generated in the granular material and controlling its direction of operation. For example, if it is desirable to increase the transmitter resistance one way of accomplishing this is to reverse the compensating disc 18 so that it will bow toward the carbon granules thereby giving a resultant change in resistance as illustrated by curve E, which is the resultant of the curve D representing the resistance change due to the disk 18 being reversed, and curve A. For the same disk curve D would be identical with curve A. By this arrangement the resistance may be made to increase to a very high value. Another way of increasing the transmitter resistance is to make the compensator 18 of a material having a higher coefficient of expansion and a lower thermal capacity than the marginal walls and dishing it away from the carbon granules as before.

Fig. 1 shows a well-known type of direct action microphone in which the disk 18 may also serve as one of the electrodes, in which case, the surface presented to the granular material is preferably gold plated. The other electrode is carried in the well known manner by a diaphragm 20 securely clamped between the cup 21 and the clamping ring 22. In order to insure that the diaphragm 20 will always be moved in the same direction it is provided with a corrugation, 25. With the corrugation 25 as shown the diaphragm 20 will tend to decrease the transmitter resistance and if reversed it will tend to make it breathe up.

The invention provides a convenient arrangement for positively controlling the action of a transmitter. With it the resistance of the transmitter may be kept within the value graphically represented in Fig. 3 by the curve C to any desired value by the proper selection of the material shape and dimensions for the disk 18 and dishing it in or out as desired.

What is claim is:

1. In a telephone transmitter, a container for comminuted material, a resilient member located within said container in contact with the comminuted material, and a mounting for said member adapted to change the shape of said member in response to the heat variations in said comminuted material.

2. In a microphone device, comminuted material, a metal container therefor, a concavo-convex member mounted in the walls of said chamber and spaced from the rear wall and having its concave side in contact with the comminuted material, said member having a lower coefficient of expansion than said container walls.

3. In a microphone device, comminuted material, a container therefor having a rear wall, a thin metal concavo-convex disc in said container spaced from said rear wall, said disc having a lower coefficient of expansion than the walls of the container and being of lower thermal capacity than said container walls.

4. A microphone device, comminuted material, a container therefor, a concavo-convex shaped member in said chamber adapted to modify its shape in response to the heat variations in said comminuted material to vary the pressure thereon.

5. In a microphone device, comminuted material and a container therefor, having a rigid outside and an inside resilient wall having its periphery secured to said rigid wall, said walls having different thermal capacities and adapted to control the pressure on said comminuted material in accordance with the heat variations in said material.

In witness whereof, I hereunto subscribe my name this 30th day of November A. D., 1923.

ARTHUR F. BENNETT.