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J. E. AIKEN

MICROPHONE

Filed June 17, 1924

Fig. 1.

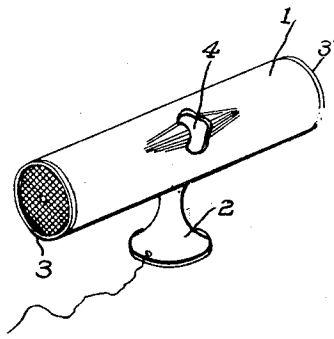


Fig. 4.



Fig. 2.

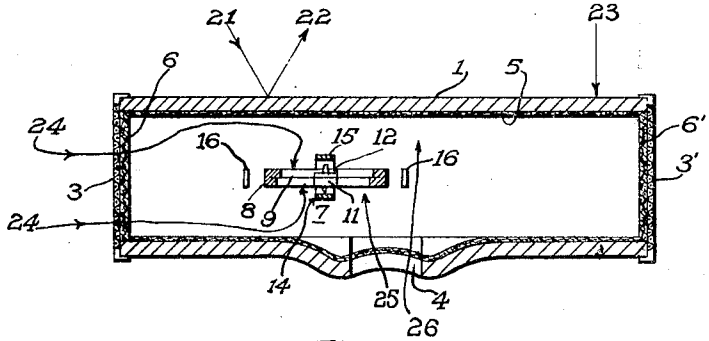
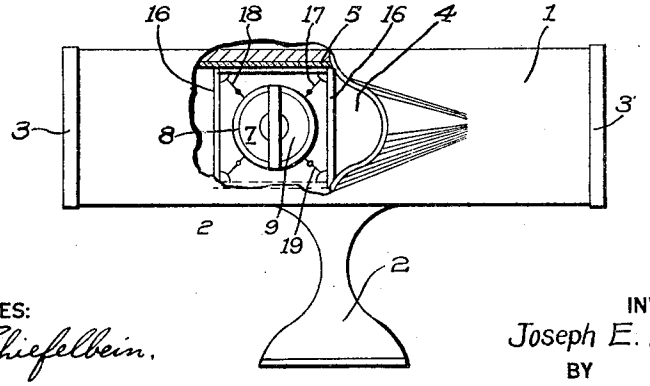


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MICROPHONE.

Application filed June 17, 1924. Serial No. 720,477.

My invention relates to microphones and it has particular relation to microphones of the "pick-up" type.

One object of my invention is to produce an improved microphone for use in connection with the transmission of announcements of public events.

Another object of my invention is to produce a microphone device and sound controlling means combined therewith whereby a preferential response to sound from a predetermined source can be obtained from the microphone.

Another object of my invention is to produce a microphone structure that is responsive only to a single predetermined sound source and which can, therefore, be operated satisfactorily in a noisy place.

Another object of my invention is to produce a microphone device that is responsive to a single speaker's voice and which can, therefore, be operated in a noisy location without interference from extraneous noises.

In the prior art of the construction and operation of microphone devices, it has been found that they respond substantially in a proportional manner to the intensity of any sound impinging upon their diaphragms.

When it is desired to obtain a translation of the vibratory motion produced by sound waves into vibratory electric currents, such as is desired for a sound "pick-up" to be used for the radio broadcasting of performances, much difficulty has been experienced in obtaining a response to the desired sounds and in avoiding response to extraneous sounds such as are produced by an audience, or by echoes of the source which it is desired to copy.

Particular difficulty has been experienced when it was desired to broadcast the voice of an announcer describing plays at an athletic event, such as a football game or a boxing match, where the cheering of the spectators produced a sound much greater in volume than the sound of the announcer's voice.

Microphones constructed according to the prior art have been found to be entirely impracticable under such conditions because of the fact that an announcer's voice is entirely lost in the extraneous sounds.

My invention provides means whereby the microphone is caused to respond to an announcer's voice only, and is prevented from responding to extraneous sounds such as cheering.

Other objects and structural details of my invention will be apparent from the following description when read in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of the device of my invention;

Fig. 2 is a horizontal sectional view of the microphone;

Fig. 3 is a view, partially in elevation and partially in section, of the microphone, and

Fig. 4 is a sketch in elevation of the microphone in operative relation to a speaker.

Referring to Fig. 1, a metallic cylinder 1, preferably of steel, is mounted upon a stand 2. The cylinder 1 has perforated metal closures 3 and 3′ at its ends. An aperture 4 is provided at substantially the central portion of the cylinder 1.

A cylindrical felt or other sound absorbing lining 5 is provided within the cylinder 1, and felt discs 6 and 6′ are placed within the perforated metal closures 3 and 3′. A double-button microphone 7 is shown within both the cylinder 1 and the lining 5. The microphone 7 comprises a frame 8, a diaphragm 9, granule containers 11 and 12 and supporting bridges 14 and 15 therefor. The microphone 7 is further mounted in a supporting frame 16 which is slidably mounted within the cylinders 1 and 5.

In Fig. 2, a double-button microphone is shown and described by way of example. Such a double-button microphone is not, however, essential, since I have found that any microphone which has both sides of its diaphragm exposed to sound waves is satisfactory.

Reference may now be had to Fig. 3 in which part of the cylinder has been broken away to show elastic supporting cords 17, 18, 19 and 20 for sustaining the microphone 7 within the frame 16.

In the operation of my device, extraneous sounds coming from random directions, as indicated by the arrow 21, (Fig. 2) are reflected from the smooth surface of cylinder 1, as shown by the arrow 22. This reflection occurs with all sounds, except such sounds as

strike normal to the surface of the cylinder 1, as shown by the arrow 23 (Fig. 2) which sound is conveyed through the body of the cylinder 1 to the felt lining 5 by which it is absorbed and destroyed. Sound from another direction such as indicated by the arrow 24 may enter the end of cylinder 1 through the perforated closure 3 and impinge upon microphone 7. Such sound does not, however, influence microphone 7 to produce a response, since the sound waves represented by arrows 24, being in phase, influence both sides of diaphragm 9 equally at a given instant, and, therefore, produce no vibration of diaphragm 9. There being no vibration corresponding to such sound, there can be no response by the diaphragm to such sound.

A sound from a speaker, such as that sound represented by arrow 25, enters through aperture 4 and impinges upon one side only of the diaphragm 9, thereby producing vibration of the diaphragm 9 and therefore a response. A sound from a speaker entering through aperture 4, such as that represented by arrow 26, which does not strike the diaphragm 9 is absorbed and destroyed by the felt lining 5 and, not being reflected, does not produce vibration of diaphragm 9 and therefore is without effect.

The edges of the aperture 4 conform to a speaker's face. This feature enables the speaker to place his mouth within the aperture, thereby filling it completely and preventing the ingress of extraneous sounds through aperture 4. The perforations of the end closures 3 and 3′ allow the speaker's breath free egress from the cylinder.

The amplitude of the response of microphone 7 to the speaker's voice may be controlled by shifting it lengthwise along the axis of cylinder 1. If placed directly opposite the aperture 4, a maximum response is obtained, since the direct path of sound wave causes it to impinge upon diaphragm 9. When a lesser amplitude of response is desired, the microphone 7 may be moved to a position not immediately in front of aperture 4. The greater distance then reduces the intensity of the sound striking the diaphragm by the inverse square factor and also allows the same sound, by the bending of the wave front around the edge of the frame 8, to influence the reverse side of diaphragm 9, thereby neutralizing a portion of the influence produced by sound upon the forward side of the diaphragm 9. By this means, it is possible to control the amplitude of the response obtained by the microphone, as well as to prevent response of the microphone to extraneous sounds.

The effect of mechanical impact and vibrations of the structure upon which the complete device is supported, which impact, if allowed free access to the device, would produce undesired fluctuations in the microphone currents, is prevented from influencing the microphone by an elastic supporting means, represented by the rubber cords 17, 18, 19 and 20 which support the microphone 7 within the frame 16.

By this means, I am able to obtain a maximum, or an optimum, responce of a microphone to a speaker's voice to prevent response of said microphone to other and extraneous sounds of greater magnitude than the speaker's voice.

While I have shown only one embodiment of my invention in the accompanying drawings, it is capable of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or set forth in the appended claims.

I claim as my invention:

1. In combination, a microphone and sound-shielding means therefor comprising a sound-reflecting cylinder having a side aperture, a sound-absorbing lining therefor, and sound-absorbent closures for the ends of said cylinder, said microphone being adjustably supported within said cylinder.

2. In combination, a microphone device having a diaphragm, both sides of which are exposed to sound, and sound-directive means comprising an apertured cylinder, a sound-absorbing lining therefor and sound-absorbent closures for the ends thereof, said microphone being flexibly mounted therein.

3. In combination, a microphone device having a diaphragm exposed on both sides to sound, and sound-directive means comprising an apertured cylinder, a sound-absorbing lining thereto and sound-absorbent closures for the ends thereof, said microphone being flexibly mounted therein with the plane of the diaphragm thereof parallel to the axis of said cylinder.

4. In combination, a microphone device having a diaphragm exposed on both sides to sound, and sound directive means comprising an apertured cylinder, a sound-absorbing lining therefor and sound absorbent closures for the ends thereof, said microphone being flexibly mounted therein adjacent to said aperture.

5. In a sound translating device, a tubular shield for confining extraneous sounds to directions along the tube, said shield having a lateral opening for the admission of sound from a given source and a sound-responsive device including a diaphragm within the shield and parallel to the length thereof.

In testimony whereof, I have hereunto subscribed my name this 3rd day of June, 1924.

JOSEPH E. AIKEN.