Dec. 18, 1928. 1,695,875

J. E. AIKEN

MICROPHONE SYSTEM

Filed July 2, 1925

Fig. 1.

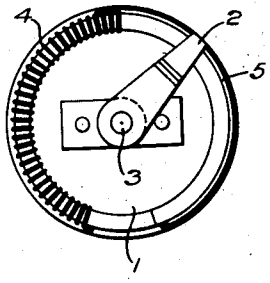


Fig. 2.

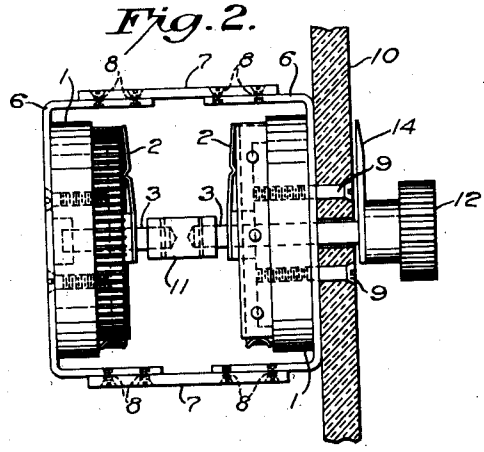
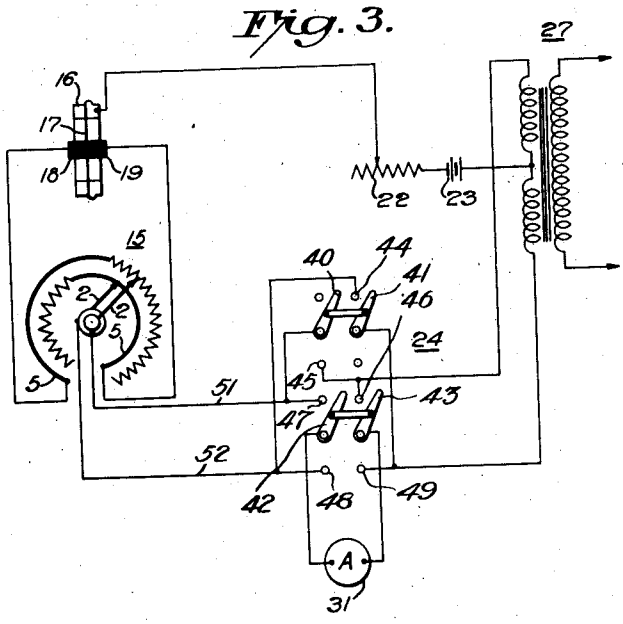


Fig. 3.



WITNESSES:

G. S. Neilson

H. P. Hinchline

INVENTOR

Joseph E. Aiken.

BY

Wesley G. Carr

ATTORNEY

Patented Dec. 18, 1928. 1,695,875

UNITED STATES PATENT OFFICE.

JOSEPH E. AIKEN, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

MICROPHONE SYSTEM.

Application filed July 2, 1925. Serial No. 41,179.

My invention relates to microphone systems and particularly to regulating means therefor.

An object of my invention is to provide a balancing means for regulating the output of a duplex or "double button" microphone.

Another object of my invention is to provide a convenient means for controlling the current value through the opposite resistors in a duplex microphone.

Another object of my invention is to provide a regulating means having resistor elements which are alternatively effective under the control of contact arms which are simultaneously movable.

In the operation of duplex microphones, it has been found that frequently there is a difference in the quiet resistance of the granules in the respective granule cups on opposite sides of the diaphragm. This difference in resistance appears to be due to minor differences in the quantity of granules in the cups and to minor differences in the tightness of packing. It results in differences in the current value in the opposite respective granule resistors and thus results in differences in the variable-current component produced.

It is well known that the single resistors of a microphone do not give strict proportionality of translation of sound vibrations into electrical vibrations, but it has been found possible, by the use of two microphone resistors operated by a single diaphragm, as in the duplex type, to cause the deviation of the change in resistance from strict proportionality to occur in opposite directions and thereby to neutralize each other. This occurs only when the current through the two resistors is the same.

In order to equalize the current flow through the two granule resistors, I have provided a special rheostat and a special system of connections which enable me readily to equalize the currents.

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 plan view of a portion of a rheostat embodied in my invention:

Fig. 2 is a side view of the complete rheostat, and

Fig. 3 is a diagrammatic view of circuits and apparatus of the system of my invention.

I provide, as a part of my invention, a rheostat, shown in Fig. 1 and having a base portion 1, a contact arm 2 attached to a shaft 3, and moving over a resistance winding 4 and a non-resistive contact bar 5 connected thereto.

In a complete rheostat, two of the members shown in Fig. 1 are mounted face-to-face, as shown in Fig. 2. The base member 1 of each rheostat is attached to a metal frame 6 which frames are connected by insulating members 7 and screws 8. The base member 1 of the outer rheostat is clamped against its frame 6 by screws 9 which may pass through a supporting plate 10. An insulating coupling 11 is provided between the shafts 3 of the respective rheostats and serves to cause the contact arms 2 to move simultaneously under the control of a knob 12. The position of the contact arms is indicated by a pointer 14.

The duplex rheostat device of Fig. 2 is shown diagrammatically at 15 in Fig. 3, with suitable circuit connections thereto.

Referring to Fig. 3, a double-button microphone has a frame 16, a diaphragm 17 and resistors 18 and 19. The frame 16 and diaphragm 17 of the microphone are connected to a rheostat 22 and battery 23.

The microphone resistor 18 is connected to the contact bar 5 of one of the rheostats shown in Fig. 2, and the resistor 19 is connected to the other contact member 5 of the second rheostat element of Fig. 2. Separate connections are made from the respective contact arms 2 to a switching device 24.

The device 24 may be aptly described as a quadruple-pole, double-throw switch, comprising switch blades 40, 41, 42 and 43 and associated active contact elements 44, 45, 46, 47, 48 and 49. A conductor 51 connects the inner contact arm 2 to the blade 40, and to the contact element 47, and a conductor 52 connects the outer contact arm 2 to the contact elements 44 and 48.

In one position of the device 24, a circuit may be traced from the resistor 22 through the diaphragm 17, resistor 18, outer rheostat element 5, the inner contact arm 2, conductor 51, contact 47, switch blade 42, ammeter 31, arm 43, upper primary winding of the transformer 27, battery 23 and back to the resistor 22. Another circuit may be traced from the resistor 22, through the diaphragm 17, resistor 19, inner rheostat element 5, outer contact

arm 2, conductor 52, contact element 44, switch arm 41, lower primary winding of the transformer 27, battery 23, and back to the resistor 22.

When the switching device 24 is moved to its second operative position, the ammeter 31 is included in circuit with the microphone resistor element 19, while the microphone resistor element 18 is placed directly in circuit with the upper primary winding of the transformer 27. It is believed unnecessary to describe, in detail, the specific circuits involved when the switching device is in the second position, as they are sufficiently obvious on inspection of the drawing.

Attention is called to the fact, however, that, by a simple movement of the switching device, the ammeter may be included in circuit with either of the microphone resistors, thus permitting an observation to be made of the current flowing therethrough.

The rheostat 15 is so assembled that the midposition of the contacts 2 provides a point at which no resistance is included in either of the circuits to the resistors 18 and 19. By means of this construction, a slight movement of the knob in either direction will selectively insert resistance gradually into one only of the resistor circuits and in accordance with the direction of movement.

In the operation of my device, the rheostat 22 may be so adjusted, with the ammeter 31 in one of the resistor circuits, that the reading of the ammeter 31 is about one half of the desired total current through the microphone. The rheostat 15 may then be adjusted to the one or the other side of its midposition until, upon changing the ammeter 31 from one circuit to the other, it shows that equal currents are flowing through the resistors 18 and 19.

By means of my invention, I am enabled to provide a duplex microphone system containing a special rheostat, by means of which it is possible to adjust the variable-component output of the microphone members in such way as to obtain precise neutralization of the irregularities produced by the device, and I have further provided indicating means whereby this condition of equality may be demonstrated.

While I have shown but a single embodiment of my invention in the accompanying description, it is capable of various modifications therefrom, and it is desired, therefore, that only such limitations shall be imposed thereon as are required by the prior art or indicated in the appended claims.

I claim as my invention:

1. Regulating means for a differential microphone having an input terminal and output terminals comprising a rheostat connected to the input terminal, a duplex rheostat having two sections respectively connected to the output terminals of the microphone and being alternatively insertable in circuit therewith, and common control means for said rheostat.

2. Regulating means for a differential microphone having an input terminal and output terminals comprising a rheostat connected to the input terminal, a duplex rheostat having two sections respectively connected to the output terminals of the microphone and being alternatively insertable in circuit therewith, a single control device for said duplex rheostat, and means for selectively connecting an indicating device to said output terminals.

3. A microphone system comprising a microphone having two variable-resistance elements, a transformer having two primary coils oppositely effective and connected, respectively, to said microphone resistors, and a duplex rheostat connected therebetween having sections that are respectively connected to said microphone resistors, simultaneously operable, and alternately effective.

4. A microphone system comprising a microphone having a single diaphragm and two vibration-responsive resistors respectively on opposite sides thereof, and means respectively connected in circuit with said resistors to be simultaneously operable and alternately effective to control said resistors.

5. In combination, a differential microphone, means for simultaneously inserting a resistor in circuit with one of the elements thereof and removing a resistor from a circuit connected to another of the elements, means for supplying talking current, means for indicating the amount of current flowing in each portion of the microphone, and means for switching the current-indicating means from one to another of the microphone circuits, whereby the current flowing through the microphone in its quiet state may be equalized.

In testimony whereof, I have hereunto subscribed my name this 24th day of June, 1925.

JOSEPH E. AIKEN.