

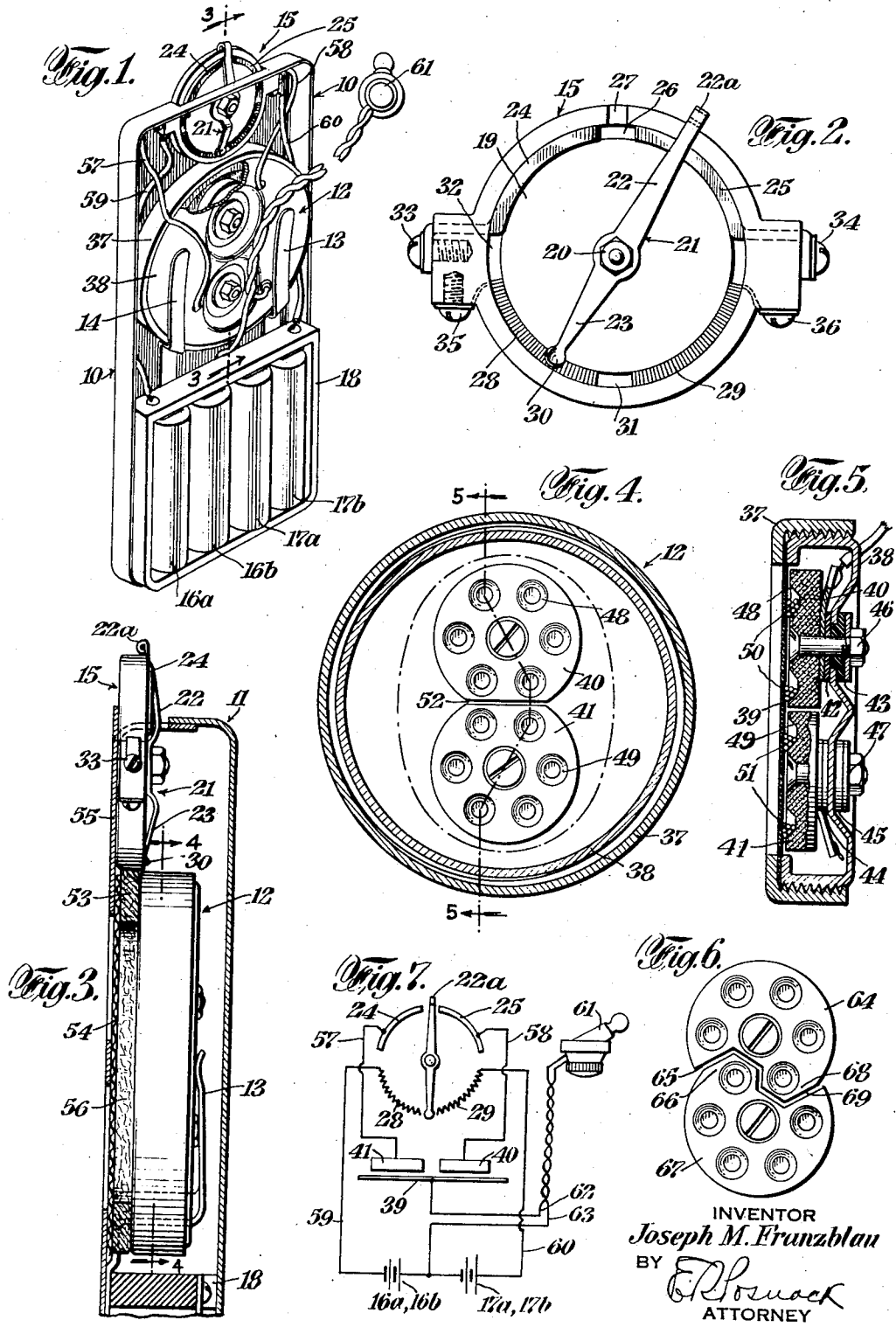
Dec. 12, 1939.

J. M. FRANZBLAU

2,182,865

ACOUSTICAL DEVICE

Filed March 4, 1938



INVENTOR
Joseph M. Franzblau
BY
E. Rosnack
ATTORNEY

UNITED STATES PATENT OFFICE

2,182,865

ACOUSTICAL DEVICE

Joseph M. Franzblau, Brooklyn, N. Y., assignor
to Colonial Earphone Co. Inc., New York,
N. Y.

Application March 4, 1938, Serial No. 193,912

10 Claims. (Cl. 179-107)

This invention relates to an acoustical device, and particularly to a special embodiment thereof adapted for use in an earphone for the deaf.

Devices of this general class are in extensive use, most of them containing certain common elements such as a diaphragm, one or more carbon buttons engaging the diaphragm and electrically connected to a switch, and batteries. And in many devices of this character, the said carbon buttons have a number of recessed portions each containing a plurality of very small carbon balls adapted for oscillatory engagement with the adjacent diaphragm. It is an accepted fact, however, that acoustical devices containing the above-referred-to elements have certain shortcomings, one of the most serious being the loss of efficiency of the device due to fatigue of certain of these elements during continuous operation. For example, if the device has been used continuously over a period of time, as it must of necessity be when employed as an earphone for a deaf person, the fatigue of the battery will begin to manifest itself by a loss of efficiency of the receiver. The said diaphragm-engaging carbon buttons will also become subject to fatigue, as well as the above-referred-to carbon balls. The latter, because of their shape and size, and the mechanical and electrical action to which they are subjected, will have internal heat generated therein,—a factor in fatigue,—with a consequent loss of efficiency. Hence in most of the acoustical devices containing the above elements, it frequently becomes necessary to switch off the current from the battery to give the various parts some rest, whereby they will be brought back to normal effectiveness after a period of time. Obviously, such an interruption of operation is exceedingly inconvenient and annoying to the person using the earphone.

It is one of the objectives of my invention to obviate the above-mentioned shortcomings by enabling an acoustical device of this general structure to effectively remain in continuous use with practically no interruption because of fatigue of any of the elements. And in this aspect of my invention, another object is to prolong the life of certain of the elements by enabling them to be periodically relieved of their respective operative loads without discontinuing the operation of the device.

It is also within the contemplation of my invention to provide a combination switch and rheostat that will conveniently enable the wearer of the acoustical device to alternately put into

operation certain supplementary elements when it is noticed that the effects of fatigue are beginning to manifest themselves, whereby the device can be kept in continuous and uninterrupted effective use at all times.

Another object of my invention is to produce a longer effective life of an acoustical diaphragm, particularly when made of carbon, by providing protective means against the bombardment of the above-referred-to carbon balls situated within the recesses of the carbon buttons.

And still another object is to provide a device of this character with absorbing means for the purpose of eliminating unwanted noises caused by the vibration of certain of the structural parts of this device. And in this aspect of my invention, another object is to provide improved resonance means in a device of this character.

It is also within the contemplation of my invention, in one form thereof, to enable two carbon diaphragm-engaging buttons to be employed for alternate use whereby both of said buttons are sufficiently near the center of the diaphragm for efficient operation.

It is my further purpose to enable all the above-stated objectives to be effectuated and accomplished in a simple, readily constructed and compact structure.

Other objects, features and advantages will appear from the drawing and the description hereinafter given.

Referring to the drawing,

Figure 1 is a perspective rear view of the acoustical device constituting my invention, the back cover being removed.

Figure 2 is an enlarged rear view of the combination switch and rheostat shown in Figure 1.

Figure 3 is a fragmentary vertical section taken substantially along line 3-3 of Figure 1, the diaphragm casing and the switch and rheostat being shown in elevation.

Figure 4 is a section through the diaphragm casing taken along lines 4-4 of Figures 3 and 5.

Figure 5 is a section of Figure 4 taken along line 5-5.

Figure 6 is a rear view of a modified form of the carbon buttons employed in this invention, and

Figure 7 is a semi-diagrammatic representation of the elements of this invention, including a wiring diagram.

In the drawing, the outer casing or housing 10, over which the cover 11 is adapted to be positioned (as shown in Figure 3), contains therein the diaphragm casing 12 preferably supported

by the clips 13 and 14 mounted on housing 10, the combination switch and rheostat 15 and two sets of batteries, one set consisting of the cells 16a and 16b and the other set consisting of the cells 17a and 17b, these batteries being shown supported by the frame 18 suitably secured to the housing 10.

The said switch and rheostat 15 contains a disc-like member 19 of insulating material at the center 20 of which is rotatably mounted the contact member 21 containing the radial arms 22 and 23 forming a continuous electrical conductor. The contact terminals or segments 24 and 25, made of a conducting material such as copper, are preferably slightly elevated above the level of disc 19 to enable ready contact to be made with the arm 22. Said contact bars are separated by the recessed portion 26 which is radially continuous with the recess 27 for receiving a portion of the arm 22 when it is manipulated into its neutral position. The lower portion of the disc contains two independent coils of resistance wire 28 and 29, preferably slightly elevated above the disc 19 to enable ready contact to be made with the terminal 30 of arm 23. It will be noted that said coils 28 and 29 are separated by a recessed portion 31 which is adapted to receive the terminal 30 when the member 21 is rotated into neutral position. In the form illustrated, the disc 19 is shown with a circular groove 32 within which the contact bars 24 and 25 and the resistance wires 28 and 29 are set, this being a preferred arrangement. The terminal binding posts 33 and 34 are electrically connected to the bars 24 and 25 respectively, and the binding posts 35 and 36 are connected to the resistance elements 28 and 29 respectively, it being understood that other forms of connecting means may be employed in lieu of said binding posts, within the scope of this invention.

The diaphragm casing 12 preferably consists of a hollow shell 37 (see Figure 5) within which is mounted the complementary shell 38, the diaphragm 39 being clamped in operative position therebetween, in the particular construction illustrated. The two carbon buttons 40 and 41 are suitably supported upon the shell 38 and electrically insulated therefrom by the washers 42, 43, 44 and 45. Electrically connected to the buttons are the binding posts 46 and 47 adapted to receive the terminals of wire conductors. The said carbon buttons 40 and 41 contain a number of substantially cup-shaped recessed portions 48 and 49 each of these containing therein a plurality of small carbon balls 50 and 51 respectively. Said buttons 40 and 41 are positioned in such close proximity to the diaphragm 39 as to enable said carbon balls 50 and 51 to come into engagement with the rear surface of the diaphragm without dropping out through the space between the buttons and the diaphragm. Cognizance is taken of the fact that this button and ball arrangement is known in the art.

The said buttons 40 and 41 are adjacent to each other but nevertheless separated by a gap 52, the adjacent portions of said buttons preferably being flat so as to bring both of the buttons closer to the center of the diaphragm than would be the case if they were both absolutely circular. The inner or rear surface of the diaphragm 39 is preferably gold-plated over at least the area thereof covered by the said buttons, the elliptical dot-dash line of Figure 4 showing the approximate limitations of said gold-plated area.

In the operation of this device, the balls 50 and 51 are caused to vibrate to produce what in effect is a bombardment of the diaphragm 39. When a diaphragm is made of carbon, such a bombardment generally causes a gradual breaking away or wearing out of certain portions of the diaphragm, making frequent replacements necessary. By gold-plating the area thereof adjacent the buttons, such a bombardment will not have any harmful effect upon the diaphragm, and will enable clean contact to be obtained between the carbon balls and the diaphragm, thereby eliminating transmitter noises and producing efficient results. The use of gold-plate is particularly preferable in view of the fact that it is not subject to oxidation or tarnishing.

By referring to Figure 3 it will be seen that the diaphragm casing 12 is mounted upon an annular felt base 53 which in turn is mounted upon the metal screen 54 secured to the front plate 55 of the housing 10. This felt base 53 not only serves as an acoustic absorber to eliminate the interfering effects of the mechanical vibration of the metallic parts in the structure, but also serves as a spacer between the casing 12 and the screen 54, thereby providing a chamber 56 which will tend to enhance the resonance of the apparatus.

In describing the operation of this device, reference will particularly be made to Figures 1, 2 and 7 which show the electric conductors 57 and 58 connecting the contact bars 24 and 25 with the corresponding buttons 40 and 41, said conductors being attached to the terminals 33 and 34. The conductor 59 connects the resistance coil 28 to the set of batteries 16a and 16b, this conductor being secured to the terminal 35; and the conductor 60 connects the resistance coil 29 to the set of batteries 17a and 17b, said conductor being connected to the terminal 36. The receiver 61, of conventional structure, is electrically connected by the conductors 62 and 63 to the diaphragm 39 and the batteries, respectively.

In setting this device into operation, the protruding portion 22a of contact member 21 is manipulated to operatively rotate the member, whereby the arms 22 and 23 are brought into electrical contact with said contact bars and corresponding resistance coils. For example, by referring to Figures 2 and 7, the member 22 had been rotated slightly clockwise from the neutral spaces 26 and 27, so that the arm 22 is shown to be in electrical engagement with the contact bar 25, and the arm 23 in electrical engagement with the resistance coil 28. This forms a complete circuit through the one set of batteries 16a and 16b, the diaphragm, the buttons and the ear-phone receiver 61, whereby the device is rendered operative. It is, of course, obvious that by continuing the clockwise rotation of member 22, more of the coils of the resistance element 28 will be cut out, and hence greater amplification will be obtained.

If the device is maintained in continuous use for a period of time in the above position, fatigue will set in not only within the batteries 16a and 16b, but also within the button 40 and the carbon balls 50, for the reasons as aforesaid. The wearer of the device will generally be able to notice when this occurs by its decreased efficiency. All that he need hence do is to move the contact member 22 to the oppositely disposed resistance coil and contact segments. In other words, by simply rotating member 22 from the position shown in Figure 2 to a position where the arm 22

engages the contact bar 24, and the arm 23 engages the resistance element 29, the circuit through button 40 and cells 16a and 16b will be broken and a new circuit established through the cells 17a and 17b, the button 41 and balls 51. Inasmuch as these elements are more or less fresh and free from fatigue, they will operate at their maximum efficiency. Hence by a simple manipulation on the part of the wearer of this device, one set of operative elements is given an opportunity to rest while another set of fresh elements is brought into action, all without interrupting the operation of the entire device. The combination switch and rheostat of Figure 2 readily makes this operation possible, in view of the relative positioning of the rheostatic and contact elements, and the convenient location of the member 21 for manual manipulation.

In the form of carbon button shown in Figure 6, an interlocking arrangement is illustrated. The upper button 64 contains a recessed portion 65 within which the protruding portion 66 of the lower button 67 is positioned, the protruding portion 68 of button 64 extending within the recessed portion 69 of lower button 67. The arrangement is such as to bring both of the buttons closer towards the center of the diaphragm with which they are associated, thereby enabling each button to independently operate at greater efficiency than would be the case if these buttons were farther removed from said center. It will also be noted that the said buttons are of the general form of the buttons 40 and 41, and are also separated by a gap.

It is of course understood that the various embodiments above described and shown in the drawing are illustrative of my invention and not employed by way of limitation, inasmuch as numerous changes and modifications may be made within the scope of the appended claims without departing from the spirit of this invention.

What I claim:

1. In an acoustical device, a housing, and suitably supported therein an electric battery, two-way switch means containing two independent contact terminals and a movable contact member selectively engageable upon manual manipulation alternately with either one or the other of said contact terminals, acoustical oscillating means containing a diaphragm and two adjacent buttons of conducting material adapted for operative engagement with the diaphragm and having portions flanking the center thereof, electric conducting means connecting one of said terminals with one of said buttons and the other terminal to the other button, an earphone electrically connected to said diaphragm and said battery, and electrical conductors connected to the battery and adapted for engagement with said movable contact member whereby the earphone is operable by the circuit through either one or the other of the buttons, in accordance with the selective operative manipulation of the contact member.

2. In an acoustical device, a housing, and suitably supported therein acoustical oscillating means, two independent electric batteries, two-way switch means containing two independent contact terminals and a movable contact member selectively engageable upon manual manipulation alternately with either one or the other of said contact terminals, said oscillating means containing a diaphragm and two adjacent buttons of conducting material adapted for operative engagement with the diaphragm and adja-

cent the central portion thereof, electric conducting means forming a circuit through one of said contact terminals, the movable contact member when engageable therewith, one of said batteries and one of said buttons, supplementary conducting means forming a circuit through the other of said contact terminals, the movable contact member when engageable therewith, the other of said buttons and the other of said batteries, and an earphone electrically connected to said diaphragm and said batteries, whereby the earphone is operable by the circuit through either one or the other of the batteries and through the corresponding button, in accordance with the operative manipulation of the movable contact member.

3. In an acoustical device, a housing, and suitably supported therein acoustical oscillating means, two independent electric batteries, two-way switch means containing two independent contact terminals, two corresponding independent resistance elements and a movable contact member operatively engageable upon selective manual manipulation with one or the other of said terminals and the corresponding resistance element, said acoustical means containing a diaphragm and two adjacent buttons of conducting material adapted for operative engagement with the diaphragm and adjacent the central portion thereof, conducting means electrically connecting one of said terminals, its corresponding resistance element, one of said buttons and one of said batteries, and supplementary conducting means electrically connecting the other of said terminals its corresponding resistance element, the other of said buttons and the other of said batteries, and an earphone electrically connected to said diaphragm and said batteries, whereby the earphone is operable by the circuit through either one or the other of the batteries and through the corresponding button, in accordance with the operative manipulation of the movable contact member.

4. An acoustical device containing the combination according to claim 3, the said buttons containing a plurality of recesses in facing relation to the diaphragm, and a plurality of relatively small balls of conducting material contained therein and engageable with the diaphragm, the said buttons and diaphragm being spaced apart a distance less than the diameter of any of the balls.

5. An acoustical device containing the combination according to claim 3, the rear surface of the diaphragm being gold-plated over that portion thereof adjacent said buttons and adapted for operative engagement therewith.

6. In an acoustical device, a housing, and suitably supported therein acoustical oscillating means, two independent electric batteries, two-way switch means containing two independent elongated contact bars, two corresponding independent resistance coils of substantially the length of said contact bars, and a rotatably mounted contact member containing two radial arms forming a continuous electrical conductor, a supporting member associated with said switch means and upon which are operatively mounted said contact bars, resistance coils and contact member, one of said radial arms having a portion thereof extending through said housing for manual manipulation and being engageable, upon selective manual manipulation, with either of said contact bars while the other of said radial arms is in engagement with the corresponding resistance

coil, said acoustical means containing a diaphragm and two adjacent buttons of conducting material adapted for operative engagement with the diaphragm and having portions flanking the center thereof, conducting means electrically connecting one of said contact bars, its corresponding resistance coil, one of said buttons and one of said batteries, and supplementary conducting means electrically connecting the other of said contact bars, its corresponding resistance coil, the other of said buttons and the other of said batteries, and an earphone electrically connected to said diaphragm and said batteries, whereby the earphone is operable by the circuit through either one or the other of the batteries and through the corresponding button, in accordance with the operative manipulation of the movable contact member.

7. In an acoustical device, a housing, and suitably supported therein acoustical oscillating means, two independent electric batteries, two-way switch means comprising a disc-like member of insulating material, a contact member rotatably mounted at the center of the said disc and containing two oppositely extending radial arms forming a continuous electrical conductor, two independent adjacent contact bars of substantially arcuate form disposed near a peripheral portion of the said disc and separated by a relatively small gap, two independent adjacent resistance coils of substantially arcuate form disposed near a peripheral portion of said disc diametrically opposite to that of said contact bars and separated by a relatively small gap, the said opposite radial arms being adapted, upon an operative rotatable manipulation of the contact member, for simultaneous slidable engagement with either of said contact bars and the corresponding resistance coil when in an operative position, and for simultaneous positioning in both of said gaps when in a neutral position; said acoustical means containing a diaphragm and

two adjacent buttons of conducting material adapted for operative engagement with the diaphragm and having portions flanking the center thereof, conducting means electrically connecting one of said contact bars, its corresponding resistance coil, one of said buttons and one of said batteries, and supplementary conducting means electrically connecting the other of said contact bars, its corresponding resistance coil, the other of said buttons and the other of said batteries, and an earphone electrically connected to said diaphragm and said batteries, whereby the earphone is operable by the circuit through either one or the other of the batteries and through the corresponding button, in accordance with the operative manipulation of the movable contact member.

8. An apparatus according to claim 7 wherein the two-way switch means is contained within a casing having an aperture therein, a portion of one of said radial arms extending through said aperture whereby it can be grasped for manual manipulation.

9. An apparatus according to claim 7 wherein the said disc contains on a face thereof a circular groove, the said contact bars and resistance coils being partially set and retained within said groove, and partially extending therefrom above the surface of the disc, whereby the radial arms will form operative contact therewith without engaging the surface of the disc.

10. In an acoustical device the combination according to claim 6, further provided with a casing within which said acoustical oscillating means are operatively supported, said casing being contained within the said housing of the device and in spaced relation to the front wall thereof, and an annular resilient base secured to the said front wall of the housing and upon which said casing is mounted, thereby providing a resonance chamber between the casing and the wall of the housing.

JOSEPH M. FRANZBLAU.