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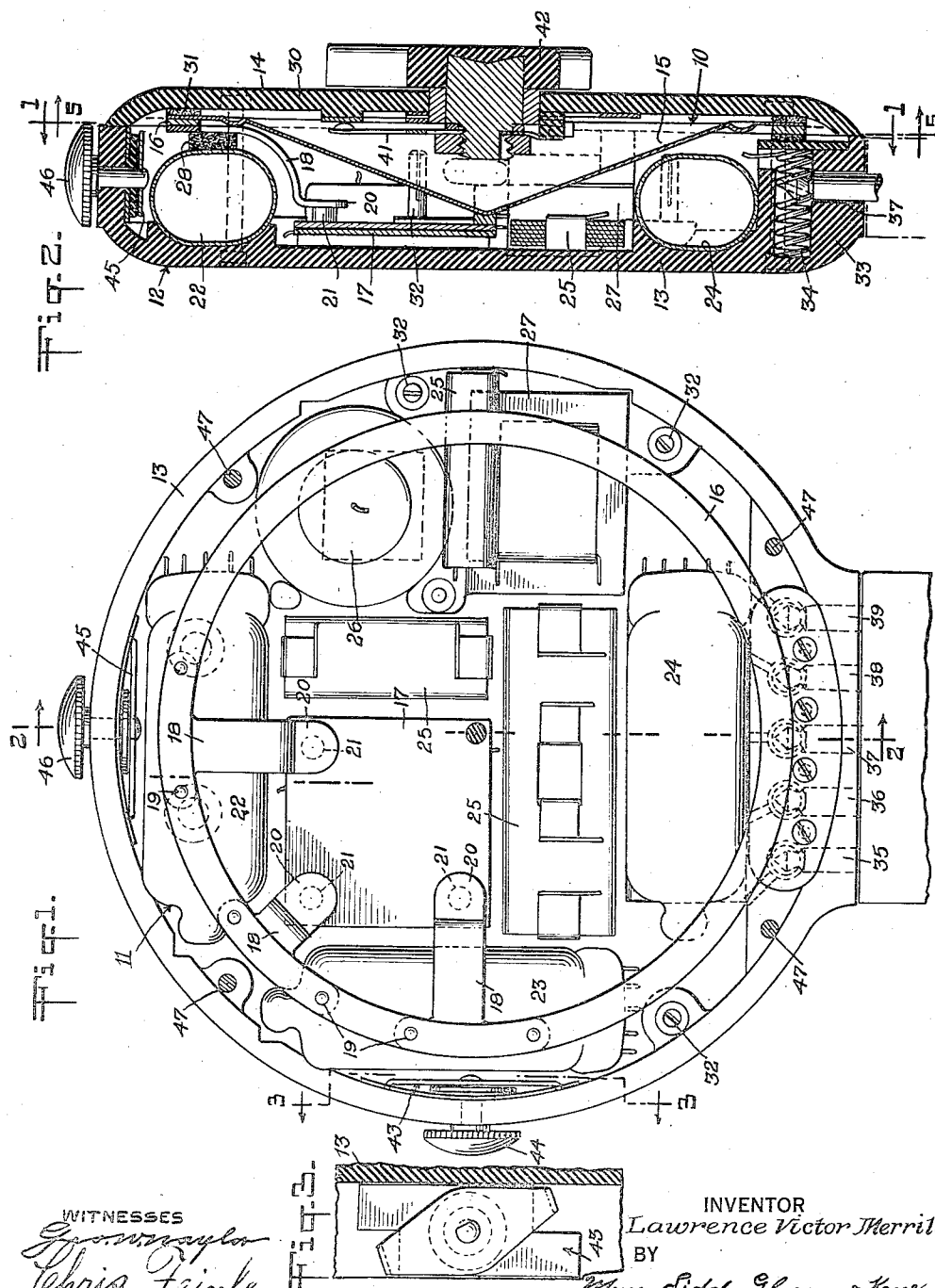
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2,386,705

TRANSMITTER

Filed June 18, 1941

2 Sheets-Sheet 1



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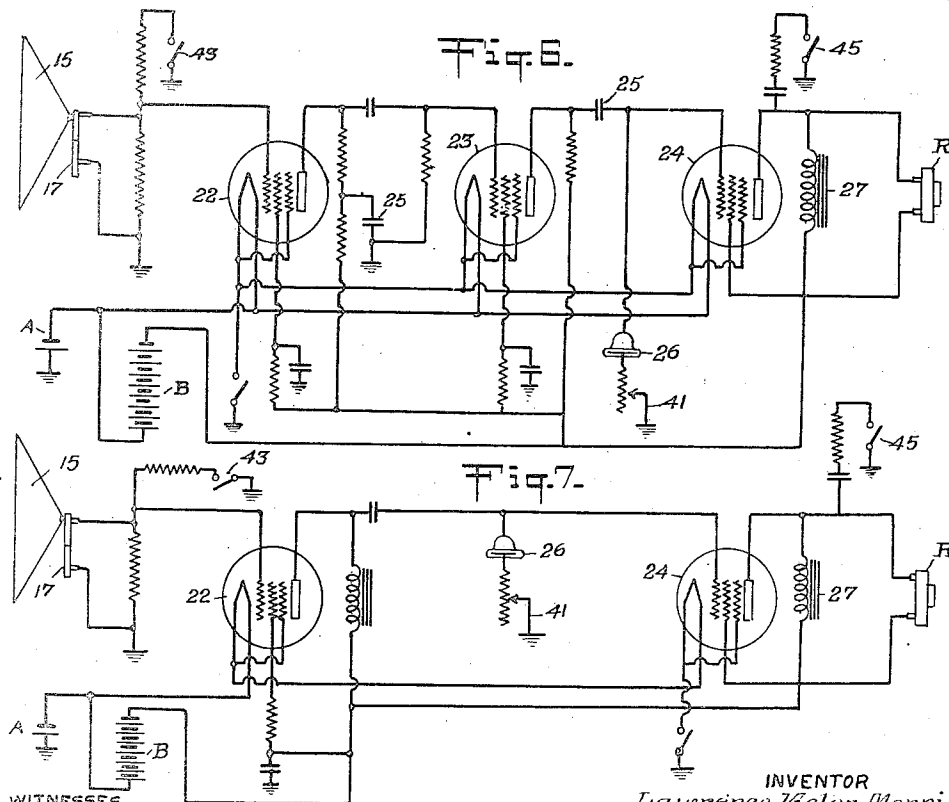
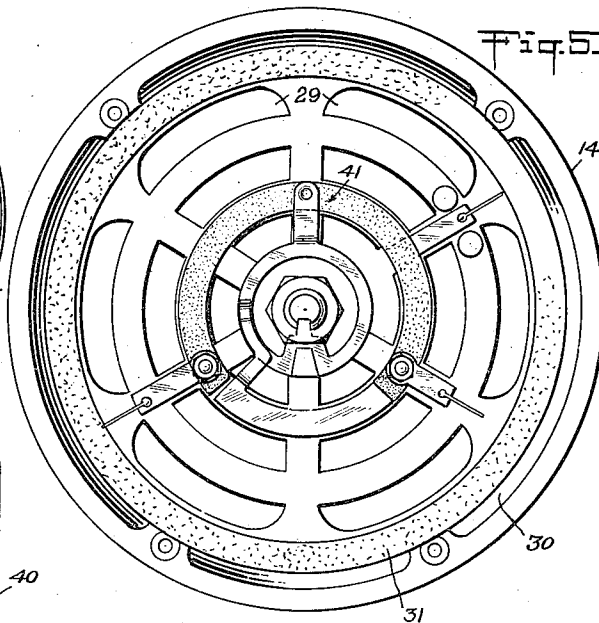
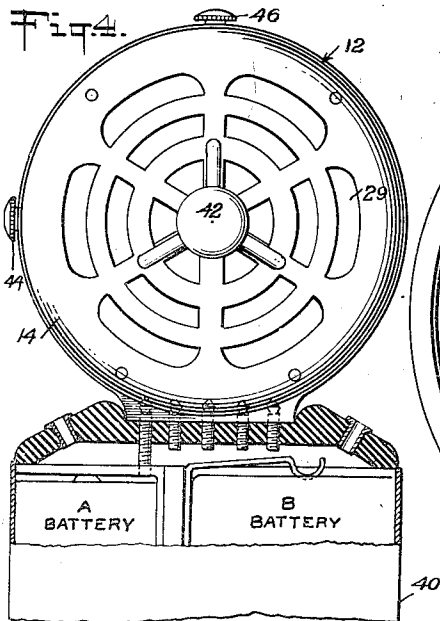
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TRANSMITTER

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2 Sheets-Sheet 2



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2,386,705

TRANSMITTER

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Application June 18, 1941, Serial No. 398,528

2 Claims. (Cl. 179-107)

This invention relates to improvements in devices which pick up sound waves, transform the waves into electric telephonic currents, and then amplify these currents to bring them up to sufficient strength for transmission to a suitable receiver for the benefit of deaf persons and those whose hearing is affected.

More particularly the invention relates to a device of the indicated character in which use is made of a microphone system and a vacuum-tube audio-amplifier system housed within a single casing of suitable design.

Some of the objects and advantages of the invention are as follows. It provides a transmitter of the type mentioned in which the parts are arranged in a compact relation to afford a device of correspondingly small size and of desirable shape capable of being carried about the person comfortably and inconspicuously. It provides a sound amplifying transmitter which is of efficient and substantial design and capable of giving a relatively high or low tone effect of the desired volume. It also provides for low frequency control between the crystal and the first stage of amplification. The microphone or modulating unit is of such design as to afford extra space for certain parts of the amplifying system in such manner that a thinner over-all casing or one with less bulk may be used.

The nature of the invention and its distinguishing features and advantages will appear when the following specification is read in connection with the accompanying drawings, in which

Fig. 1 is an enlarged sectional view of a transmitter embodying the features of the invention, the section being taken approximately on the line 1-1 of Fig. 2 and looking in the direction indicated by the arrows;

Fig. 2 is an enlarged cross-section, the section being taken approximately on the line 2-2 of Fig. 1 and looking in the direction indicated by the arrows in which both sections of the casing and parts associated therewith are shown;

Fig. 3 is a detail sectional view taken approximately on the line 3-3 of Fig. 1 and looking in the direction indicated by the arrows;

Fig. 4 is a front elevation of the transmitter and a battery pack shown partly in section in electrical connection with the transmitter;

Fig. 5 is an inside view on an enlarged scale of the front section of the casing and showing the volume control rheostat;

Fig. 6 is a wiring diagram of the microphone and audio-vacuum tube amplifying systems ac-

cording to the arrangement of elements shown in Figs. 1 and 2;

Fig. 7 is a wiring diagram in which one stage of amplification of the amplifying system has been omitted.

Referring now more particularly to the drawings, it will be apparent that the device includes a microphone system 10 and a vacuum-tube amplifying system 11 having the elements thereof arranged and enclosed by a relatively flat or shallow casing 12 preferably of circular shape. The casing 12 consists of two companion separable sections, there being a back section 13 and a front section 14. The casing sections may be composed of any suitable light weight insulating material, such as hard rubber or Bakelite. The microphone system is in the form of a unit and includes a conical diaphragm 15. A metal ring 16 supports the diaphragm 15. The marginal edge portion of the diaphragm is glued, cemented, or otherwise secured to the ring. A modulating element, such as a crystal 17, is connected with the apex of the diaphragm 15 for controlling or modulating the telephonic current in accordance with the frequency of the sound waves or impulses imposed on the diaphragm. The crystal is flat and is of rectangular shape, preferably square. The crystal is secured to the ring by means of three curved members 18 integral with or secured, as at 19, to the ring and extending inwardly therefrom. The ends 20 of the members 18 are disposed parallel to the plane of the ring. Yieldable or resilient spacers 21 of rubber or similar material are disposed between the ends 20, respectively, and the crystal 17 and are secured by means of cement or paste to said ends and the front face of the crystal 17. The members 18 are connected to three corners, respectively, of the crystal 17 and the fourth corner of the crystal is located substantially centrally of the casing 12 coincidental with the apex of the diaphragm 15 with which it is operatively connected. It will therefore be understood that the parts 15 to 21, inclusive, constitute a sound-responsive and modulating unit in which the crystal lies almost wholly at one side of the apex of the diaphragm.

The amplifying system 11 includes a plurality of miniature vacuum tubes 22, 23 and 24. The tubes are preferably of the type which includes a plate, a grid, a filament, and a screen and are, therefore, each provided with five terminals for connecting the same in the circuits of the amplifying system in the usual manner for such systems as shown in Figs. 6 and 7. The tubes 22,

23 and 24 provide for a first, a second, and a third stage of amplification. The tubes are arranged around on the inside of the back section 13, disposed respectively in suitable recesses conforming to the shape of the tubes which are secured in place by a suitable adhesive or other means. The system 11 also includes various condensers 25, a biasing cell 26, and a choke 27. The cell 26 and choke 27 are arranged within the back section 13 in the space between the tubes 22 and 24, whereas the condensers occupy the space beneath, beside, or around the crystal 17 and the other available space within the section 13. The elements 25, 26 and 27 are secured in place by suitable adhesive or other means within the section 13.

The sound responsive and modulating unit is resiliently supported on the tubes and other elements in the section 13 by means of cushions or pads 28 of rubber, felt, or other suitable material, secured to these elements and also secured to the rear surface of the ring 16. It will be apparent that the crystal 17 is disposed well into the casing section 13 and that the members 18 of the ring are disposed between the crystal 17 and the ring 16, thereby making it possible to use a casing which is thin or of relatively small bulk or depth.

The front casing section 14 has openings 29 in the central portion 30 thereof to allow the sound impulses to freely enter the casing to be impinged upon the diaphragm. In order to prevent leakage of sound around the diaphragm, there is provided a ring or gasket 31 of felt or other sound-absorbing material, which is secured to the portion 30 on the inside thereof surrounding the openings 29. When the casing sections 13 and 14 are brought together the marginal portion of the diaphragm is in contactual engagement with the gasket 31 for the purpose stated.

The back casing section 13 has mounted therein bifurcated binding posts 32. The section 13 also has arranged in a thickened portion 33, plugging means consisting of a plurality of coil springs 34 arranged in sockets respectively, there being five of these sockets arranged in a row. The binding posts 32 and the springs 34 serve for the purpose of establishing electrical connections for rendering the amplifying system 11 fully operative. The portion 33 also has five sockets 35, 36, 37, 38 and 39, respectively, which open to the sockets containing the springs 34. The sockets 35, 36, 37 and 39 receive the terminal plugs, respectively, of a battery pack including an A battery and a B battery and sockets for receiving the terminals of an extension cord connected with the usual crystal receiver R. The battery pack is illustrated in Fig. 4 and designated 40. The sockets 35, 37 and 39 receive from the plugs of the battery pack the electrical energy input, whereas the sockets 36, 37 and 38 complete the circuits to certain terminal plugs of the battery pack to furnish the sound output to the extension cord having the crystal receiver which the user applies to the ear in hearing with the device. The front casing section 14 on the central portion 30 carries a rheostat 41 with an operating knob 42 exteriorly of the section 14. The rheostat 41 serves as a volume control when op-

erating on a high or a low tone frequency. The rim of the casing section 13 carries a switch 43 having a control knob 44 exteriorly of the section 13. This switch 43 is electrically connected with suitable resistances in a circuit traversing the input circuit between the crystal 17 and the first stage amplification tube 22. The knob 44 of the switch 43 may be turned to operate the switch 43 so as to eliminate low frequency impulses and thereby obtain clarity of tone. The rim of the casing section 13 also carries a switch 45 having a control knob 46 exteriorly of the section 13. This switch is electrically connected with a suitable resistance and condenser in a circuit traversing the output between the third stage amplifying tube 24 and the choke 27. The knob 46 may be manipulated to operate the switch 45 to eliminate high frequency impulses in order to assure clarity of tone.

The casing sections 13 and 14 are held in case-forming relationship by means of screw bolts 47 extending in holes in the section 13 and tapped holes in the section 14. This brings the ring 16 of the diaphragm in contactual engagement with the ring 31 as explained hereinabove and the parts of the rheostat 41 on the inside of the section 14 are conveniently received within the space afforded by the conical diaphragm 15 as shown most clearly in Fig. 2.

In Fig. 6 is shown a wiring diagram of the amplifying circuits and elements appearing in Figs. 1, 2 and 5. For the sake of clearness the wiring has been omitted from said figures. In Fig. 7 there is shown a wiring diagram in which the second stage amplifying tube has been omitted and use has been made of an additional choke. This provision of elements may be conveniently arranged within the casing sections in which all of the advantages of the present invention may be attained.

I claim:

1. A hearing device including a casing having sound openings therein, a cushioning ring secured to the inside of said casing and surrounding said openings, a conical sound responsive diaphragm in contact along its marginal portion with said ring, a modulating element arranged within said casing, said portion having members resiliently connected with the front face of said element at spaced points to support the element, and a connection between the apex of the diaphragm and said front face of said element so that the latter will generate voltage in accordance with the frequency of the sound vibrations reaching the same from said diaphragm.

2. A device of the character described including a casing composed of separable front and back sections, a spider, means within the back casing section to resiliently support said spider, said spider having an annular portion adjacent the inner face of said front casing section, a diaphragm supported at the margin by said annular portion within said back section, a modulating element behind said diaphragm within said back section and connected with said diaphragm, and a gasket composed of yieldable sound absorbing material disposed between said front casing section and the margin of said diaphragm.

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