March 4, 1941. R. E. POLK 2,233,848

AUDIPHONE

Filed June 30, 1938

FIG. 1

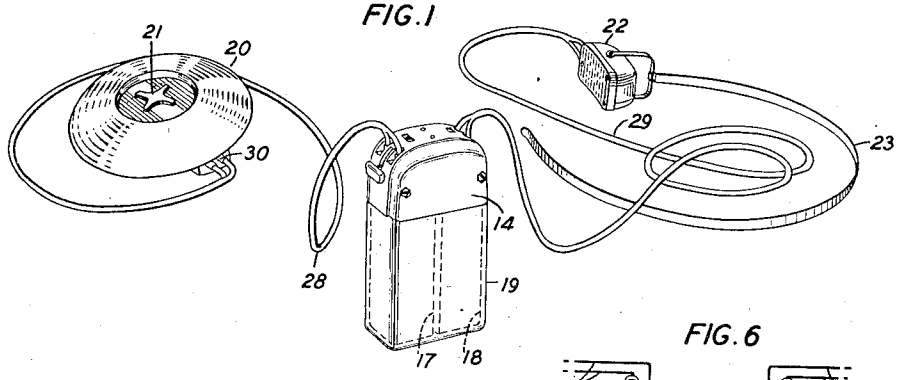


FIG. 2

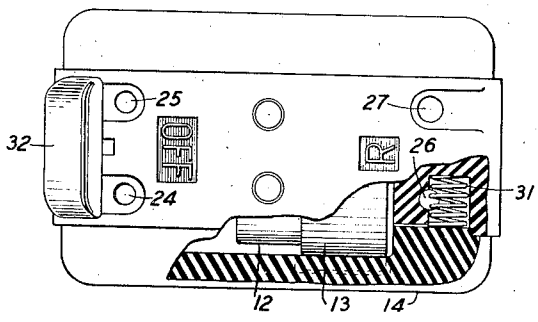


FIG. 6

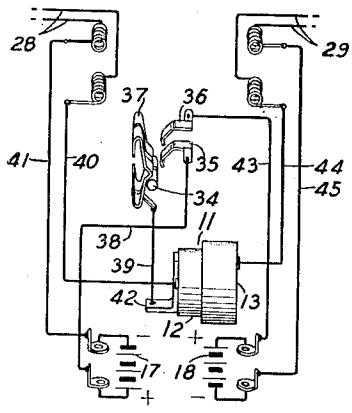


FIG. 3

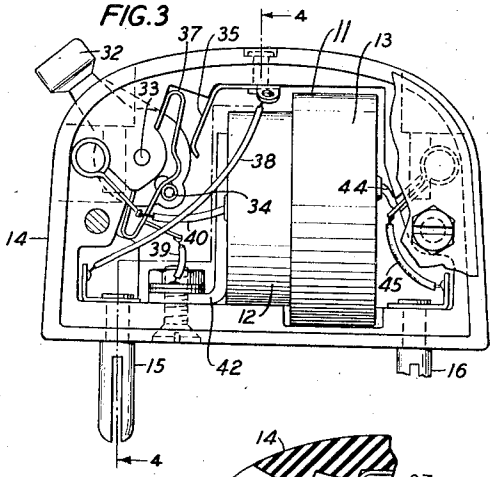


FIG. 4

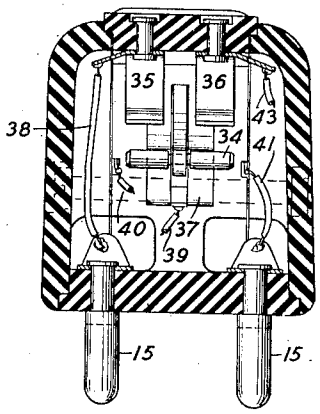
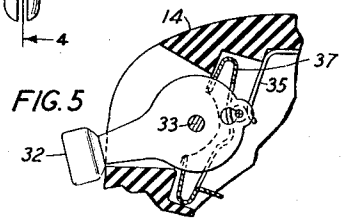


FIG. 5



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UNITED STATES PATENT OFFICE

2,233,848

AUDIPHONE

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Application June 30, 1938, Serial No. 216,692

3 Claims. (Cl. 179—107)

This invention relates to audiphones using mechanical amplifiers to increase the signal level delivered to the receiver of the audiphone.

The object of the invention is an audiphone which is light in weight, convenient to carry and operate and capable of working at high gain without becoming unstable.

In order to keep the weight of such devices low, it has been common practice to use a single battery unit for supplying current to both the pick-up transmitter and the receiver networks. Since the impedance of this battery is common to the input and output circuits of the amplifier, special precautions, which usually involve some sacrifice in amplification, must be taken to keep the audiphone stable in its operation.

According to this invention, separate battery units are used for the two networks, thereby avoiding the use of any elements of appreciable impedance in the common portion of the input and output circuits and making it possible to take full advantage of all the gain available in the amplifier. As each battery unit supplies only half the load, the units may be very small and the two units can be readily housed in a box no larger than that required for the single battery generally used.

The amplifier is housed in a casing which is mounted on the battery box by means of plugs engaging socket terminals in the batteries and connecting the batteries to the input and output circuits of the amplifier. A single switch is used to control both circuits without producing appreciable coupling between them by mounting the switch within the amplifier casing so that the connections to the input and output circuits can be very short.

Mounting the switch in the amplifier casing also has the further advantage over other locations, such as in the transmitter or receiver cord, that these cords can be of the highly flexible two-conductor concentric type and can be identical and, therefore, interchangeable so that a single spare may be used in either position.

In the drawing,

Fig. 1 shows an audiphone according to the invention;

Fig. 2 is a top view of the amplifier casing;

Figs. 3 and 4 are sectional views of the casing;

Fig. 5 is a detail view of the switch; and

Fig. 6 is a wiring diagram of the amplifier casing.

Referring to the drawing, the amplifier 11 comprises essentially a small telephone receiver element 12 and a transmitter element 13 having a common diaphragm which is normal to the plane of Fig. 3 of the drawing. This amplifier is preferably of the type shown in the copending application of A. F. Bennett et al., Serial No. 207,980, filed May 14, 1938. One end of the receiver winding and the diaphragm are electrically connected to the bracket 42 by means of which the amplifier is secured in position in the casing 14. The casing is provided with split metal plugs 15, 15 and 16, 16 which engage corresponding terminal sockets in the battery units 17 and 18 in the battery box 19 and also serve as a means for mechanically holding the casing 14 in position on the box, as shown in Fig. 1.

While the efficiency of a properly designed amplifier does not vary a great deal with changes in its position, it is, of course, desirable that it be operated in the most efficient position. Obviously, if the amplifier and battery assembly is laid in such a position that the plane of the diaphragm is above the carbon of the transmitter element, the carbon may tend to fall away from the diaphragm and reduce the efficiency. When the assembly is carried in the pocket of the user, the diaphragm is substantially vertical and when the assembly is placed on a desk or table, it will ordinarily be stood upright, as in Fig. 1, or be laid flat rather than on edge where it would be relatively unstable. The amplifier 11 is, therefore, mounted in the casing 19 in the position shown in Fig. 3 so that the diaphragm is vertical for all probable positions of use.

The pick-up transmitter 20 preferably has mounted in its casing a rheostat connected in series with the transmitter and operable to adjust the output to the desired level by means of a knob 21 on the face of the transmitter. The receiver 22 shown is of the bone conduction type with a head band 23 for holding it in position on the head of the user but, obviously, the receiver may be of any other suitable type. The transmitter and receiver are connected to terminal sockets 24, 25 and 26, 27 in the amplifier casing 14 by means of identical, two-conductor flexible cords 28 and 29 which are fitted at each end with plug type tips 30. Each of the terminal sockets 24 to 27 is provided with a helical spring 31 which projects part way into the socket, as shown in Fig. 2, so that, when the cord tips are inserted into the sockets, the springs are deflected and maintain good electrical contact with the tips.

When the switch 32 is operated from the position shown in Fig. 2 to the position of Fig. 5, the handle rotates about its axis 33 and forces the

metal pin 34 upwardly into contact with all three of the spring members 35, 36 and 37. Current then flows from the positive terminal of battery 17 over a circuit extending from conductor 38, the springs 35 and 37 of the switch, conductor 39, the winding of the receiver element 12 of the amplifier 11, conductor 40, cord 28, the pick-up transmitter and rheostat and conductor 41 to the negative terminal of the battery.

The transmitter element 13 of the amplifier and the receiver 22 are energized by battery unit 18 over a circuit extending from the positive terminal, conductor 43, springs 35 and 37 of the switch, conductor 39, the transmitter element 13, conductors 44 and 29, the receiver unit 22 and conductor 45 to the negative terminal of the battery 18. In order to minimize the clicks due to switching, the springs 35 and 36 of the switch are preferably adjusted so that the transmitter circuit is made slightly before the receiver circuit is completed and is broken after the receiver circuit has been opened.

The general theory of operation of audiphones is, of course, well known and requires no detailed discussion. It will be noted, however, that in this audiphone, since separate batteries are provided for the two networks, the current variations in the receiver circuit cannot react on the transmitter circuit. It, therefore, becomes practical to operate the amplifier at full gain at all times, to use simple cord circuits and to control the output volume at the pick-up transmitter.

What is claimed is:

1. In an audiphone, a mechanical amplifier having input and output circuits, a pick-up transmitter in the input circuit, a receiver in the output circuit, separate batteries for the circuits, a casing for the amplifier and a switch in the casing controlling both of said circuits and having contacts so adjusted as to make the circuits in one sequence and break the circuits in the reverse sequence.

2. In an audiphone, a casing, a mechanical amplifier within the casing having input and output circuits including a short common conductor of low impedance, two terminals for each circuit for connecting the circuit to external batteries, two sockets for each circuit in the top of the casing for receiving transmitter and receiver cords and a single switch mounted in the casing and connecting the common conductor to a battery terminal in each circuit to control both of said circuits.

3. In an audiphone, a pick-up transmitter, a receiver, a mechanical amplifier having a transmitter element, a receiver element and a diaphragm forming a mechanical coupling and a common electrical connection between the elements, circuits connecting the transmitter to the receiver elements and the transmitter element to the receiver, separate batteries for energizing said circuits, a switch connecting the common electrical connection to both batteries to control both circuits, a box for the batteries having one side substantially shorter than the other and means for mounting the switch and the amplifier on the battery box with the diaphragm of the amplifier parallel to the shorter side of the box.

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