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C. N. REIFSTECK ET AL

2,098,402

TELEPHONE APPARATUS

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Fig. 1.

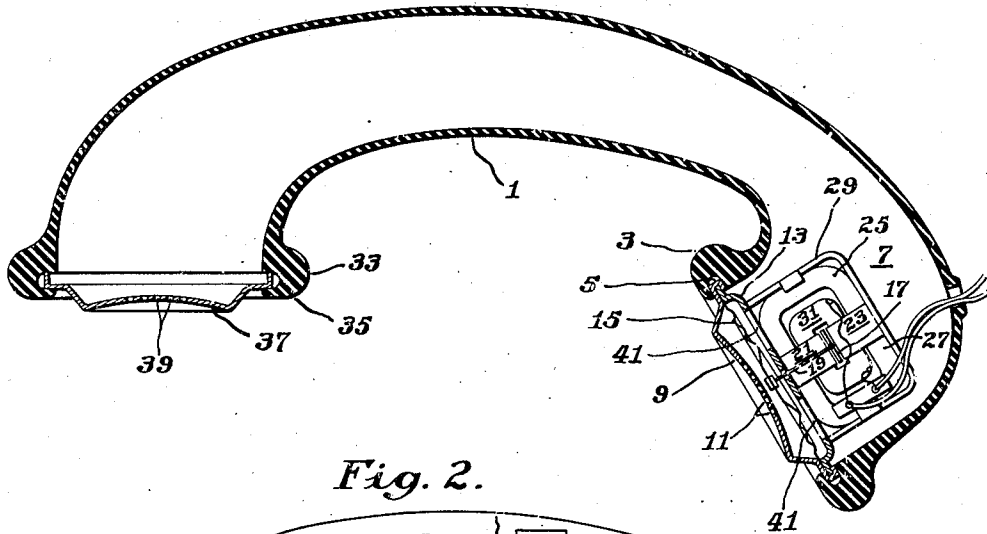


Fig. 2.

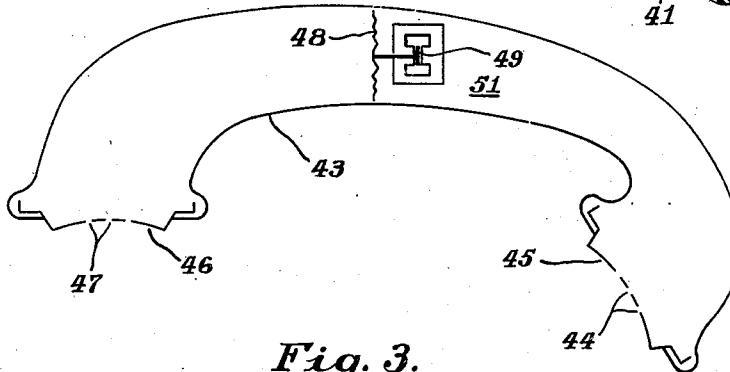
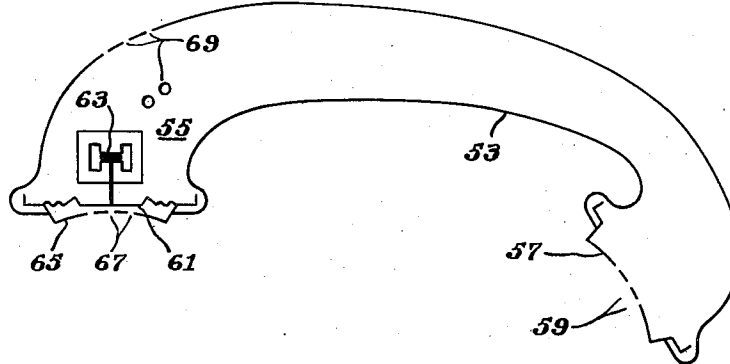


Fig. 3.



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TELEPHONE APPARATUS

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2 Claims. (Cl. 179-103)

Our invention relates to telephone apparatus and particularly to telephone hand-sets.

At the present time there is a tendency to employ batteryless operated telephone systems for many applications. These systems generally include two electro-mechanical units (such as electro-magnetic units) at each station, one unit being utilized as a transmitter and the other unit being utilized as a receiver. Some systems have employed a single electro-magnetic unit at each station, the unit being used both as transmitter and receiver, but in such systems it has been necessary to hold the unit first at the mouth and then at the ear during a conversation.

It will be apparent that, while the above-mentioned single unit construction is the cheaper of the two designs, it has serious disadvantages. Perhaps the most important of these is that it is inconvenient to use. Another disadvantage is that one person cannot interrupt or "cut in on" another person's conversation.

An object of our invention is to provide telephone apparatus utilizing a single electro-mechanical unit for both transmitting and receiving which does not have the above mentioned disadvantages.

A further object of our invention is to provide a combined transmitter and receiver unit having a single electro-mechanical unit therein which may be used simultaneously as a transmitter and as a receiver.

In a preferred embodiment of our invention, we utilize a hollow tube in the shape of a French hand-set. An electro-magnetic unit is so positioned in the tube that it may be operated as a transmitter by speaking into one end of the tube. It also functions as a receiver for producing sound waves appearing at the other end of the tube.

Other objects, features, and advantages of our invention will appear from the following description taken in connection with the accompanying drawing in which,

Fig. 1 is a view taken in cross-section of one embodiment of our invention, and

Figs. 2 and 3 are schematic diagrams of other embodiments of our invention.

Referring to Fig. 1, we provide a combined transmitter and receiver in the form of a French hand-set. The combined unit comprises a hollow tube 1 open at both ends and shaped in the form of the usual French hand-set, whereby one end of the tube may be utilized as the transmitting end and the other end of the tube utilized as the receiving end.

In the embodiment illustrated, the tube 1 is made of soft rubber, but it will be understood that any suitable material such as hard rubber or metal may be employed.

A bead 3 is provided at the transmitter end 5 of the tube and provided with a circular groove 5 in which an electro-mechanical unit 7 is mounted. This unit comprises a cap or face plate 9 having openings 11 in the center thereof and a back plate 13 which is fastened to the face plate 9 at its periphery in any suitable manner. A diaphragm 15 is clamped at its periphery between the face plate 9 and the back plate 13.

The diaphragm 15 is connected to the upper end of an armature 17 by means of a pin 19. The armature 17 is preferably of the cantilever type, rigidly supported at the bottom end by means of structure not shown in the drawing. Armature 17 is positioned between pole pieces 21 and 23 of a magnet structure which includes two permanent magnets 25 and 27 positioned on opposite sides of the pole pieces 21 and 23. The magnetic structure is supported from the back plate 13 by means of a bracket member 29.

A magnet coil 31 surrounds the armature 17 so that any movement of the armature causes a variation in the flux threading the magnet coil whereby voltages are induced therein in accordance with the armature movement. Also, this action is reversible since any variation in current supplied to the magnet coil 31 causes a corresponding movement of the armature 17 and of the diaphragm 15 to which it is connected.

The receiver end of the tube 1 also is provided with a bead 33 which has a circular groove 35 therein. A cap 37 which is provided with openings 39 in the center thereof is mounted in the circular groove 35. Both the cap 37 and the electro-mechanical unit 7 are assembled in the rubber tube 1 by deforming or stretching the rubber beads 33 and 3, respectively, to permit the insertion of these devices in the grooves.

The back plate 13 of the electro-mechanical unit 7 has openings 41 therein so that sound waves set up by the back side of the diaphragm 15 can travel through the tube 1 to the receiver end. Thus it will be seen that by talking into the transmitter end of the tube, the electro-mechanical unit 7 is caused to produce electrical energy in accordance with the sound waves, which energy may be transmitted over a telephone line to the electro-mechanical unit of a similar telephone hand-set. When voice signals are impressed upon the electro-magnetic coil 31 from a telephone line, the diaphragm 15 is

caused to vibrate in accordance therewith and sound waves are transmitted from the back side of the diaphragm through the tube 1 to the receiving end.

5 Since a person using the hand-set has the receiver end of the tube at his ear while talking, he may be interrupted by the person at the other end of the line at any time as in the case of a conventional telephone system.

10 Although the electro-mechanical unit 7 has been described somewhat in detail, it should be understood that any electro-mechanical unit which will function both as a transmitter unit and as a receiver unit may be employed in practicing our invention.

15 It is not necessary that the electro-mechanical unit be located at the transmitter end of the tube, and in some cases it may be preferable to locate it elsewhere. For example, it may be located at the middle of the tube as illustrated in Fig. 2, or at the receiver end of the tube, as illustrated in Fig. 3.

Referring to Fig. 2, the hand-set comprises a hollow tube 43 open at both ends, the transmitter 25 end being provided with a cap 45 having openings 44 in the center, while the receiver end is provided with a cap 46 having openings 47 in the center. A diaphragm 48 is positioned transversely of the tube 43 and connected to the armature 49 of an electro-mechanical unit 51 of any suitable construction. It will be noted that in this construction the sound waves, which operate the unit 51 as a transmitter, travel from the transmitter end of the tube to the right-hand side of the diaphragm 48. The sound waves produced by incoming speech signals travel from the left-hand side of the diaphragm 48 to the receiver end of the tube.

Referring to Fig. 3, the hand-set comprises 40 a hollow tube 53 open at both ends and having an electro-mechanical unit 55 positioned at the receiver end. The transmitter end is provided with a cap 57 having openings 59 in the center.

The unit 55 may be of any suitable construction, the same as the unit illustrated in Fig. 1,

for example, and may be mounted in the same manner as that unit. It includes a diaphragm 61 which is connected to the armature 63 of the unit. A cap 65 having openings 67 in the center is preferably provided for protecting and supporting the diaphragm. 5

In any of the above described embodiments of our invention it may be desirable to provide the hollow tube with openings or restrictions to give the tube the proper acoustic qualities. In the 10 embodiment shown in Fig. 3, for example, it has been found desirable to provide openings 69 in the end of the tube near the electro-mechanical unit 55 for reducing certain resonant effects.

Various other modifications may be made in our 15 invention without departing from the spirit and scope thereof, and we desire, therefore, that only such limitations shall be placed thereon as are necessitated by the prior art and are set forth in the appended claims. 20

We claim as our invention:

1. A telephone unit comprising a hollow tube of resilient material and shaped to have a mouth-piece at one end and an earpiece at the other end, a diaphragm located in said tube and positioned transversely thereof, and a single reversible electro-mechanical unit having an armature connected to said diaphragm, said unit also being located inside said tube and being resiliently supported thereby. 25 30

2. A telephone unit comprising a hollow tube of resilient material open at both ends and so shaped that one end may be held near a person's mouth while the other end is held near his ear, an electro-mechanical unit having a diaphragm, 35 said unit being located inside said tube with its diaphragm positioned transversely thereof and being resiliently supported thereby, and means for causing said unit to produce electrical energy in response to sound waves striking one end and to produce sound waves which appear at said 40 other end in response to electrical energy supplied to said unit.

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