

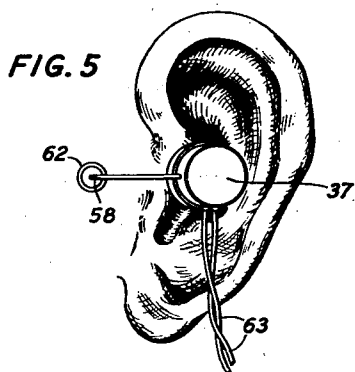
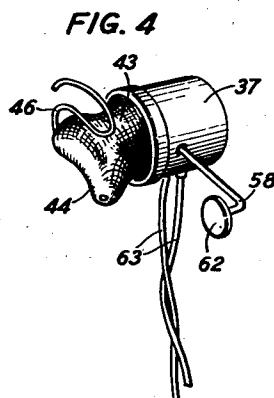
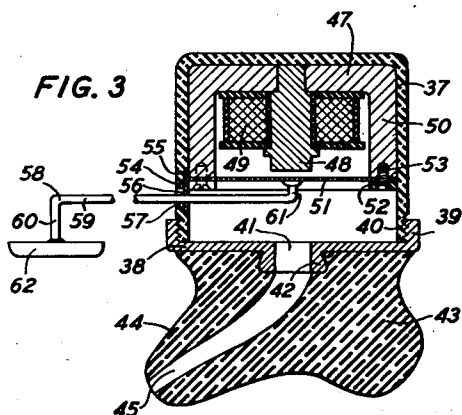
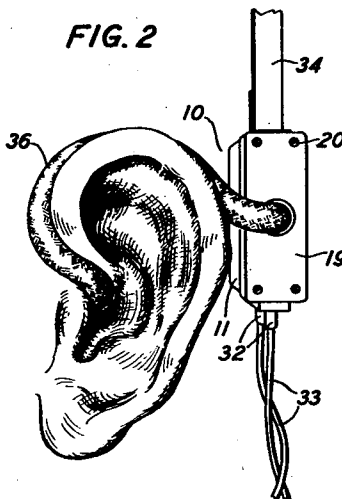
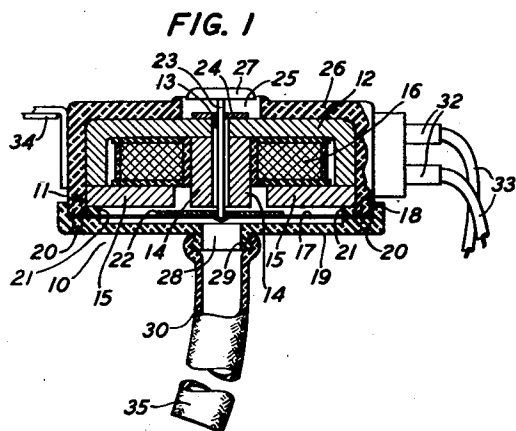
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ACOUSTIC DEVICE

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ACOUSTIC DEVICE

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10 Claims. (Cl. 181—23)

This invention relates to acoustic devices and more particularly to devices for aiding or improving the reception and detection of sound wave vibrations by those who are hard of hearing.

5 An object of this invention is to enable the hard of hearing to receive and detect sound waves more readily and more naturally over a greater portion of the frequency range of speech and music.

10 A feature of this invention comprises a telephone receiver having a vibratory member adapted to actuate a bone vibrating or agitating member, and, also, to generate sound waves, which waves are led through a restricted path or passage to the ear drum of a user.

15 Another feature comprises a telephone receiver supported in the ear of a user, the vibratory member of the receiver being adapted to generate sound waves which are led directly to the user's ear and also to actuate a vibrator member adapted to contact with the skin and to vibrate the head bone in front of the user's ear.

20 One embodiment of this invention comprises a telephone receiver comprising a case enclosing a vibratory member and actuating means therefor, a vibrator member connected to the vibratory member at one end and adapted to be pressed against and to vibrate the head bone behind a user's ear, and a sound wave conduit or tube defining a restricted passage and leading from the interior of the case and adapted to be inserted in the ear canal of a user. The receiver may be supported on the user's head by a headband, strap or ribbon.

25 Another embodiment comprises a telephone receiver comprising a case enclosing a vibratory member and actuating means therefor, the receiver being coupled to a hard or soft rubber molded member adapted to be inserted in the user's ear to support the receiver therein, and having a sound wave passage leading from the vibratory member to the user's eardrum, and a vibrator member extending from the case, vibratable by the receiver vibratory member, and adapted to rest against the user's skin and to vibrate the head bone in front of the ear.

30 A more complete understanding of this invention will be derived from the detailed description which follows, read with reference to the appended drawing, wherein:

35 Fig. 1 is a side elevational view of one embodiment of this invention, partly broken away and partly in section to expose the details of its construction;

40 Fig. 2 illustrates the mode of use of the device

of Fig. 1, and the manner in which it is associated with the user's ear and head (not shown);

Fig. 3 is a sectional view of another embodiment of this invention;

Fig. 4 is a view in perspective of the device of Fig. 3; and

Fig. 5 illustrates the mode of use of the device of Fig. 3, and the manner in which it is associated with the user's ear and head (not shown).

There is shown in Figs. 1 and 2 an acoustic device comprising a telephone receiver, designated generally 10, having a casing or housing 11, elongated and substantially rectangular in shape, and preferably of insulating material. Within the casing is an electromagnet structure comprising a U shaped bar or member 12 of magnetic material having a central perforation or drilling 13; spaced, central pole pieces or extensions 14, 14; radially extending pole pieces 15, 15; and an energizing coil 16 disposed within the magnet structure and surrounding the central pole pieces. A diaphragm 17, substantially rectangular in shape and either of magnetic or non-magnetic material, is mounted in the open end of the casing and is secured to the rim 18 along its short edges by the casing cover or closure member 19 and suitable fastening means such as screws 20. The width of the diaphragm is less than the width of the inside of the casing so that the long edges of the diaphragm are free and unclamped. Spacer strips or members 21 restrain movement of the electromagnet with reference to the diaphragm. An armature 22 is secured to the central portion of the diaphragm in spaced relation to the extremities of the pole pieces 14, 15. An elongated member or rod 23 is attached to the center of the diaphragm, extends between the pole pieces 14, 14, through the drilling 13 and an aligned opening in the lateral movement limiting plate 24, and through an opening 25 in the wall 26 of the casing, to terminate in an enlargement or button member 27 which is positioned slightly above the plane of the outer surface of the wall 26 of the casing. The cover member 19 contains an opening or aperture 28 surrounded by a flange portion 29 over which is drawn one end of a sound wave conduit or tube 30. The energizing coil is connected to terminals, (not shown), with which the cord tips 32, 32 of the receiver conductors 33, 33 engage.

The receiver is supported on the head of the user behind his ear preferably by a band or strap 34 of spring metal, such as steel, so that the button 27 makes firm contact with the skin of the head over the mastoid eminence. The free

end 35 of the tube is inserted in the ear. While it is preferable that the free end be of a soft or flexible material, the remaining portion 36 may be stiff, rigid, or of fixed shape and of the contour shown in Fig. 2, so as to be the more readily retained between the user's head and the lobe of the ear and rendered comparatively inconspicuous.

In operation, the vibrations of the diaphragm cause vibration of the rod 23 and button 27 to agitate and vibrate the mastoid eminence, and, simultaneously, the sound waves generated by the diaphragm are led through the restricted path or passage provided by the tube 30 directly to the eardrum. In this way, the user derives the benefit of both bone and air conduction of the sound wave impulses.

The acoustic device of Figs. 3, 4 and 5 comprises a casing or housing 37, substantially cylindrical in shape and having an open end normally closed by a cover or closure member 38 having an interiorly threaded flange portion 39 engaging the externally threaded portion 40 of the casing. The cover contains a central opening or aperture 41, and has an annular extension 42. An insert member or earpiece 43, preferably of hard or soft molded rubber and adapted to be inserted in the user's ear, is secured to the cover, having a recessed portion into which the extension 42 is adapted to fit tightly. This ear insert substantially fills the cavum conchae of the ear, and the portion 44 is shaped to firmly seat into the ear and tightly engage in the auditory canal so as to form a substantially sound tight connection. The constricted passage or path 45 in the insert member connects the interior of the casing with the user's ear canal. The wire or spring 46 is sufficiently flexible to be adjustable in shape to fit the contour of the cyma conchae of a particular user, and aids in holding the receiver securely in the ear. The casing houses a pot-shaped member 47 of magnetic material having a center pole portion 48 surrounded by an energizing coil 49, and an outer pole portion 50 to which a diaphragm 51 of magnetic material is secured at its periphery by suitable fastening means, such as clamping ring 52 and screws 53. The diaphragm has an angularly extending tab portion 54, adapted to seat in a recess 55 in the inner surface of the casing and having an aperture 56 in alignment with the aperture 57 in the cylindrical wall of the casing.

Attached to the central portion of the diaphragm is a rod or elongated member 58 having a straight portion 59 and parallel portions 60 and 61 at the ends of the straight portion and angularly disposed with reference thereto. The portion 59 extends through the apertures 56 and 57, and when the diaphragm is vibrating, the tab 54 provides a support on which it pivots. The portion 60 terminates in an enlargement or button 62 adapted, when the receiver is mounted in the ear of a user as shown in Fig. 5, to press firmly against the skin in front of the ear in region of the temporal bone. Electric signal impulses are led to the receiver through the conductors 63.

In operation, the vibration of the diaphragm in accordance with sound wave impulses received by the receiver, generates sound waves which are led directly to the user's eardrum through the aperture 41 and passage 45, and vibrates the connecting rod 58 and button 62 whereby the temporal bone is agitated or vibrated. The user is enabled, therefore, to detect or re-

ceive sound wave impulses by bone and air conduction, simultaneously.

While the features of this invention have been disclosed in several specific embodiments, it is understood, of course, that various modifications may be made in the details of construction thereof without departing from the spirit of this invention as defined in the appended claims.

What is claimed is:

1. An acoustic device comprising a vibratory member, means for actuating said member, a case containing said member and means, means providing a restricted sound wave passage leading from said vibratory member to the eardrum of a user, and a vibration conducting rod attached at one end to the vibratory member and having an enlarged button-shaped portion at its other end, said enlarged portion adapted to rest against the skin of the user and to vibrate the head bone of the user in the region of the ear.

2. An acoustic device comprising a vibratory member, means for actuating said member, a case containing said member and means, said case comprising a wall on each side of said vibratory member, each wall having an aperture therein, a hollow tubular member providing a continuation of the aperture in one of said walls and a path for sound waves leading to the eardrum of a user, and a vibrator member attached to said vibratory member and having a button member positioned in the aperture in the other of the walls of said case and adapted to rest against the skin and to vibrate the head bone of the user in the region of the ear.

3. An acoustic device comprising a vibratory member, means for actuating said member, a case containing said member and actuating means, means actuated by said vibratory member for communicating the movement thereof to the head bone in back of a user's ear, said last mentioned means consisting of a rod-like member having a button member at one end for engagement with the user's head, and a tubular member connecting the interior of the case and the user's eardrum to communicate to the latter the sound waves generated by said vibratory member.

4. An acoustic device to be mounted on a user's head behind the user's ear, comprising a vibratory member, means for actuating said member for the generation of sound waves, a casing for said member and actuating means, and means connecting the interior of said casing with the ear canal of the user to conduct the generated sound waves thereto, said means comprising a hollow tubular member, one end of which is insertable in the ear of a user, the other end of which is connected to said casing, and the intermediate portion of which follows the contour of the head between the latter and the ear lobe.

5. An acoustic device comprising a vibratory member, means for actuating said member, a member insertable in the ear of a user of the device, said insertable member having a central sound wave passage, a case containing the vibratory member and actuating means and attached to and supported by said insert, and a vibrator member consisting of a rod-like member connected at one end to the vibratory member and having a button member at its other end to rest against the skin of and to vibrate the head bone in front of the user's ear.

6. An acoustic device to be mounted in a user's ear, comprising a vibratory member, means for causing said member to vibrate, a casing for said member and means, and means for applying the

vibrations of the vibratory member to the head bone of the user in the region of the ear, said head bone vibrating means consisting of a rod-like member attached to said vibratory member and having a button member at its other end for engaging the head.

7. An acoustic device to be mounted in a user's ear, comprising a vibratory member, means for causing said member to vibrate, a casing for said member and means, and means attached to said vibratory member for applying the vibrations thereof to the head bone of the user in the region of the ear, said means comprising an elongated member attached at one end to the vibratory member and having its other end adapted to be placed against the skin of the head, said elongated member being pivotally supported at a point intermediate its ends.

8. An acoustic device comprising a vibratory member, means for actuating said member, a member insertable in the ear of a user of the device, a case containing the vibratory member and actuating means and attached to and supported by said insert, said insertable member having a sound wave passage connecting the interior of said case with the user's ear canal, and a vibrator member connected to the vibrating member and extending from said case to rest against

the skin of and to vibrate the head bone in front of the user's ear, said means being pivotally supported at a point intermediate its ends.

9. An acoustic device comprising a casing, a vibratory member and actuating means therefor in said casing, said casing having a pair of substantially parallel walls, each having an aperture therein and disposed on opposite sides of the vibratory member, means connected to one of said walls connecting the interior of the casing through the wall aperture with the ear drum of the user, and a vibrator rod secured at one end to the diaphragm and terminating in a button member in the aperture in the other of said walls, said button member engaging the user's head when the device is supported behind the user's ear with the said other apertured wall adjacent thereto.

10. A bone conduction receiver comprising a vibratory member, means for actuating said member, and a vibration conducting rod attached at one end to said vibratory member and having an enlarged end portion at its other end for engagement with the user's body in the region of the ear, said rod being pivotally supported intermediate its ends.

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