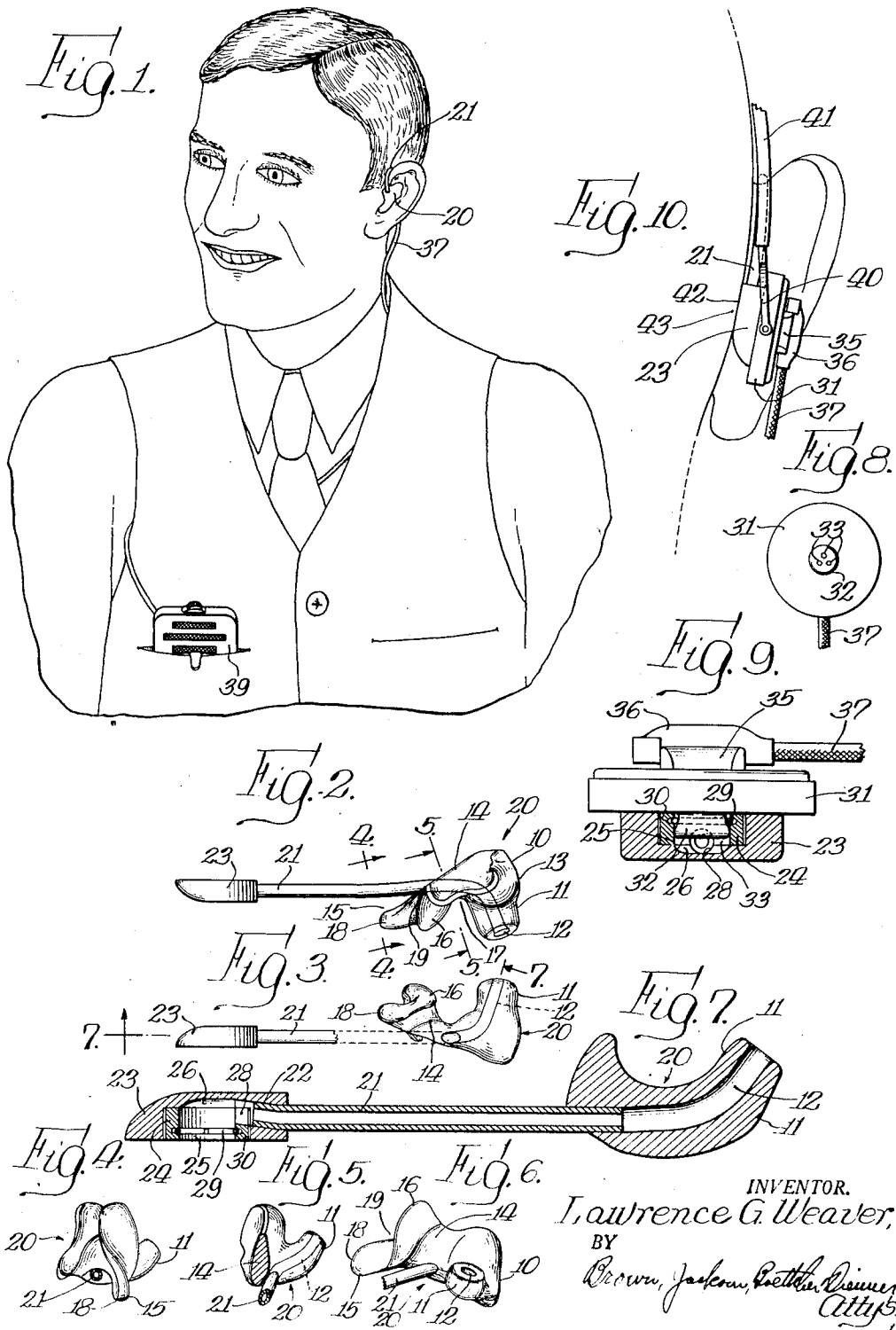


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HEARING AID EARPIECE
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HEARING AID EARPIECE

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2 Claims. (Cl. 181—23)

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This invention relates to devices, commonly termed hearing aids, intended for use by persons having defective or impaired hearing.

In general, there are two types of hearing aids in use. In one type, the receiver, which as is well known is in the nature of a telephone receiver, is held seated against the mastoid bone prominence in back of the ear for conducting the vibrations of the receiver through the bone structure, this type being known as the bone conduction type. In the other type, the receiver is mounted directly on an insert positioned in the ear and having a projection fitting into the auditory canal, said insert and projection having a passageway so that an air column is provided, which is vibrated in accordance with the vibration of the receiver diaphragm, this type being known as the air conduction type of receiver. My invention has to do particularly with the air conduction type of hearing aid.

In the air conduction type of hearing aid the receiver is carried by the ear insert, as noted. Two types of inserts are commonly used. In one type, the insert is molded from an impression taken of the external ear and of the outer or entrance portion of the auditory canal, so as to be retained snugly in position within the ear. This type of insert is commonly referred to as a "mold," and has a comparatively large and thick body portion to provide for mounting thereon of the receiver. The other (plug) type of insert commonly used is in the form of a short tube, which may have a rubber tip provided with one or more annular vanes or flanges, for insertion into the auditory canal, the tubular member having at its outer end an enlarged head with associated means for mounting thereon of the receiver. In either case, the receiver is mounted at the outer end or face of the insert and is readily observable. Many persons requiring the use of hearing aids are quite sensitive on the subject and refuse to use such devices, even though needed, since they have a feeling that the receiver and the insert together are quite prominent and that they attract undesired attention. Further, the insert is subjected to a certain amount of pull or pressure by the receiver and its associated cord, even though the receiver be quite small and light, which causes discomfort to the user. The plug type of insert is not altogether satisfactory, since it is difficult to obtain an accurate and comfortable fit thereof in the ear, which results in discomfort to the wearer and causes objectionable noises, due to loose fit causing feed back.

My invention is directed to an ear insert of a

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character to fit comfortably in the ear while being not readily visible when in position, and means whereby a receiver may be mounted in position outside of the ear and spaced from the insert, with the output of the receiver connected to the insert in a manner effective for transmitting there-through and to the auditory canal vibrations caused by vibration of the receiver diaphragm. The ear insert of my invention preferably is molded to fit the external ear and to be held securely in position thereby, and is provided with a tubular projection extending and opening into the auditory canal, this insert having associated therewith a mounting member for the receiver, connected to the passage of the tubular projection of the insert by means providing an air column extending from the output of the receiver through the passageway of the tubular projection of the ear insert, whereby the receiver may be disposed in any suitable location exterior of the ear and where it may be effectively concealed, and greater volume of sound can be produced than is possible with known ear molds or inserts. By disposing the receiver exterior of the ear, the ear insert need not have a body portion of appreciable mass and, therefore, may be so formed as not to be readily visible when positioned in the ear.

Further objects and advantages of my invention will appear from the detail description.

In the drawings:

Figure 1 is a front view of the head and shoulder portions of a man wearing hearing aid means embodying my invention, with the head shown in about three-quarters front view;

Figure 2 is a front view of the ear insert and the receiver mounting member unit embodying my invention;

Figure 3 is a back view of the unit of Figure 2;

Figure 4 is a top view of the ear insert, taken substantially on line 4—4 of Figure 2;

Figure 5 is a sectional view taken substantially on line 5—5 of Figure 2;

Figure 6 is an inner side view of the ear insert;

Figure 7 is a sectional view, on an enlarged scale, taken substantially on line 7—7 of Figure 3, with the receiver mounting member turned through an angle of approximately 90° from its position shown in Figure 3;

Figure 8 is an inner side view of a receiver suitable for use in the hearing aid means of my invention;

Figure 9 is a sectional view, on an enlarged scale, of the receiver mounting member and the

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receiver mounted thereon, the receiver being shown in elevation; and

Figure 10 is a back view showing the receiver mounting member and the receiver positioned behind the user's ear, with the side of the user's head indicated in outline.

This application is a continuation of my application Serial No. 634,597, filed December 12, 1945, now abandoned.

Preferably, I use an ear insert or mold, which may be formed of any suitable material, conveniently of a thermoplastic, molded to fit the external ear and the entrance portion of the auditory canal. Referring to Figures 2 to 7, inclusive, the insert comprises a lower portion 10 having an inwardly extending tubular element or projection 11 with a passage 12 therein opening through its inner end. Element 11 extends from a rounded base element 13 connected at one side, by a relatively thin web element 14, to the upper portion 15 of the insert. This upper portion 15 is shaped to provide a rounded rib or projection 16 at the inner side thereof defining with lower portion 10 a groove 17 and, outwardly from rib 16, an extension 18 providing with rib 16 a groove 19 of more or less rounded contour in cross section. When the insert, designated in its entirety by the reference number 20, is properly positioned in the ear, the projection 11 fits snugly within the entrance to the auditory canal, with the rounded base 13 seating snugly in the bowl of the ear at the lower portion of the conchae and snugly between the tragus and the anti-tragus. When the insert 20 is properly positioned in the ear, with the projection 11 and base 13 disposed as stated, the grooves 17 and 19 snugly receive the cartilage ribs above the entrance to the auditory canal, the rib 16 of the insert fits snugly into the upper portion of the conchae between the ribs of the ear, and the extension 18 fits into the fossa triangularis or the fossa of the antihelix of the ear. In that manner the insert is effectively secured in the ear against casual displacement. It will be noted that the web element 14 connecting the lower and upper portions 10 and 15, respectively, of the insert is relatively thin and occupies but little space. When this insert is properly positioned in the outer ear, it is substantially concealed thereby and is not readily visible, particularly if the insert be formed of a clear transparent material, such as "Lucite," through which the flesh color of the ear is readily visible, or if the insert be tinted flesh color. I thus provide an insert of comparatively small mass and light weight which may readily be mounted firmly in the ear and effectively retained therein, while not being objectionably conspicuous or visible.

The passage 12 of the tubular element or projection 11 of insert 20 opens at its other end through base 13 at one side thereof. A small tube 21 is suitably secured at one end in the outer end portion of passage 12, as shown in Figure 7. This tube 21 may be flexible or rigid, as desired, and, when flexible, preferably is formed of a suitable plastic such as Vinylite, though it may be formed of rubber, either natural or synthetic, or of any other suitable material. The other end portion of tube 21 is secured in a duct 22 in a receiver mounting member 23 of generally disc shape conveniently formed of the same material as the insert or mold 20. An exteriorly knurled ring 24, of brass or other suitable metal or material, is embedded in disc or mounting member 23, and defines a bore or recess 25 opening

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through one side face thereof. This bore 25 opens, at its inner end, into a recess 26 formed in mounting member 23, which recess is connected with tube 21 through an opening or notch 28 in ring 24. A split clamp spring 29 is mounted in ring 24, adjacent the outer end thereof, in an interior circumferential groove 30 formed therein. The clamp spring 29 provides means for attaching to mounting member 23 the receiver, as will be explained presently. In Figures 8 and 9 I have shown a receiver 31 suitable for use with the hearing aid unit of my invention. This receiver is of known construction and is in the form of a disc provided at one side with a central button or stud 32 provided through its inner end with one or more small openings 33, and tapering outward for the major portion of its height, as shown in Figure 9. The inner face of receiver 31 is flat, as is the outer face of mounting member 23 therefor, so that the receiver 31 seats flatwise on member 23 in sealing contact therewith. It will be understood that by pressing receiver 31 toward member 23, the stud 32 expands the clamping spring 29 sufficiently to pass there-through, after which this spring contracts about the restricted outer end portion of stud 32, thereby detachably securing the receiver 31 to member 23 seating thereon, as above. As is shown more clearly in Figure 9, the depth of the depression in member 23, defined by ring 24 and depression 26, is greater than the height of stud 32, providing therebelow an air chamber 33 in member 23, which air chamber 33 opens freely into tube 21. There is thus provided an air column extending from the chamber 33 and the output of receiver 31 to passage 12 of projection or tubular element 11 of insert 20, passage 12 opening at its inner end into the auditory canal of the ear, when the insert is positioned in the ear in the manner above described.

The receiver 31 is provided at its outer side with two spaced projections or ribs 35 defining between them a dovetailed groove which receives a cooperating terminal member 36 attached to a cord or cable 37, terminal 36 carrying suitable contacts cooperating with contact members of the receiver 31. The cord 37 carries suitable wires or conductors leading from an amplifier and transmitter unit 39 of known type. It will be understood that my invention comprehends the use of any suitable transmitter means. The receiver 31 including the terminal member 36 and associated parts, likewise is of known type and need not be described in greater detail, it being noted that, within the broader aspects of my invention, any suitable receiver may be used.

In the use of the device of my invention, the insert is mounted in the ear in the manner above described, after which the receiver 31 is attached to the mounting member 23 therefor, and this member 23, with the attached receiver, is then disposed behind the ear, tube 21 being led from insert 20 upward over the ear, between the latter and the side of the head, as will be clear from Figures 1 and 10. When thus positioned, mounting member 23 and receiver 31 are substantially concealed by the ear so as not to be readily visible, and the cord 37 may be led from the receiver downward under the wearer's clothing to the transmitter 39, as shown in Figure 1. In that manner, the receiver is not readily visible, nor is the ear insert, thereby avoiding the objection to the present day hearing aids with respect to the ear insert and the attached receiver being objectionably prominent. If desired, the receiver 31

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may be attached to a fork 40 at the lower end of a head band 41 effective for holding the flat inner face 42 of mounting member 23 seated against the mastoid bone prominence 43 in back of the ear. In that manner bone conduction may be employed to supplement air conduction which, in certain cases, is advantageous as being conducive to improved hearing. The head band 41, with its associated fork 40, and the manner of mounting the receiver 31 in the fork are known and need not be described in greater detail, such an arrangement being used in conjunction with present day receivers used in bone conduction hearing aids.

While I have shown the tube 21 as being of but sufficient length to position the receiver mounting member 23 in back of the ear, such showing is by way of example only. The tube 21 may be of any length, within limits, enabling the member 23 and the receiver carried thereby to be positioned a considerable distance from the ear, for example, beneath the collar or even in a man's vest pocket or otherwise suitably located so as to be concealed by the clothing or apparel. As above indicated, the flexible tube 21 may be replaced by a rigid tubular member which may be formed of any suitable material and in any suitable manner, for example, the rigid tube may be formed of the same material as the ear insert 20 and as a part thereof, being curved to fit or hook over the ear and of flat shape to fit snugly to the side of the head. Obviously, numerous variations may be resorted to, both as to the tubular member and as to the ear insert, within the broader aspects of my invention.

It will be seen that by separating the ear insert and the receiver mounting member, I render possible the use of an ear insert which is not readily visible nor objectionably prominent when positioned in the ear, while also rendering possible effective concealment of the receiver. My invention, therefore, is directed broadly to a hearing aid device of the air conduction type comprising an ear insert and a receiver spaced from such insert so as to be readily hidden or concealed, this receiver having its output connected to the ear insert in a suitable manner, conveniently by an air column, effective for transmitting to the auditory canal of the ear vibrations created incident to vibration of the diaphragm of the receiver. As above indicated, changes in details may be resorted to without departing from the field and scope of my invention, and I intend to include all such variations, as fall within the scope of the appended claims,

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in this application in which the preferred form only of my invention has been disclosed.

I claim:

1. In hearing aid means; an ear insert molded to the ear and comprising an inwardly extending element adapted to fit into the outer portion of the auditory canal, said insert having therein a passage comprising an inner portion opening through the inner end of said element and an outer portion opening through the insert side-wise and upwardly thereof and extending substantially parallel with the side of the user's head when said insert is positioned within the ear; and a flexible sound conducting tube attached at one end to said insert, said tube opening into said outer portion of said passage as a continuation thereof in substantial alignment therewith and disposed to extend therefrom forwardly and upwardly and substantially parallel with the side of the user's head and back over the ear between the user's head and ear helix, depending freely behind the ear vortex.

2. In hearing aid means; an ear insert molded to the ear and comprising an inwardly extending element adapted to fit into the outer portion of the auditory canal, said insert having therein a passage comprising an inner portion opening through the inner end of said element and an outer portion opening through the insert side-wise and upwardly thereof and extending substantially parallel with the side of the user's head when said insert is positioned within the ear; a flexible sound conducting tube attached at one end to said insert, said tube opening into said outer portion of said passage as a continuation thereof in substantial alignment therewith and disposed to extend therefrom forwardly and upwardly and substantially parallel with the side of the user's head and back over the ear between the user's head and ear helix, depending freely behind the ear vortex; and a receiver mounting member operatively attached to the free end of said tube and solely supported thereby behind the ear vortex.

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