

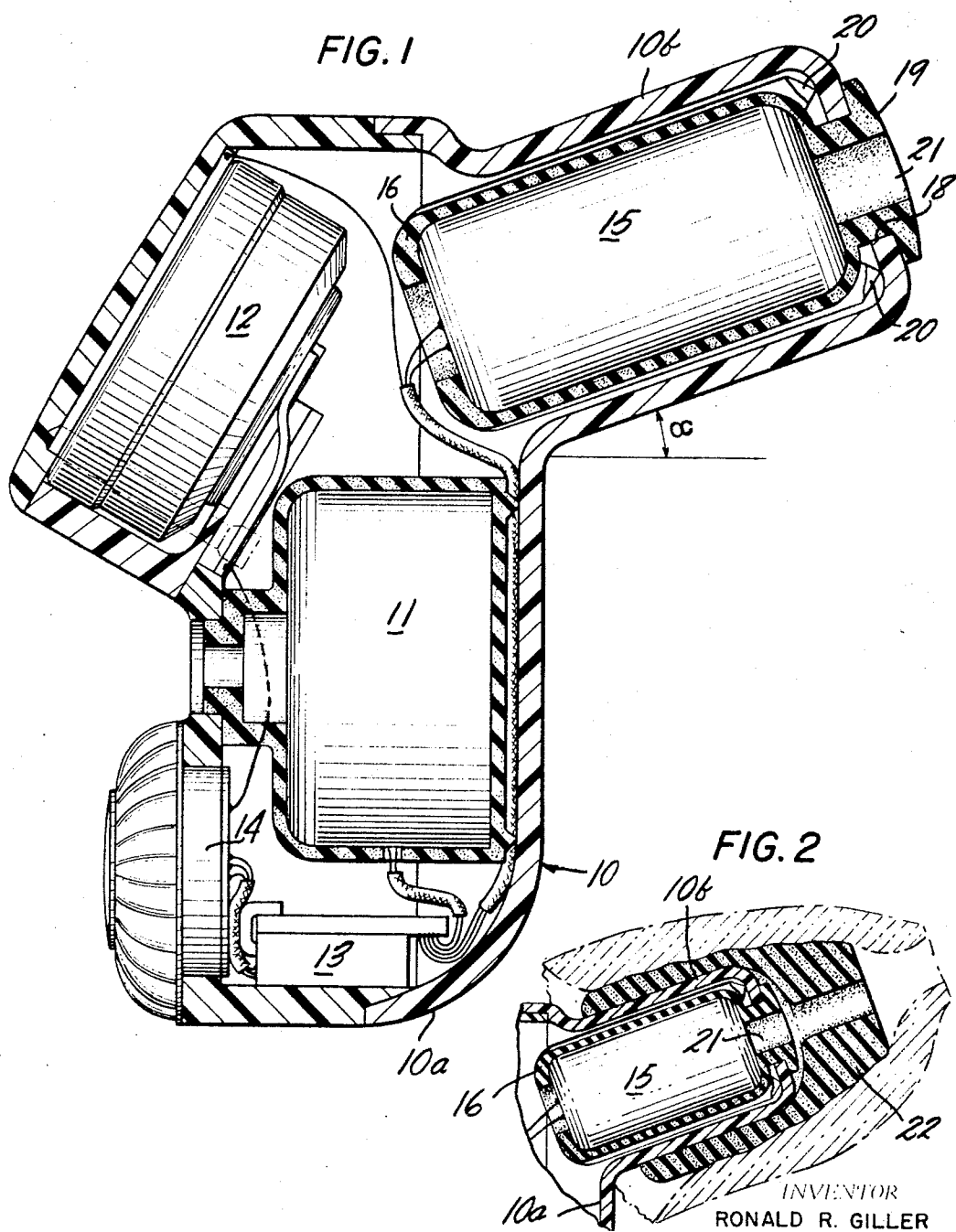
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RIGID IN-THE-EAR HEARING AID

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RIGID IN-THE-EAR HEARING AID

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3 Claims

ABSTRACT OF THE DISCLOSURE

A rigid hearing aid housing having an aperture in its outermost extremity adapted to receive in locking engagement an apertured locking protrusion of a flexible resilient suspension means for enclosing and being the sole mounting of the receiver interiorly of the unitary housing.

The present invention relates to hearing aid devices and, more particularly, to a novel and improved housing construction for an in-the-ear hearing aid.

A variety of in-the-ear hearing aids have been designed and found commercial and user acceptance since the development of miniaturized electrical circuit components which have enabled the hearing aid device to be constructed in a size susceptible of being worn in and supported by the user's ear. Early forms of in-the-ear hearing aid devices were of the custom type, wherein the electrical circuit components, such as the receiver, microphone, amplifier and power supply were disposed in a custom mold fitted to the ear of the individual user. In an effort to standardize such hearing aids for commercial production, various housing arrangements have been developed, wherein the receiver is separately mounted on and depending from the main housing by some form of flexible rubber connection, permitting angular displacement of the receiver with respect to the main housing to accommodate different configurations of the user's ear canal. The receivers are usually encased in a flexible boot and are adapted to be surrounded by an auxiliary flexible tip of a size intended to conform to the configuration of the ear canal to provide an acoustical seal.

It has been found in practice that such flexible exterior mountings of the receiver are not durable and do not provide a ready reference plane for fitting custom earmolds. The necessary length of such a form depending in its entirety from the main housing has made conventional in-the-ear hearing aid devices unacceptable for users having small and restricted ear canals. Furthermore, when the receiver extends deeply into the ear canal, there is a substantial likelihood that the receiver will become clogged with naturally generated ear wax.

In accordance with the invention, there is provided a novel and improved form of in-the-ear hearing aid, wherein the preformed housing is unitary and relatively rigid. The unitary housing comprises a main body portion adapted to lie generally within the concha of the ear for enclosing and supporting electrically interconnected elements of the device, such as the acoustical pick-up means or microphone, the amplifying means, and the power supply means. The unitary housing further comprises an elongated protruding portion rigidly disposed at a fixed angle relative to the main body portion for enclosing and supporting the receiver means within the ear canal of the user. The hollow unitary structure of the preformed housing permits an end of the receiver means to be disposed therein so that the receiver length of the protruding portion of the housing need only be of a standard dimension, sufficient to extend into and engage the user's ear canal and in conjunction with a standard or custom fitted tip to provide an acoustical seal.

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The protruding portion of the housing has an aperture in its outermost extremity adapted to receive in locking engagement an apertured locking protrusion of a relatively flexible resilient suspension means for enclosing and mounting the receiver means interiorly of the unitary housing.

For a more complete understanding of the invention, reference may be had to the following detailed description taken in conjunction with the accompanying figures of the drawing, in which:

FIGURE 1 is a cross-sectional view of an in-the-ear hearing aid device constructed in accordance with the invention; and

FIG. 2 is a partial sectional view of the protruding portion of the hearing aid device in cooperative relation with a soft flexible tip positioned in the ear canal of a user.

A unitary, relatively rigid, preformed hollow housing 10, which is preferably composed of a suitable commercially available plastic material, such as styrene or Bakelite, encloses the electrically connected elements of the hearing aid. The unitary rigid housing 10 consists of a main body portion 10a and an elongated protruding portion 10b rigidly disposed at a fixed angle α to a perpendicular from the main body portion (see FIG. 1). The angle α is preferably in the order of 20° and provides a suitable standard angular displacement conforming to the usual configuration of the human ear. The main body portion 10a of the housing may take any suitable configuration, but is preferably adapted to lie generally within the concha of the user's ear.

The main body portion 10a encloses and supports in any suitable manner conventional hearing aid elements, such as an acoustical pickup means 11, which may take the form of a conventional hearing aid microphone; a power supply means 12, which may take the form of a conventional hearing aid battery and suitable battery spring contacts; an electrical amplifying means 13; and a conventional volume control and volume control knob 14. A conventional hearing aid receiver means 15 is mounted in the interior of the protruding housing portion 10b, but may extend to any necessary extent into the interior of the main body portion 10a of the housing, dependent upon the relative size of the components. The electrical elements 11-15, inclusive, may be electrically interconnected in any suitable and conventional manner.

The receiver means 15 is substantially enclosed by a relatively flexible resilient suspension means or boot 16, which may be formed of a soft rubber or other similar natural or plastic material. The protruding housing portion 10b has an aperture 18 in its outermost extremity relative to the main body portion 10a. The resilient suspension means 16 includes an apertured locking protrusion 19 which extends through the protruding portion aperture 18, and has an enlarged flanged end overlying the protruding housing portion 10b to establish a locking engagement therewith.

The resilient suspension means 16 further includes, at least at the end proximate the apertured locking protrusion 19, a plurality of outwardly extending projections or bosses 20 for facilitating locking engagement of the suspension means 16 with the housing protruding portion 10b. The receiver enclosing suspension means 16 may be otherwise freely disposed within the interior of the elongated housing protruding portion 10b or may include one or more additional projections or bosses, adapted to be in bearing relation against the interior walls of the housing protruding portion 10b.

In order to assure an acoustic seal for acoustic vibrations or signals emanating from the receiver means 15 and passing through an aligned channel 21 in the apertured locking protrusion 19 into the ear canal, a soft

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resilient tip 22 (FIG. 2) is selectively positioned about the end of the rigid protruding housing portion 10b in a conventional manner. The tip 22 is preferably formed of soft rubber or similar material, and is either of a standard configuration or may be custom molded to conform to contiguous portions of the user's ear.

Thus there is provide, in accordance with the invention, a novel and improved in-the-ear hearing aid housing construction having a greater degree of durability and adaptability to individual ear conditions than was heretofore available.

It will be obvious to those skilled in the art that the above-described embodiment is meant to be merely exemplary and that it is susceptible of modification and variation without departing from the spirit and scope of the invention. Therefore, the invention is not deemed to be limited except as defined by the appended claims.

I claim:

1. In an in-the-ear hearing aid having a plurality of electrically interconnected elements including acoustical pickup means, electrical amplifying means connected to the acoustical pickup means, power supply means for energizing the interconnected elements, and receiver means having an input connected to the amplifying means and an acoustical output means for directing amplified acoustical signals to the interior of the user's ear canal, the improvement comprising a unitary relatively rigid preformed hollow housing, said housing having a main body portion adapted to lie generally within the concha of the ear for enclosing and supporting the acoustical pickup means, the amplifying means, and the power supply means, and an elongated protruding portion rigidly disposed at a fixed angle relative to said body portion for enclosing and supporting the receiver means within the

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ear canal of the user, said protruding portion having an aperture in its outermost extremity relative to said main body portion, and a relatively flexible resilient suspension means for enclosing the receiver means having an apertured locking protrusion at one end thereof extending through said housing protruding portion aperture and in locking engagement therewith.

2. Apparatus as claimed in claim 1, wherein said receiver enclosing suspension means is otherwise freely disposed within the interior of said elongated hollow housing protruding portion.

3. Apparatus as claimed in claim 1, wherein said resilient receiver enclosing suspension means includes outwardly extending projections for engaging in bearing relation the interior surface of said elongated hollow housing protruding portion proximate said protruding portion aperture for facilitating locking engagement of said suspension means within said protruding portion aperture and the flexible resilient mounting of the receiver means within said relatively rigid housing protruding portion.

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