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Hörvorrichtung und Ohrstück

Appareil auditif et oreillette

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(56) References cited:  
**EP-A- 1 039 779 WO-A-01/43498  
WO-A-99/07182 US-B1- 7 110 562**

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## Description

### Field of invention

[0001] This invention relates to a hearing device, such as a behind-the-ear (BTE) hearing aid, and to an earpiece for a hearing device. In this context an earpiece may be an in-the-ear part or a mould to be used in a hearing aid, and the earpiece may be provided with or without a speaker.

### Background of invention

[0002] Generally, a state of the art hearing aid, such as, for example, disclosed in US patent application no.: 2005/0244026, comprises a flexible earpiece to be inserted into the outer part (sometimes referred to as cartilaginous or softer region) of the ear canal and connected to a BTE device through a connecting tubular element. The flexible earpiece may comprise a receiver, i.e. a hearing aid speaker, mounted on to the earpiece so as to inject sound into the ear canal. This configuration is general known as receiver-in-the-ear (RITE) hearing aid. Alternatively, the BTE comprises the receiver and the sound is injected into the tubular connector communicating the sound to the earpiece.

[0003] The flexible earpiece may additionally comprise a vent so as to provide an open ear configuration thereby reducing occlusion effects but significantly reducing the allowable gain at which acoustical feedback occurs. Hence the flexible earpiece is particularly for use when hearing impairment of the user of the hearing aid is mild.

[0004] Further, US patent no.: 5,606,621 discloses a hybrid BTE and completely-in-canal (CIC) hearing aid, where the earpiece is implemented as a CIC element shaped to fit into the ear canal in such a manner to touch the bony region of the ear canal. By inserting the CIC element deep into the bony region of the ear canal occlusion effect may be avoided while a high gain still may be maintained, since sound communicated through the tissue into the ear canal (instead of from ear opening) may freely escape the ear canal. Hence this hybrid BTE/CIC hearing aid provides benefits for users having a greater hearing impairment.

[0005] In addition, US patent application no.: 2004/0010181 discloses another hybrid BTE/CIC hearing aid comprising a connector for communicating the processed sound from a processor in the BTE to a speaker in the CIC part. The connector is detachably connected to either the BTE or CIC part and is designed to be inserted in ear canal so deep as to touch the bony part of the ear canal. The connector therefore must be sufficiently rigid to allow the connector to be used to insert and remove the CIC part from the ear canal of the user.

[0006] The US patent no.: 5,606,621 and US patent application no.: 2004/0010181 basically describe closed systems, i.e. systems, which when positioned in the outer region of the ear canal causes severe occlusion effects,

which are caused by encapsulating sound conducted via tissue to the residual space between the tympanic member and closed system earpiece. Hence the purpose of the hearing aids described in these US patent documents is to position the CIC parts in the bony part or the inner most part of the ear canal thereby avoiding occlusion effect, which is not transmitted to the bony part of the ear canal. However, for users the insertion into the bony part of the ear canal may seem rather intrusive.

[0007] Furthermore, patent application WO 99/07182 discloses an acoustic coupler which is detachably secured to a receiver assembly for deep insertion into an individual's ear canal. The acoustic coupler provides a semirigid, thin walled, cylindrical coupling sleeve that is adapted to be attached to over a cylindrical receiver assembly. Accordingly, a one-fit solution is provided.

[0008] In addition patent application no. WO01/43498 discloses an in-the-canal hearing device, which includes a flexible receiver suspension grommet. The suspension member includes a tubular portion, which is configured to retain a receiver unit in a position such that sound waves emitted from the receiver are directed through a sound port.

[0009] Another acoustic coupler for deep insertion into the ear canal is disclosed in application no. EP1039779, which describes an acoustic coupler which seals comfortably, and is able to conform to a variety of ear canals, and which has a receiver module mounted in the acoustic coupler.

[0010] In a further US patent no. US 7,110,562 an earpiece auditory device including a BTE-unit and a completely-in-canal (CIC) component is disclosed. The CIC component is described as an ear mold, which mold is detachably interconnected with a speaker module, preferably using an intermediate sleeve or a detachable locking pin.

[0011] Accordingly, the above mentioned prior art hearing devices describes how a speaker element may be arranged in an earpiece of a hearing device. However, such solutions may not provide an efficient connection between the speaker element and the earpiece, why at least alternative methods of accommodating the speaker element in the earpiece should be considered.

### Summary of the invention

[0012] An object of the present invention is therefore to provide a hearing aid earpiece for insertion in the outer part of the ear canal, which accomplishes sufficient gain for users.

[0013] A particular advantage of the present invention relates to the fact that the earpiece presents an open configuration to the user thus avoiding occlusion, while maintaining a firm fixture for the earpiece in the ear canal.

[0014] A particular feature of the present invention relates to the designed shape of the earpiece providing the possibility of decreasing the vent diameter, while prohibiting the occlusion effects, and thus enabling greater gain.

**[0015]** The above object, advantage and feature together with numerous other objects, advantages and features, which will become evident from below detailed description, are obtained according to a first aspect of the present invention by a hearing device comprising a BTE unit adapted to convert and process sound to an electrical signal, and a tubular element adapted to communicate said electrical signal to an earpiece, wherein said earpiece comprises a canal element adapted to provide a tight fit of said earpiece in an ear canal, wherein the canal element comprises a proximal surface, which faces towards the BTE unit, and a distal surface, which faces towards the tympanic membrane when the earpiece is placed in the ear canal. The canal element further having a bore adapted to receive a speaker element of the hearing device, wherein the speaker element is adapted to be inserted into the bore of the canal element from the proximal surface of the canal element. The speaker element furthermore comprising a circumferential ridge section, and the earpiece further comprising a snapping element as an independent part, which snapping element is adapted to be inserted into the bore of the canal element from a distal surface of the canal element, allowing the circumferential ridge section of said speaker element to snap into engagement with the snapping element of the earpiece thereby maintaining the speaker element in the canal element, in an axially fixed position within the bore of the canal element, wherein further the speaker element comprises an O-ring adapted for providing a tight fit between the speaker element and the canal element.

**[0016]** The term "hearing device" should in this context be construed as a hearing aid, such as a BTE possibly with a receiver-in-the-ear RITE solution (receiver is a general term for a speaker within the hearing device technology), a hearing apparatus, or an assistive listening device.

**[0017]** By the speaker advantageously comprising an O-ring, a tight fit between the speaker and the canal element is obtained.

**[0018]** The speaker is adapted to receive an electrical signal and convert this to a sound pressure in the ear canal so as to improve the hearing of the user.

**[0019]** The earpiece according to the first aspect of the present invention may comprise a vent extending axially through the canal element. The vent, advantageously, allows sound pressure equalisation between ambient surroundings and the residual space between the tympanic membrane and the canal element, thus removing the occlusion effect experienced by the user of the hearing device.

**[0020]** The canal element according to the first aspect of the present invention may comprise snapping means for engaging said speaker element to said canal element. The snapping means may be separately mounted in the canal element. The term "snapping" in this context to be construed as detachably engaging, clicking on or locking together of two parts.

**[0021]** The speaker element according to the first as-

pect of the present invention may comprise a wax filter adapted to protect the speaker element from earwax entering. Alternatively, or in addition the snapping means may comprise an expendable wax filter adapted to further protect the speaker element from earwax entering. The expendable wax filter may, advantageously, be replaced whenever the wax filter is blocked. The earpiece having an outer expendable and an inner wax filter significantly increases the ability for a user to secure the operation of the hearing device. That is, the user may when experiencing decreased sound quality change the expendable wax filter and try the hearing device earpiece with a new expendable wax filter. Obviously, if the user still experiences decreased sound quality, the user may further check the wax filter in the speaker.

**[0022]** The canal element according to the first aspect of the present invention may comprise an axial bore for receiving said speaker element, said bore having an axial length in the range between 3 and 10 mm such as in the ranges between 3 and 6 mm, 6 and 9 mm, 9 and 12 mm, or 4 and 11 mm, 5 and 10 mm, 7 and 8 mm, or any combination thereof. The axial length of the bore, in fact, may express the axial length of the canal element, i.e. the bore extends through the whole length of the canal element.

**[0023]** The vent according to the first aspect of the present invention may have an axial length shorter than the axial length of the bore. By reducing the axial length of the vent advantageously enables a smaller vent diameter to be implemented for achieving the same results. Hence greater gain may be applied in the BTE unit. The canal element may thus comprise a proximal surface, which extends on one plane substantially perpendicular to said ear canal, and a distal surface facing towards the tympanic membrane, which extends on a plurality of planes substantially perpendicular to said ear canal. The terms "distal" and "proximal" should in this context be construed in relation to the BTE unit.

**[0024]** The canal element according to the first aspect of the present invention may further comprise a pull-out string extending from the proximal surface at least partly parallel to the tubular element. The pull-out string provides a means for the user to safely pull out the earpiece from the ear, i.e. without pulling the elements apart.

**[0025]** The speaker element according to the first aspect of the present invention may further comprise a hole for receiving a flexible member adapted to support said earpiece in said ear canal. The flexible member or ear-grip may be adapted to abut a surface of the outer ear.

**[0026]** The canal element according to the first aspect of the present invention may be manufactured by means of rapid manufacturing techniques such as stereo-lithographic manufacturing, selective laser sintering, shape deposition manufacturing or laminated object manufacturing. By using a SLA any customer fit is significantly simplified and customer variances may be incorporated in any earpiece.

**[0027]** The above object, advantage and feature to-

gether with numerous other objects, advantages and features, which will become evident from below detailed description, are obtained according to a second aspect of the present invention by a hearing device earpiece for connecting to a BTE unit adapted to convert and process sound to an electrical signal through a tubular element adapted to communicate said electrical signal to said earpiece, wherein said earpiece comprises a canal element adapted to provide a tight fit of said earpiece in an ear canal, and a speaker element rotate-ably mounted in said canal element.

**[0028]** The earpiece according to the second aspect of the present invention may comprise any features of the hearing device according to the first aspect of the present invention.

### **Brief description of the drawings**

**[0029]** The above, as well as additional objects, features and advantages of the present invention, will be better understood through the following illustrative and non-limiting detailed description of preferred embodiments of the present invention, with reference to the appended drawing, wherein:

figure 1, shows a perspective view of a hearing device according to a first embodiment of the present invention;

figure 2, shows an exploded view of a hearing device earpiece according to the first embodiment of the present invention;

figure 3, shows a side view of the hearing device earpiece according to the first embodiment of the present invention;

figure 4, shows a cross-sectional view of the hearing device earpiece according to the first embodiment of the present invention;

figure 5, shows a perspective view of the hearing device earpiece according to the first embodiment of the present invention; and

figure 6, shows a side view of a hearing device earpiece according to a second embodiment of the present invention.

### **Detailed description of preferred embodiments**

**[0030]** In the following description of the various embodiments, reference is made to the accompanying figures, which show by way of illustration how the invention may be practiced. It is to be understood that other embodiments may be utilized and structural and functional modifications may be made without departing from the scope of the present invention.

**[0031]** Figure 1 shows a hearing device according to the first embodiment of the present invention and designated in entirety by reference numeral 10. The hearing device 10 comprises a BTE unit 12 converting sound recorded at the BTE unit 12 and processing said sound in accordance with a particular hearing loss, a connector 14 for communicating an electric processed signal to an earpiece 16. The earpiece 16 is adapted to be inserted into an ear canal of a user and converts the electric processed signal back in to sound pressure.

**[0032]** Figure 2 shows an exploded view of the earpiece 16 and part of the connector 14 described with reference to figure 1. The earpiece 16 comprises a speaker 20 connected to the connector 14, which speaker 20 is adapted to convert electrical signals representing processed sound into a sound pressure to be provided in the ear canal of the user of the hearing device. The speaker 20 may advantageously comprise an O-ring 22 for providing a tight fit between the speaker 20 and a canal element 24. The canal element 24 is to be inserted into the outer part of the ear canal of the user of the hearing device 10.

**[0033]** The canal element 24 comprises a proximal surface 26, which faces towards the BTE unit 12, and a distal surface 28, which faces towards the tympanic membrane when the earpiece 16 is placed in the ear canal.

**[0034]** The speaker 20 comprises a circumferential ridge section 30, which is adapted to snap into engagement with the snapping element 32 thereby maintaining the speaker 20 in the canal element 24 in an axially fixed position within a bore 34 of the canal element 24.

**[0035]** The snapping element 32 may be an integral part of the canal element 24 or an independent part inserted into the bore 34 from the distal surface 28. In case the snapping element 32 is an independent part it may comprise a flange 36 axially locking the snapping element 32 against further axial movement towards the proximal surface 26.

**[0036]** Hence the speaker 20 is inserted into the bore 34 from the proximal surface 26 of the canal element 24, and the snapping element 32 as an independent part is inserted from distal surface 28 of the canal element 24, where the ridge section 30 on the speaker 20 snaps into the snapping element 32 thus locking the speaker 20 in the canal element 24. In case the snapping element 32 is an integral part of the canal element 24, the speaker 20 is simply inserted from the distal surface 28, where the ridge section 30 on the speaker 20 snaps into the snapping element 32.

**[0037]** The speaker 20 comprises a wax filter 38 for protecting the speaker 20 from ear wax produced by the user of the hearing device 10, when the earpiece 16 is inserted into the outer ear canal of the user.

**[0038]** In addition, the earpiece 16 comprises a second wax filter 40, which may be expendable so that when ever the user experience that the hearing device 10 has reduced operations then the use may exchange the wax filter 40 by simply removing second wax filter 40 and in-

serting a new wax filter 40. This functionality is, particularly, advantageous since the user may perform a first test of the operability of the hearing device 10 without needing to travel to an audiologist or hearing aid dispenser.

[0039] The earpiece 16 further comprises a vent 42 for allowing the sound pressure variations in the outer ear canal caused by sound travelling to the ear canal through the tissue and cartilage of the user. Hence the occlusion experienced by the user is significantly reduced. The diameter and length of the vent 42 are determined in accordance with the required gain for compensating a particular hearing impairment. However, by providing a shortened axial length of the vent 42 a smaller diameter may be used achieving the required effects, i.e. occlusion and gain.

[0040] The earpiece 16 further comprises a pull out string 44 for enabling the user to pull the earpiece 16 out of the ear canal of the user. When inserting the earpiece 16 into the outer ear canal of the user, the user may hold on the part of the speaker 20 extending out of the canal element 24 and gently insert the earpiece into the ear canal.

[0041] The speaker 20 further comprises a bore 46 for receiving a retention means holding the earpiece 16 in position in the outer ear canal of the user. The retention means, also called an ear grip, provides support to the earpiece 16 by flexing round the edges of the cavum concha.

[0042] Figure 3 shows a side view of the earpiece 16 having the speaker 20 inserted into the bore 34 and snapped into the snapping element 32. The second wax filter 40 is shown as inserted into the snapping element 32. The earpiece 16 in figure 3 shows the pull out string 44, whereas the earpiece according to the second embodiment of the present invention shown in figure 4 does not have a pull out string.

[0043] Figure 5, shows the canal element 24 according to the first embodiment of the present invention in a cross-sectional view where the snapping element 32 is inserted into the bore 34 and the second wax filter 40 is inserted into the snapping element 32. The bore 34 according to the first embodiment of the present invention has an axial length of 8 mm. However, the axial length of the bore 34 may be the range between 3 and 10 mm such as in the ranges between 3 and 6 mm, 6 and 9 mm, 9 and 12 mm, or 4 and 11 mm, 5 and 10 mm, 7 and 8 mm, or any combination thereof. The axial length of the bore 34, in fact, may express the axial length of the canal element, i.e. the bore 34 extends through the whole length of the canal element 24.

[0044] The axial length of the bore 34 is greater than the axial length of the vent 42. As described above with reference to figure 2 by shortening the axial length of the vent 42 the diameter of the vent 42 may be reduced. The axial length of the vent 42 according to the first embodiment of the present invention is 5.5 mm. However, the vent 42 may be in the range between 2 and 9 mm, such

as in the ranges between 2 and 4 mm, 4 and 6 mm, 6 and 9 mm, or 3 and 8 mm, 4 and 7 mm, 5 and 6 mm, or any combination thereof.

[0045] Figure 6, shows the canal element 24 according to the first embodiment of the present invention in a perspective view, where the second wax filter 40 is to be inserted into the snapping element 32.

## 10 Claims

1. A hearing device comprising
  - a BTE unit adapted to convert and process sound to an electrical signal, and
  - a tubular element adapted to communicate said electrical signal to an earpiece (16), wherein said earpiece comprises a canal element (24) adapted to provide a tight fit of said earpiece (16) in an ear canal, wherein the canal element (24) comprises a proximal surface (26), which faces towards said BTE unit (12), and a distal surface (28), which faces towards the tympanic membrane when the earpiece (16) is placed in the ear canal, said canal element further having a bore (34) adapted to receive a speaker element (20) of said hearing device, wherein said speaker element (20) is adapted to be inserted into said bore (34) of said canal element (24) from the proximal surface (26) of the canal element (24), and said speaker element (20) comprises a circumferential ridge section (30), and said earpiece further comprising a snapping element (32) as an independent part, which snapping element (32) is adapted to be inserted into said bore (34) of said canal element from a distal surface (28) of the canal element (24), wherein said circumferential ridge section (30) of said speaker element (32) is adapted to snap into engagement with the snapping element (32) of said earpiece thereby maintaining the speaker element (20) in the canal element (24), in an axially fixed position within the bore (34) of the canal element (24), **characterized in that** the speaker element (20) further comprises an O-ring (22) adapted for providing a tight fit between the speaker element (20) and the canal element (24).
2. A hearing device according to claim 1, wherein said speaker element (20) comprises a wax filter (40).
3. A hearing device according to claim 1, wherein said snapping element (32) comprises an expendable waxfilter (40).
4. A hearing device according to any of claims 1 to 3, wherein said earpiece further comprises a vent (42) extending axially through said canal element (24).
5. A hearing device according to any of claims 1 to 4, wherein said bore of said canal element (24) has an

axial length in the range between 3 and 12 mm such as in the ranges between 3 and 6 mm, 6 and 9 mm, 9 and 12 mm, or 4 and 11 mm, 5 and 10 mm, 7 and 8 mm, or any combination thereof.

6. A hearing device according to claim 5, wherein said vent (42) has an axial length shorter than the axial length of said bore of said canal element (24).
7. A hearing device according to claim 6, wherein said canal element (24) further comprises a pull-out string extending from the proximal surface at least partly parallel to the tubular element.
8. A hearing device according to any of claims 1 to 7, wherein said speaker element (20) further comprises a hole for receiving a flexible member adapted to support said earpiece in said ear canal.
9. A hearing device according to any of claims 1 to 8, wherein said canal element (24) is manufactured by means of rapid manufacturing techniques.

#### Patentansprüche

1. Hörgerät, aufweisend  
eine BTE-Einheit, die ausgebildet ist, Schall in ein elektrisches Signal umzuwandeln und zu verarbeiten, und  
ein schlauchförmiges Element, das ausgebildet ist, das elektrische Signal an ein Ohrstück (16) zu übertragen, wobei  
das Ohrstück ein Kanalelement (24) aufweist, das ausgebildet ist, einen dichten Sitz des Ohrstückes (16) in einem Gehörgang bereitzustellen, wobei das Kanalelement (24) aufweist  
eine proximale Oberfläche (26), die zur BTE-Einheit (12) gerichtet ist, und eine distale Oberfläche (28), die zum Trommelfell gerichtet ist, wenn das Ohrstück (16) in dem Gehörgang angeordnet ist, wobei das Kanalelement weiterhin eine Bohrung (34) hat, die ausgebildet ist, ein Lautsprecherelement (20) des Hörgerätes aufzunehmen, wobei das Lautsprecherelement (20) ausgebildet ist, in die Bohrung (34) des Kanalelementes (24) von der proximalen Oberfläche (26) des Kanalelementes (24) aus eingebracht zu werden und wobei das Lautsprecherelement (20) einen umlaufenden Erhöhungsbereich (30) aufweist, und  
das Ohrstück weiterhin ein Einrastelement (32) als einen unabhängigen Teil aufweist, dessen Einrastelement (32) ausgebildet ist, in die Bohrung (34) des Kanalelementes von einer distalen Oberfläche (28) des Kanalelementes (24) aus eingebracht zu werden, wobei der umlaufende Erhöhungsbereich (30) des Lautsprecherelementes (32) ausgebildet ist, in eine Rast-Verbindung mit dem Einrastelement (32)

des Ohrstückes herzustellen, wodurch das Lautsprecherelement (20) in dem Kanalelement (24) in einer axial fixierten Position innerhalb der Bohrung (34) des Kanalelementes (24) bleibt, **dadurch gekennzeichnet, dass** das Lautsprecherelement (20) weiterhin einen O-Ring (22) aufweist, der ausgebildet ist, einen dichten Sitz zwischen dem Lautsprecherelement (20) und dem Kanalelement (24) bereitzustellen.

2. Hörgerät gemäß Anspruch 1, wobei das Lautsprecherelement (20) einen Cerumenfilter (40) aufweist.
3. Hörgerät gemäß Anspruch 1, wobei das Einrastelement (32) einen aufbrauchbaren Cerumenfilter (40) aufweist.
4. Hörgerät gemäß einem der Ansprüche 1 bis 3, wobei das Ohrstück weiterhin eine Entlüftung (42) aufweist, die sich axial durch das Kanalelement (24) erstreckt.
5. Hörgerät gemäß einem der Ansprüche 1 bis 4, wobei die Bohrung des Kanalelementes (24) eine axiale Länge in dem Bereich zwischen 3 und 12 mm hat, wie etwa in den Bereichen zwischen 3 und 6 mm, 6 und 9 mm, 9 und 12 mm oder 4 und 11 mm, 5 und 10 mm, 7 und 8 mm, oder einer Kombination daraus.
6. Hörgerät gemäß Anspruch 5, wobei die Entlüftung (42) eine axiale Länge hat, die kürzer als die axiale Länge der Bohrung des Kanalelementes (24) ist.
7. Hörgerät gemäß Anspruch 6, wobei das Kanalelement (24) weiterhin eine Entnahmehilfe aufweist, die sich von der proximalen Oberfläche zumindest teilweise parallel zu dem schlauchförmigen Element erstreckt.
8. Hörgerät gemäß einem der Ansprüche 1 bis 7, wobei das Lautsprecherelement (20) weiterhin ein Loch zum Aufnehmen eines flexiblen Teils aufweist, das ausgebildet ist das Ohrstück in dem Gehörgang zu halten.
9. Hörgerät gemäß einem der Ansprüche 1 bis 8, wobei das Kanalelement (24) durch Rapid-Manufacturing-Techniken hergestellt ist.

#### Revendications

1. Appareil auditif comprenant  
une unité BTE apte à convertir et traiter le son en un signal électrique, et  
un élément tubulaire apte à communiquer ledit signal électrique à une oreillette (16), où  
ladite oreillette comprend un élément de canal (24)

- apte à fournir un ajustement serré de ladite oreillette (16) dans un conduit auditif, où l'élément de canal (24) comprend une surface proximale (26), orientée vers ladite unité BTE (12), et une surface distale (28), orientée vers la membrane tympanique lorsque l'oreillette (16) est disposée dans le conduit auditif, ledit élément de canal présentant en outre un alésage (34) conçu pour recevoir un élément haut-parleur (20) dudit appareil auditif, où ledit élément haut-parleur (20) est conçu pour être inséré dans ledit alésage (34) dudit élément de canal (24) à partir de la surface proximale (26) dudit élément de canal (24), et ledit élément haut-parleur comprend un tronçon de crête circonférentielle (30), et ladite oreillette comprenant en outre un élément d'encliquetage (32) en tant que pièce indépendante, ledit élément d'encliquetage (32) étant conçu pour être inséré dans ledit alésage (34) dudit élément de canal à partir d'une surface distale (28) de l'élément de canal (24), où ledit tronçon de crête circonférentielle (30) dudit élément haut-parleur (32) est apte à s'encliqueter en engagement avec l'élément d'encliquetage (32) de ladite oreillette maintenant ainsi l'élément haut-parleur (20) dans l'élément de canal (24), dans une position fixée axialement dans l'alésage (34) dudit élément de canal (24), **caractérisé en ce que** l'élément haut-parleur (20) comprend en outre un joint torique conçu pour assurer un ajustement serré entre l'élément haut-parleur (20) et l'élément de canal (24).
2. Appareil auditif selon la revendication 1, où ledit élément haut-parleur (20) comprend un filtre de cire (40).
  3. Appareil auditif selon la revendication 1, où ledit élément d'encliquetage (32) comprend un filtre de cire consommable (40).
  4. Appareil auditif selon l'une quelconque des revendications 1 à 3, où ladite oreillette comprend en outre un évent (42) s'étendant axialement à travers ledit élément de canal (24).
  5. Appareil auditif selon l'une quelconque des revendications 1 à 4, où ledit alésage dudit élément de canal (24) présente une longueur axiale dans l'intervalle situé entre 3 et 12 mm, comme dans les intervalles compris entre 3 et 6 mm, 6 et 9 mm, 9 et 12 mm, ou 4 et 11 mm, 5 et 10 mm, 7 et 8 mm, ou toute combinaison de ceux-ci.
  6. Appareil auditif selon la revendication 5, où ledit évent (42) présente une longueur axiale plus courte que la longueur axiale dudit alésage dudit élément de canal (24).
  7. Appareil auditif selon la revendication 6, où ledit élément de canal (24) comprend en outre un fil d'extraction s'étendant à partir de la surface proximale au moins partiellement parallèle à l'élément tubulaire.
  8. Appareil auditif selon l'une quelconque des revendications 1 à 7, où ledit élément haut-parleur (20) comprend en outre un trou destiné à recevoir un élément flexible apte à supporter ladite oreillette dans ledit canal auditif.
  9. Appareil auditif selon l'une quelconque des revendications 1 à 8, où ledit élément de canal (24) est fabriqué au moyen de techniques de fabrication rapides.

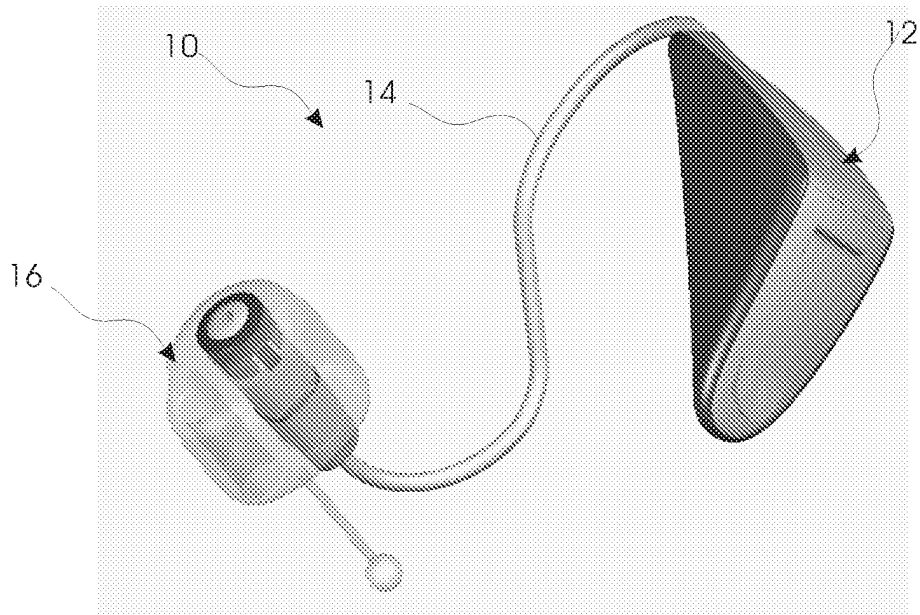


FIG. 1

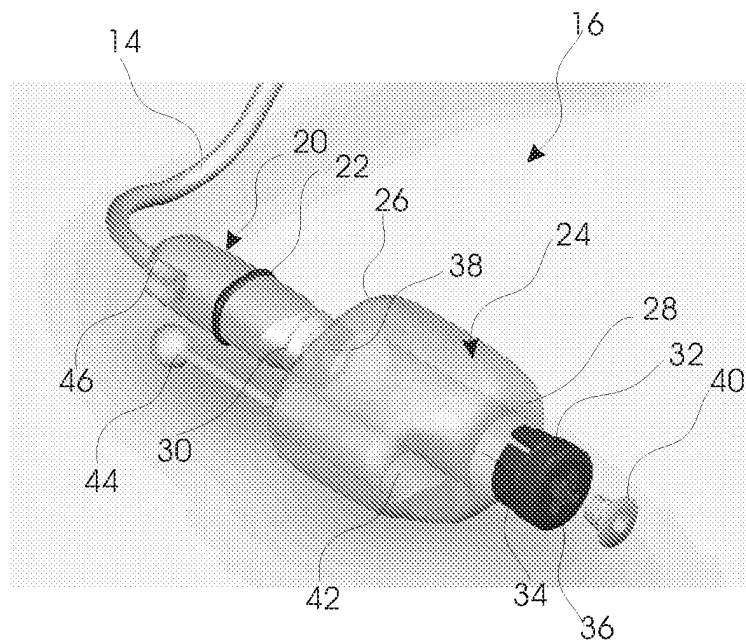


FIG. 2

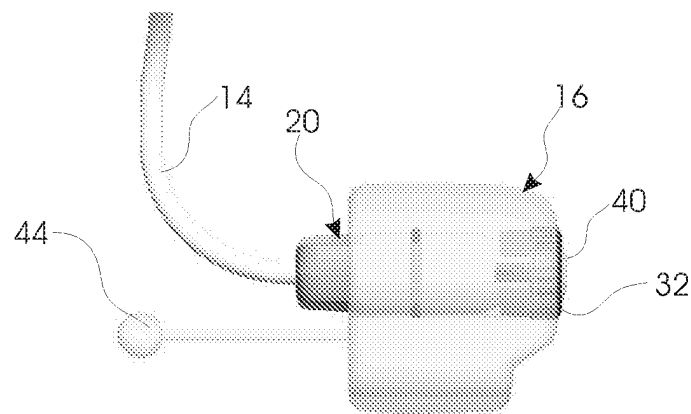


FIG. 3

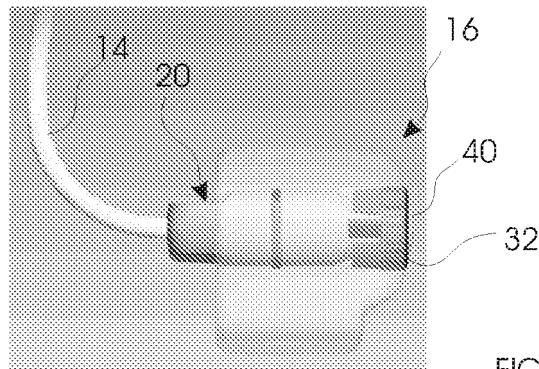


FIG. 4

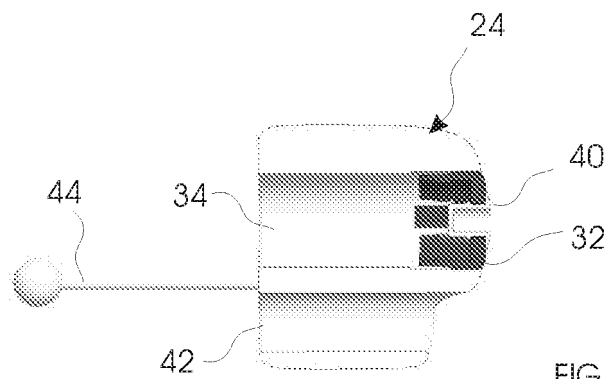


FIG. 5

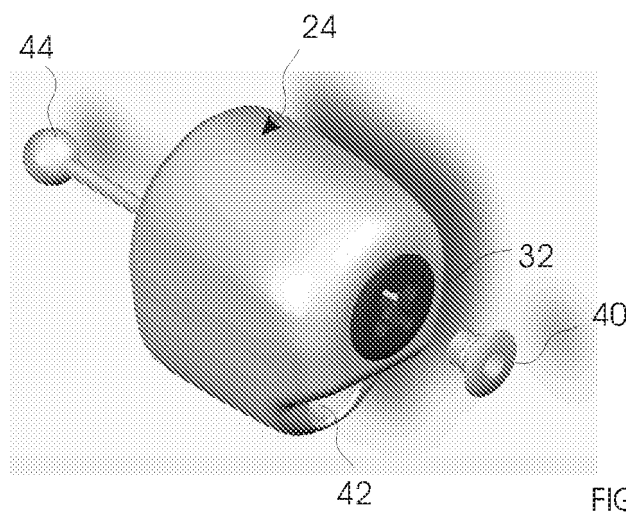


FIG. 6

**REFERENCES CITED IN THE DESCRIPTION**

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