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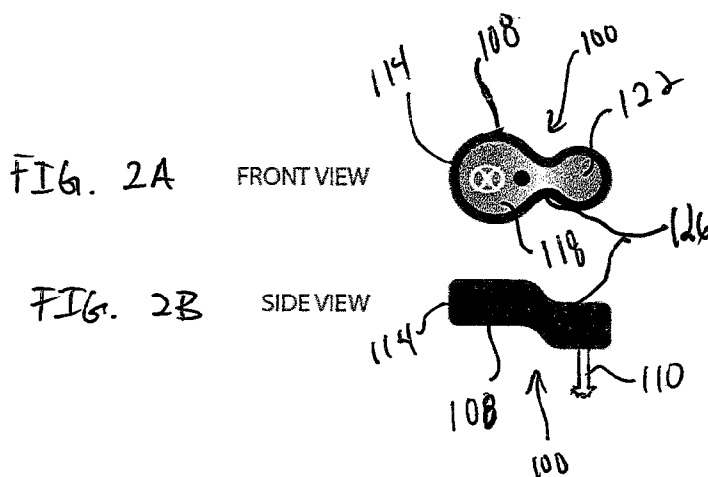
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(54) Title: PERSONAL HEARING DEVICE



(57) Abstract: A universal personal hearing device is provided. The universal personal hearing device includes a first microphone, an amplification circuit electrically connected to the first microphone, a speaker electrically connected to the amplification circuit for amplifying ambient sound detected by the first microphone, and a housing having at least one arcuate outer edge. The arcuate outer edge is slidably engageable with the concha wall to provide a universal fit across a variety of ears having different sizes and/or shapes.

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PERSONAL HEARING DEVICE

THE FIELD OF THE INVENTION

The present invention relates generally to the field of hearing devices, and more particularly to a hearing device that is usable as a universal personal sound amplifier.

BACKGROUND

The importance of hearing devices in today's society and the need to take care in protecting one's hearing from the very negative effects of hearing loss is becoming more and more apparent. It has been estimated that over 120 million Americans need to hear while working on the job or recreationally. Moreover, professional sources also estimate that over 35 million Americans need to hear better due to hearing loss. However, only 7-8 million of those have been willing to use the current distribution model of a traditional hearing clinic to get help.

There may be a variety of reasons why more people do not take advantage of the different options currently available for hearing enhancement. For example, one reason more people are not getting help may be due to the inefficiencies and expenses associated with the current distribution model of a traditional hearing clinic. In such settings, hearing devices are often customized for use with a particular individual. And,

although there may be other options available, such as personal sound amplification products (“PSAP”) which can be used to improve hearing performance in a variety of situations, there may still be some disadvantages associated with PSAP products currently available on the market. One such disadvantage is that ear size varies greatly across the general population such that a particular PSAP device that fits comfortable and in a stable fashion in one person’s ear is not likely to have the same sort of fit in another person’s ear.

There is thus a need for an improved hearing device that is easy to use in a substantially universal fashion.

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SUMMARY OF THE INVENTION

It is an object of the present invention to provide a universal personal hearing device.

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According to one aspect of the invention, a hearing device may include a first microphone, an amplification circuit electrically connected to the first microphone, a speaker electrically connected to the amplification circuit for amplifying ambient sound detected by the first microphone, and a housing having at least one arcuate outer edge. The arcuate outer edge may be part of a larger circle and configured to align with the concha area when the hearing device is placed in an ear. The arcuate outer edge may allow the housing to slidably engage the concha area of the ear, so that the hearing device is stably and comfortably held in the ear regardless of the size of the particular ear.

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According to another aspect of the invention, a hearing device includes a housing having a first section and a second section, the first section comprising an arcuate outer edge. The arcuate outer edge of the first section may be part of a larger circle and configured to align with the concha area when the hearing device is placed
5 in an ear while the second section aligns to the ear canal.

According to another aspect of the invention, a hearing device includes a housing having a first section with a substantially circular design and a second section with a substantially circular design. In at least one embodiment, the first section is larger than
10 the second section. Additionally, there may be a transition space between the first section and the second section. An outer edge of the first section may be configured to align with the concha area when the hearing device is placed in an ear while the second section aligns to the ear canal. This two-circle design may allow the hearing device to roll up or down in the outer ear according to whatever the person's ear shape or size is.

15 According to another aspect of the invention, the hearing device may be a personal sound amplification product ("PSAP").

According to another aspect of the invention, the hearing device may have a design that allows for a true unplugged, open feeling while maintaining a small in the ear, hearing device for all ears. For example, the design may include a very slim port
20 that goes into the ear allowing an open ear tip to be placed on it, leaving the ear canal completely open and natural. Alternatively, a foam tip may be placed on the port for maximum hearing protection. This is a critical point to be able to provide an affordable,

yet highly effective solution, for hearing enhancement or hearing protection to help tens of millions of Americans have easy access to effective solutions for their hearing needs.

According to another aspect of the invention, a hearing device includes a housing and one or more attachment members for engaging the housing. The attachment
5 member may releasably engage the housing to aid in the retention of the hearing device when the hearing device is placed in an ear.

These and other aspects of the present invention are realized in an improved universal hearing device and methods of using the same.

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BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments of the present invention are shown and described in reference to the numbered drawings wherein:

FIG. 1 shows a typical human ear;

15 FIG. 2A shows a front view of a hearing device according to principles of the present invention;

FIG. 2B shows a side view of the hearing device of FIG 2A;

FIG. 2C shows the hearing device of FIG. 2A placed in a ear;

FIG. 3 shows a hearing device of the present invention place in an ear at a first
20 position;

FIG. 4 shows the hearing device of FIG. 3 slidably engaged with the concha wall of the ear;

FIG. 5 shows an attachment member for securing a hearing device in an ear.

It will be appreciated that the drawings are illustrative and not limiting of the scope of the invention which is defined by the appended claims. The embodiments shown accomplish various aspects and objects of the invention. It is appreciated that it is not possible to clearly show each element and aspect of the invention in a single figure, and as such, multiple figures are presented to separately illustrate the various details of the invention in greater clarity. Similarly, not every embodiment need accomplish all advantages of the present invention.

DETAILED DESCRIPTION

The invention and accompanying drawings will now be discussed in reference to the numerals provided therein so as to enable one skilled in the art to practice the present invention. The skilled artisan will understand, however, that the methods described below can be practiced without employing these specific details, or that they can be used for purposes other than those described herein. Indeed, they can be modified and can be used in conjunction with products and techniques known to those of skill in the art in light of the present disclosure. The drawings and descriptions are intended to be exemplary of various aspects of the invention and are not intended to narrow the scope of the appended claims. Furthermore, it will be appreciated that the drawings may show aspects of the invention in isolation and the elements in one figure may be used in conjunction with elements shown in other figures.

Reference in the specification to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the

embodiment is included in at least one embodiment. The appearances of the phrase “in one embodiment” in various places may not necessarily limit the inclusion of a particular element of the invention to a single embodiment, rather the element may be included in other or all embodiments discussed herein.

5 Turning now to FIG. 1, for illustration purposes and to aid in the understanding of the placement of the present invention, a typical human ear is shown in FIG.1. The outer ear, or pinna, is an irregularly concave cartilaginous member including a number of eminences and depressions which give each ear a distinct shape and form. The helix 10 is the curved outer rim of the ear. Below the helix 10 is the antihelix 50. The antihelix 50 is a curved prominence which describes a curve around the concha 38, a deep cavity containing the entry to the ear canal 18. The concha 38 is divided into two parts, the upper concha 46 and the lower concha 34, by the crux of the helix 14 which curves around the outside of the ear, and extends inwards at about the vertical midpoint of the ear. The upper concha 46 lies above the crux of the helix 14 and below the antihelix 50. The lower concha 34 lies below the crux of the helix 14 and surrounds the entry to the ear canal 18. The concha wall 42 separates the concha 38 from the antihelix 50. In front of the lower concha 38 and projecting backwards from the front of the ear is the tragus 22, a small semicircular prominence. Opposite the tragus 22 and separated from it by the deep curvature of the intertragic notch 26 is the antitragus 30. The intertragic notch 26 is formed between the tragus 22 and the antitragus 30.

FIGs. 2A-2C show one example of a hearing device, generally indicated at 100, that may be used for total versatility in fitting various ear sizes and applications, while keeping the hearing device 100 all in the ear and not having to go behind the ear. This universal approach can serve all ears from children to adults or from small ear sizes to
5 large ear sizes.

The hearing device 100 may comprise a housing 118 that defines an internal cavity in which a first microphone, an amplification circuit electrically connected to the first microphone, and a speaker electrically connected to the amplification circuit for amplifying ambient sound detected by the first microphone are located. The housing
10 118 may also have an arcuate outer edge 114. The arcuate outer edge 114 may be part of a larger circle 108 and configured to align with the concha area when the hearing device is placed in an ear (see FIG. 4). The arcuate outer edge 114 may allow the housing 118 to be placed in an ear (as shown in FIG. 3) and then engage the concha area of the ear by sliding the arcuate outer edge
15 114 along the concha wall 42 (as shown in FIG. 4), so that the hearing device 100 is stably and comfortably held in the ear regardless of the size of the particular ear.

In a preferred embodiment of the invention the hearing device may comprise a housing having a first section 108 with a substantially circular design and a second section 122 with a substantially circular design as shown in particular in
20 FIGs. 2A and 2B. In at least one embodiment, the first section 108 is larger than the second section 122. Additionally, there may be a transition space 126 between the first section 108 and the second section 122. An outer edge of the first section

108 may be configured to align with the concha area when the hearing device 100 is placed in an ear while the second section aligns to the ear canal. This two-circle design may allow the hearing device to roll up or down in the outer ear according to whatever the person's ear shape or size is.

5 As will be appreciated by one skilled in the art, prior art in-ear hearing instruments can plug the ear off, creating an uncomfortable plugged up feeling. By comparison, the hearing device 100 of the present invention may have a design that allows for a true unplugged, open feeling while maintaining a small in the ear, hearing device for all ears. For example, the design may include a very slim port 110 (see FIG.
10 2B) that goes into the ear allowing an open ear tip to be placed on it, leaving the ear canal completely open and natural. Alternatively, a foam tip may be placed on the port for maximum hearing protection. This is a critical point to be able to provide an affordable, yet highly effective solution, for hearing enhancement or hearing protection to help tens of millions of Americans have easy access to effective solutions for their
15 hearing needs. It will also be appreciated by one skilled in the art that the principles of the present invention may be applied to a variety of hearing devices such as hearing aids, PSAPs, etc.

 On a general note, a two-circle design for a hearing device as described herein may allow for a universal fit for a variety of ears. In particular, the hearing device 100,
20 may be able to roll up or down in the outer ear according to whatever the person's ear shape or size is. Additionally, it is believed by the inventor that the novel aspects of the hearing device 100 described herein, including the use of a slim port 110 that goes into

the ear canal which is so small that it does not plug off the canal like all other in ear devices do, helps create the first in ear/open ear hearing device commercially available. In fact, the two-circle design is believed to be effective in fitting 98% of ears that it goes in.

5 Turning now to FIG. 5 there is shown an attachment member 130 for engaging the housing of a hearing device of the present invention. The attachment member 130 may releasably engage the hearing device to aid in the retention of the hearing device when the hearing device is placed in an ear. The attachment member 130 may be manufactured in a variety of sizes such that a user may choose a particular size
10 that best fits his or her ear to provide a more customized fit that is more comfortable and secure.

 There is thus disclosed an improved hearing device that is easy to use in a substantially universal fashion

CLAIMS

What is claimed is:

- 5 1. A hearing device comprising:

 a housing having an arcuate outer edge for slidably engaging the concha wall of

 an ear.
2. The hearing device according to claim 1 wherein the housing defines an
10 internal cavity, and located within the internal cavity is a first microphone, an

 amplification circuit electrically connected to the first microphone, and a speaker

 electrically connected to the amplification circuit for amplifying ambient sound

 detected by the first microphone.
- 15 3. The hearing device according to claim 1 wherein the housing includes a first

 section and a second section, the first section being larger than the second section, and

 wherein the arcuate outer edge is located on the first section.
4. The hearing device according to claim 3 wherein the first section is substantially
20 circular and the second section is substantially circular, and wherein the arcuate outer

 edge of the first section may be configured to align with the concha area when the

 hearing device is placed in an ear while the second section aligns to the ear canal.

5. The hearing device according to claim 4 wherein the hearing device is a personal sound amplification product.
6. The hearing device according to claim 1 further comprising a port for positioning in the ear canal, wherein the port is sufficiently slim so as to not plug off
5 the ear canal.
7. The hearing device according to claim 1 further comprising an attachment member for engaging the housing of the hearing device.
- 10 8. The hearing device according to claim 7 wherein the attachment member releasably engages the housing to aid in the retention of the hearing device in the concha area of an ear.
9. The hearing device according to claim 6 further comprising a foam tip may be
15 placed on the port for hearing protection

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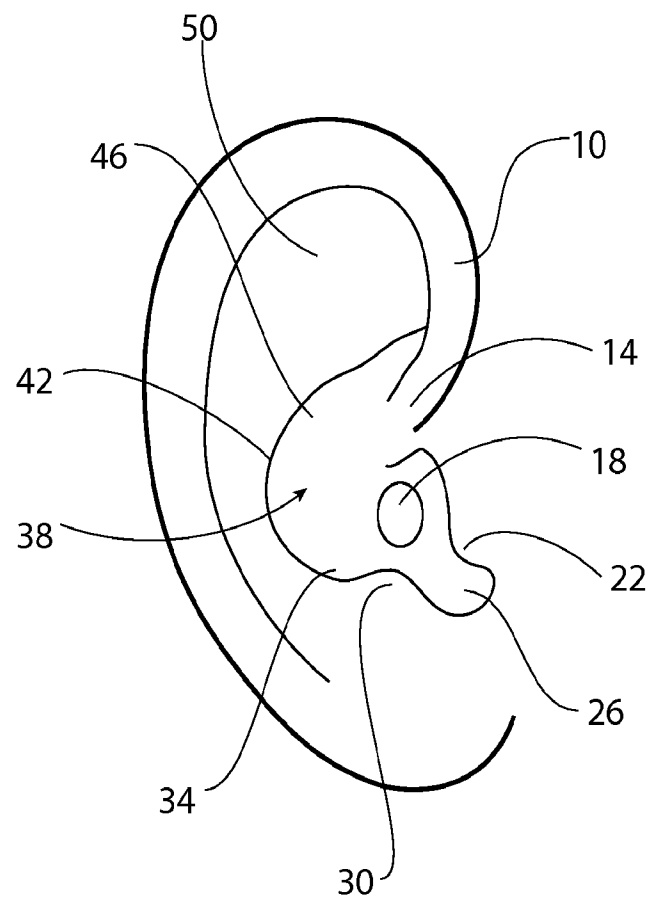
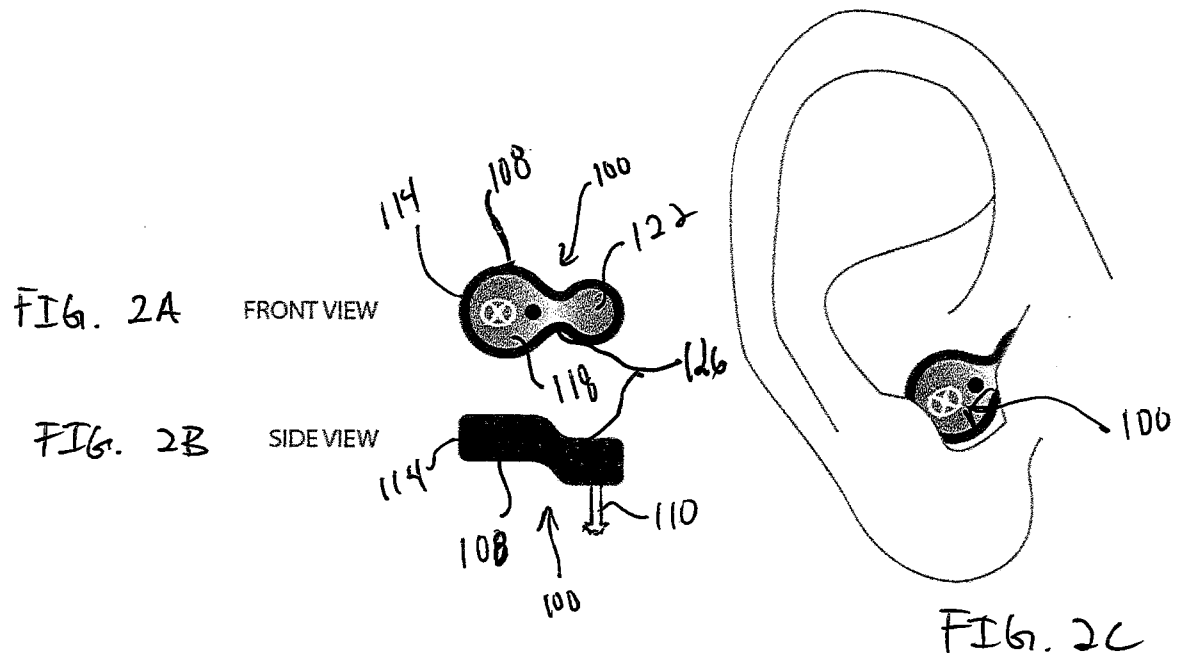


FIG. 1

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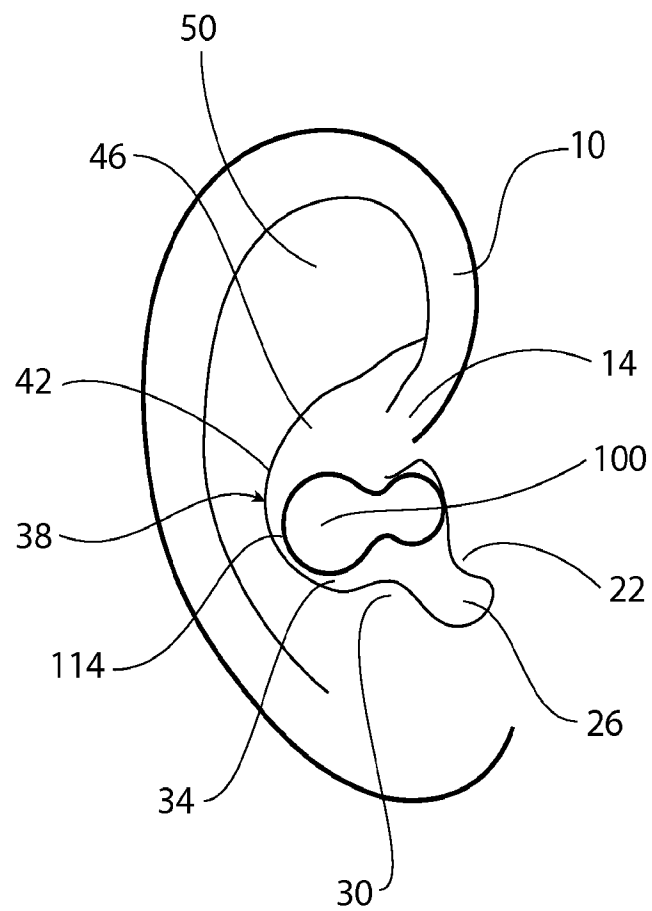


FIG. 3

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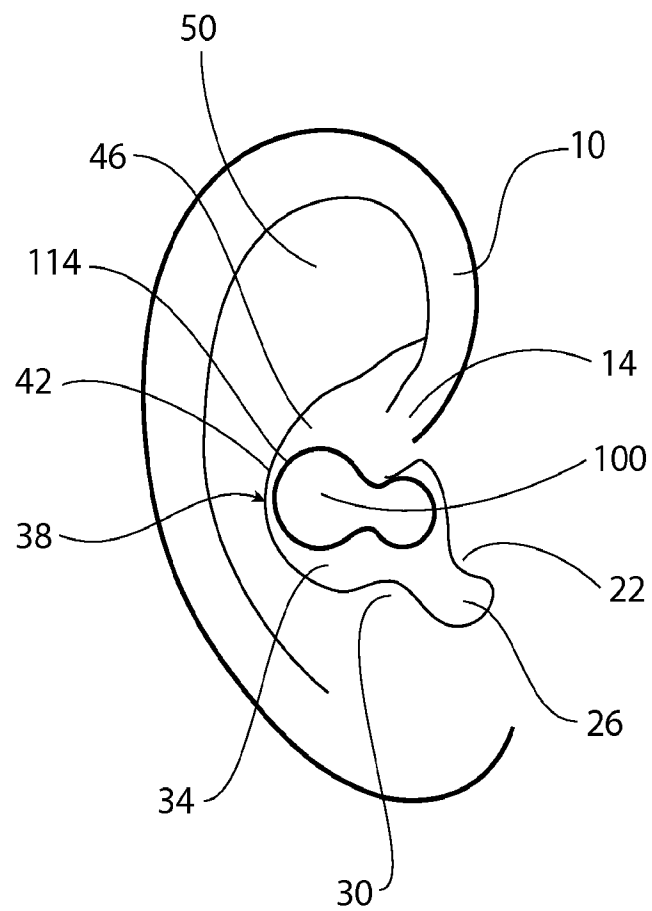


FIG. 4

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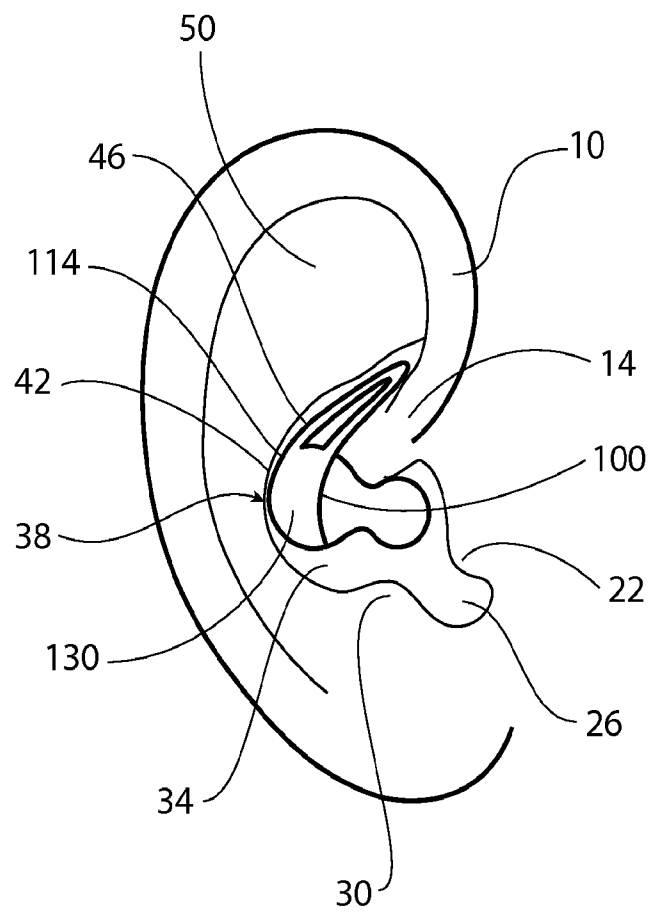


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/011478

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H04R 25/02 (2015.01)

CPC - H04R 25/02 (2014.12)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - H04R 25/00, 25/02 (2015.01)

USPC - 381/all, 312, 322-324, 328-329, 380

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - H04R 25/00, 25/02, 25/60, 25/65 (2014.12) (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar.

Search terms used: hearing, concha, slide, rotate, slip, fit, figure eight, infinity, foam, canal, curve, arcuate, shape, insert, install, attach, release

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0067556 A1 (BAILEY et al) 30 March 2006 (30.03.2006) entire document	1-6
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Y		7-9
Y	US 2011/0206225 A1 (MOLLER et al) 25 August 2011 (25.08.2011) entire document	7-8
Y	US 2009/0214072 A1 (STAAB et al) 27 August 2009 (27.08.2009) entire document	9
A	US 2013/0136279 A1 (BROWN et al) 30 May 2013 (30.05.2013) entire document	1-9

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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