

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 May 2009 (22.05.2009)

PCT

(10) International Publication Number
WO 2009/063096 A2

(51) International Patent Classification:
H04R 25/00 (2006.01)

(21) International Application Number:
PCT/EP2009/051700

(22) International Filing Date:
13 February 2009 (13.02.2009)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: MULTIPART COMPARTMENT FOR A HEARING DEVICE

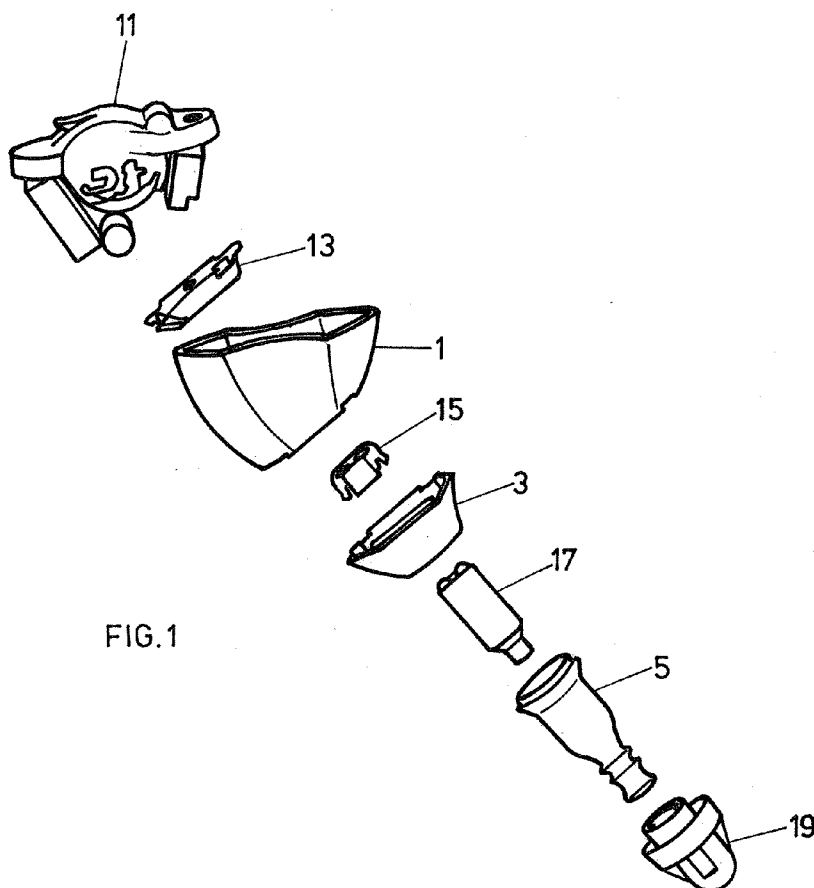


FIG.1

(57) Abstract: A hearing aid is comprising an assembly structure with at least three parts. The parts are removably connectable and at least one of the parts can be arranged in relation to another one in a different orientation. Alternatively or in addition, at least one part is made out of a flexible material.



Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— upon request of the applicant, before the expiration of the time limit referred to in Article 21(2)(a)

— without international search report and to be republished upon receipt of that report

— without classification; title and abstract not checked by the International Searching Authority

Multipart Compartment for a Hearing Device

The present invention refers to a hearing device according to the introduction of claim 1, and in particular to a
5 multipart compartment for a hearing device, such as e.g. a three-part compartment.

Hearing devices, as in particular current custom in-the-ear (ITE) hearing instruments, usually have a hard, contiguous
10 shell enveloping the entire set of internal components of the hearing instrument.

One consequence of today's usually used embodiment for an in-the-ear hearing instrument is that servicing requires
15 cutting open the hard shell.

Another problem is that each in-the-ear custom hearing instrument is suitable only for either the right or the left ear print of one single user. In other words, the same
20 in-the-ear custom unit hardware cannot be used by multiple users, nor can it be used for both ears of the same user.

The above mentioned features generate an elaborate custom product process destined to customize the fitting of each
25 in-the-ear unit to a specific ear of a specific user.

A few solutions to at least partially solve the above mentioned problems are known from the state of the art. For instance, the US 5 701 348 proposes a hearing device comprising a main module adapted to contain microphones, signal processing units etc. and a receiver module adapted to contain a receiver. So that the two modules can be at least introduced in a relatively flexible manner into an ear canal a connector of the two modules is proposed which gives a certain free movement between the two modules.

10

The WO 99/39548 proposes a hearing instrument adapted for positioning in an external auditory canal of a human proximal to the tympanic membrane. It includes a substantially rigid shell and a relatively flexible tip member.

15

Furthermore, the US 2002/0027996 proposes a disposable modular hearing aid with a plurality of shell parts. The various parts can be assembled in a modular manner to replace e.g. an earpiece as disposable part.

20

The US 6 022 311 finally proposes a soft hearing aid which comprises one shell-part which is effectively soft and which is made out of an elastomer material with a Shore Hardness of approximately 3 to 55 Durometer Shore A.

25

All the proposed solutions enable the placement of a hearing device with a certain flexibility, taking

individual, at least very similar ear canal geometries into consideration. But the use of the same hearing aid, e.g. for the right and the left ear, is not possible and furthermore, use for a plurality of users with different
5 ear canal geometries is not possible as well.

It is therefore an object of the present invention to propose a hearing instrument which can be used in a universal manner, i.e. that it can be used either for the
10 right ear as well as for the left ear of the same user or for different users. In particular, it is an object of the present invention to propose an in-the-ear hearing instrument for universal use to solve the above mentioned problems.

15

Accordingly, a hearing instrument, as in particular an in-the-ear hearing instrument is proposed according the wording of claim 1.

20 Proposed is a hearing instrument which comprises a shell or compartment for the various hearing instrument components comprising at least three parts which can be removable assembled, or which can be assembled in a different orientation one to each other, or of which at least one
25 part is flexible.

According one embodiment, it is proposed to use three shell or compartment parts in the hearing instrument as e.g. a

first hard rigid shell for e.g. electronic parts, power supply, microphones etc., a second receiver compartment or shell which can accept various dome designs at its tip and a third flexible middle compartment or shell, which

5 connects the two above mentioned parts or shells. The flexibility of this third part could be such that it is possible to adjust the angle of an individual's canal upon entry of the instrument into the ear.

10 According a further embodiment, it is also possible that the third middle part can be connected to at least one of the two other parts, such that the middle compartment is reversibly mountable, thus resulting in fitting the right or the left ear.

15

It is e.g. proposed that the three parts can be assembled with a locking mechanism that interlocks the middle e.g. flexible compartment with the hard shell of the first part and/or with the second part, such as the receiver

20 compartment. In other words, the locking mechanism can also interlock the receiver compartment and the middle flexible compartment.

Both locking mechanisms as mentioned above allow a snap-fit
25 assembly. The snap action is reversible e.g. for servicing purpose.

Of course, the shell or compartment of the hearing instrument can also have more than three parts, as e.g. in case that the hard first part-shell is made out of two shell half parts.

5

The inventive embodiments are preferably used e.g. for an in-the-ear hearing device, which has to be introduced into a user's ear canal. The invention shall be described in more detail by the examples as shown within the attached
10 figures.

The figures show:

Fig. 1 shows an inventive hearing instrument in an exploded
15 view;

Fig. 2 shows the assembled hearing instrument, shown in parts within fig. 1; and

Fig. 3a and 3b show an inventive hearing instrument assembled for the use in the right ear and assembled for
20 the use in the left ear of a user, and

Fig. 4a and 4b the inventive hearing instrument, further comprising a securing feature to prevent over insertion.

Fig. 1 shows schematically an inventive in-the-ear (ITE)
25 hearing instrument in exploded view.

The hearing instrument comprises as principle shell parts a e.g. rigid or hard first protective shell 1, in which e.g. electronics and power supply 11 can be introduced. At the bottom of this hard shell 1, a shell-snap mechanism 13 can
5 be inserted for a releasable snap-connection with a following flexible middle compartment 3, which is an intermediate compartment to connect the hard shell 1 with a receiver housing compartment 5 in which the receiver 17 can be introduced. For a releasable snap-connection between the
10 flexible middle compartment 3 and the receiver housing 5, a further receiver snap mechanism 15 can be introduced within the flexible middle compartment.

At the end of the receiver housing 5, a flexible dome 19
15 might be arranged.

The flexible middle compartment can be connected to the half-shell 1 and the receiver housing compartment 5 such to adjust the angle of an individual's ear canal upon entry of
20 the instrument into an ear.

The middle flexible component 3 can be an enveloping structurally empty chamber. As such the usually trapped air acts as a sound dampening mechanism which reduces the
25 energy transfer produced in the receiver compartment from being picked up by components (microphone) in the sound-receiving shell. In addition, the flexible nature of the

middle envelope compartment also acts as an energy absorber helping to damper the energy transfer.

An additional function of the two snap mechanisms, items 13 and 15 in fig. 1, is to establish a physical barrier to the energy generated by the receiver compartment. In addition the two snap mechanisms 13 and 15 preferably include e.g. a small central hole to allow passage of e.g. wires that conduct the electrical energy generated in the shell module to the receiver module.

Fig. 2 shows again schematically the various parts as shown in fig. 1 in an assembled arrangement. Within the hard shell 1, again the electronics and the power supply 11 is inserted. Abutting to the hard shell 1, the flexible middle compartment 3 is arranged, connecting the hard shell 1 directly with the receiver housing compartment 5. The receiver housing compartment could be either again a rigid hard shell or could also be made out of a flexible material such as e.g. a polymeric material.

Figs. 3a and 3b show two possible assemblies of a hearing instrument as proposed according the present invention. Fig. 3a shows the hearing instrument foreseen for being inserted into the right ear of a user person. The middle flexible compartment 3 is arranged such, that the angle between the receiver housing 5 and the hard outer shell 1 corresponds to the angle of the right ear of a user person.

In contrast, fig. 3b shows the same hearing instrument, but the middle flexible compartment being arranged reversed, i.e. at an angle turned around 180° compared to the assembled hearing instrument as shown in fig. 3a. As a
5 consequence the same hearing instrument can also be used for the insertion into the left ear of the same user person.

In a similar way of course by arranging the middle flexible
10 compartment in an appropriate way, the same hearing instruments could be used by another user of which the geometry of the ear canal is slightly different. To be able to adjust the mounting of the three parts, it might be preferred that for connecting the three parts a releasable
15 snap mechanism is used, as described with reference to fig. 1. But of course, also different connections could be used, preferred of course is, if the release of one part to the other can be achieved without the use of a special instrument and also without the danger of damaging one or
20 the other part of the hearing instrument.

Besides, the possibility of using one and the same hearing instrument for the right ear of a user as well as for the left ear of a user, and also for users with different ear
25 canal geometry, another advantage is that the production of such a hearing instrument is universal. In other words, a hearing instrument which can be used for different purposes can easily be produced without the need that for each user the ear canal geometry has to be measured before. In other

words, so-called fit-and-go in-the-ear hearing instruments can be produced. Also the service and maintenance for such a hearing instrument is far easier than for a normal custom made ITE hearing instrument.

5

Figures 4a and 4b show in perspective view from the side and from the top the inventive hearing instrument, further comprising a safety feature to prevent over insertion of the hearing instrument into the ear canal. The component 31
10 to prevent over insertion is a part that can be snapped e.g. onto the shell 1 to help prevent the possibility of over inserting the in-the-ear hearing instrument into patients especially having large ear canals. The component can be snap-removed when it is not desirable to have it
15 included. Furthermore, when included the component 31 to prevent over insertion also may serve as a convenient structure for the user to grab to facilitate the removal of the hearing instrument from the ear physicality.

20 The examples as shown with reference to figs. 1 - 4 are for the better understanding of the present invention. Of course, the design, the geometry, the way of the assembly etc. can be made in a different way. It is also possible to use flexible materials for all compartments, to use
25 different materials for the three compartments etc. The main issue of the present invention is that the casing of a hearing instrument is made out of various parts which can be arranged in relation one to each other in a different orientation to enable use in a right or in a left ear. Or

to have at least one middle part of a three-part shell which is flexible, such to enable the use in ear canals of different users with different ear canal geometry.

Patent Claims

1. Hearing aid, comprising an assembly structure with
at least three parts which are removable
5 connectable and of which at least two parts can be
arranged one in relation to the other in a
different orientation.
2. Hearing aid, comprising an assembly structure with
at least three parts which are removable
10 connectable, of which at least one part is made out
of a flexible material.
3. Hearing instrument according to one of the claims 1
or 2, characterized in that the middle part is made
out of a flexible material.
- 15 4. Hearing instrument according to one of the claims 1
to 3, comprising a hard or rigid shell for the
arrangement of electronic parts and a power supply,
a receiver housing compartment for the arrangement
of a receiver and a middle connecting compartment
20 for the interconnection of the hard shell and the
receiver housing compartment.
5. Hearing instrument according to one of the claims 1
to 4, characterized in that at least two parts or
compartments are made out of a flexible and/or
25 elastomeric material.
6. Hearing instrument according to one of the claims 1
to 5, characterized in that the three parts are

connectable to each other via a mechanical snap interlocking mechanism.

- 5 7. Hearing instrument according to one the claims 1 to 6, characterized in that of the three parts at least one as e.g. the middle part is reversibly mountable, thus resulting in fitting a hearing instrument suitable for the right or the left ear of a user.
- 10 8. Hearing instrument according to one of the claims 1 - 7, further comprising an additional component provided to be attached e.g. by snapping onto the rigid or hard shell and laterally projecting from the shell to help prevent the possibility of over inserting the hearing instrument into the ear canal
15 of patients having large ear canals.
9. Hearing instrument according to one of the claims 1 to 8, characterized in that the hearing instrument is a so-called in-the-ear (ITE) hearing instrument.

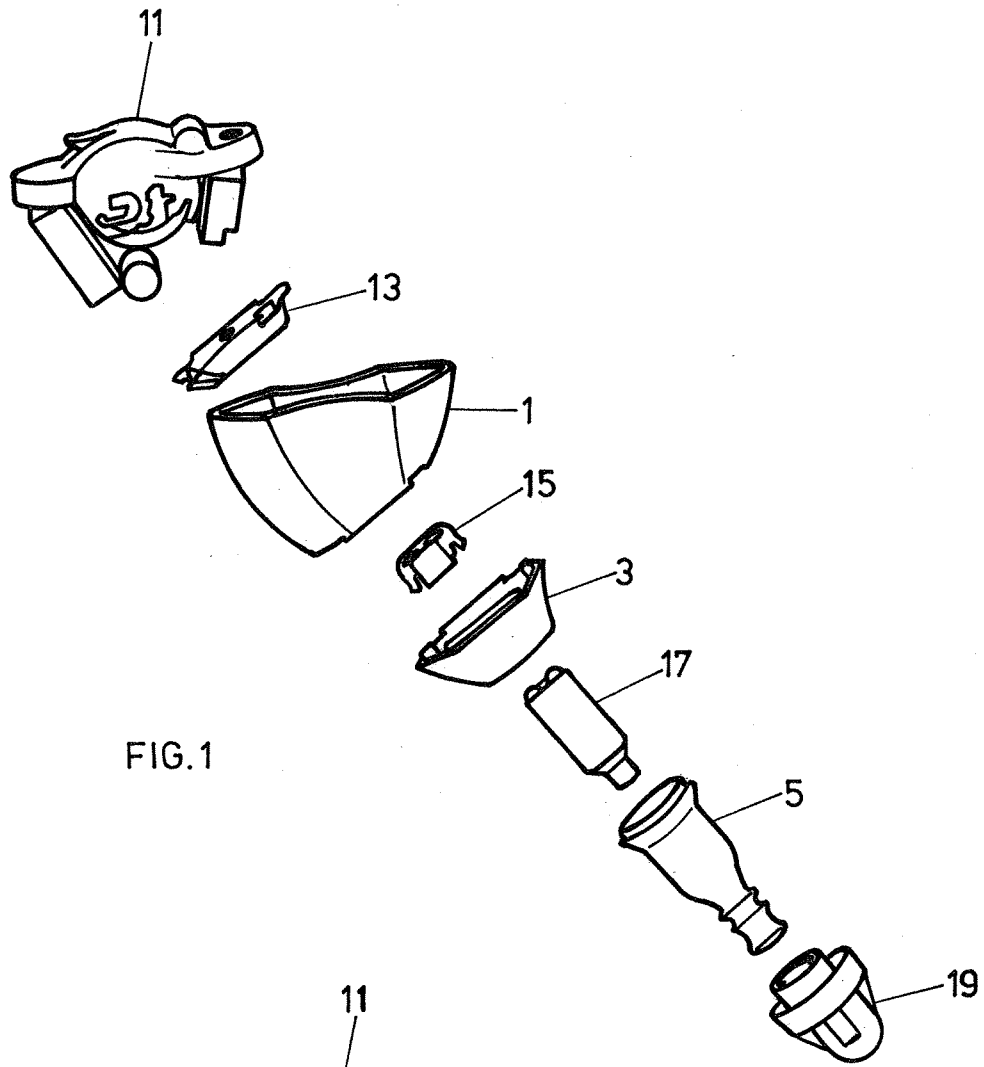


FIG. 1

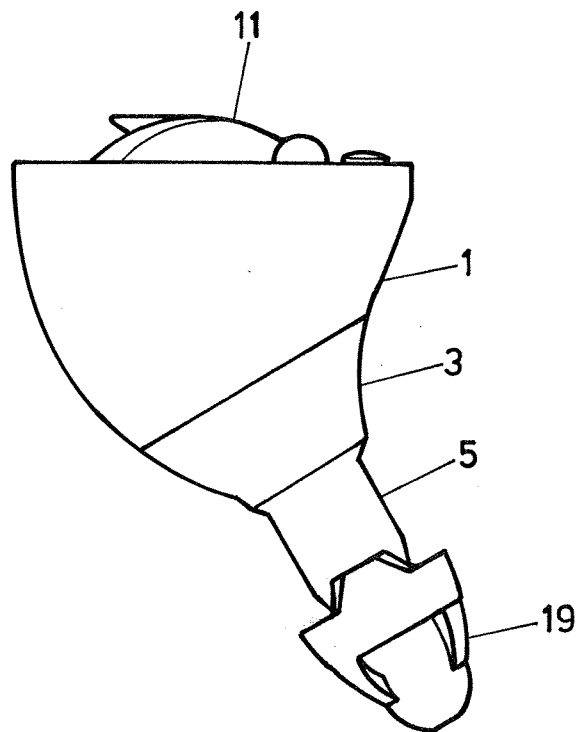


FIG. 2

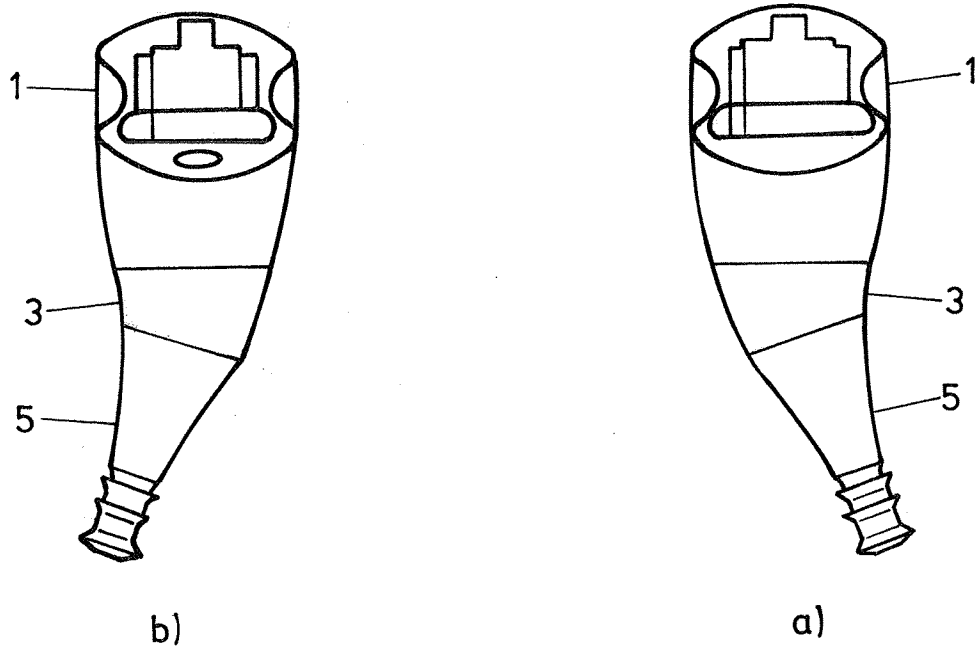


FIG. 3

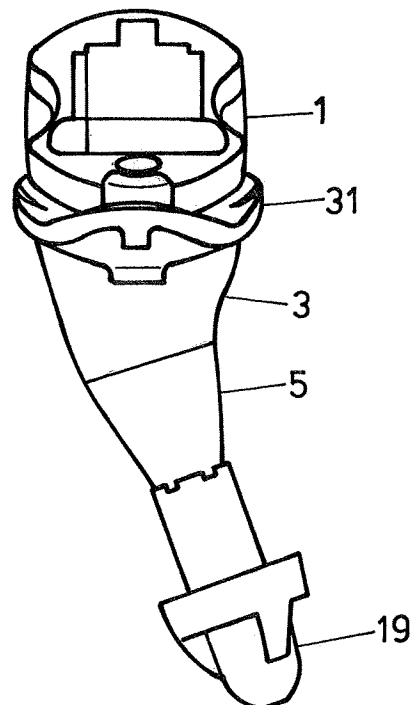


FIG. 4a

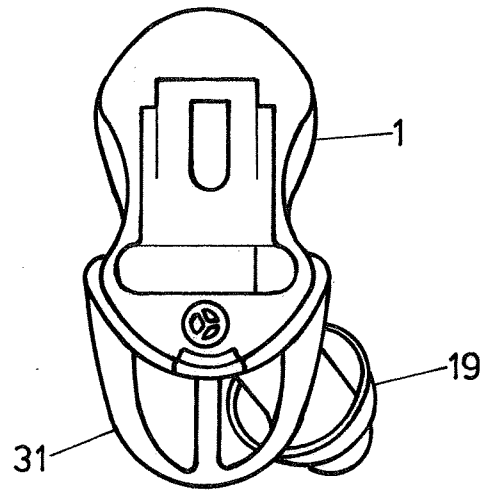


FIG. 4b