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(54) **In-ear earphone**

(57) An in-ear phone having a housing (110) for receiving an electro-acoustic transducer (115) and a stabilizing unit (120) is provided. The stabilizing unit comprises a first section (121) fixedly connected to the housing (110) and a second section (122) being adjustable along a longitudinal direction of the stabilizing unit (120). The second section (122) of the stabilizing unit comprises a first end (123a) and a second distal end (122b). The second end (122b) is flexible and comprises a surface contact area for engaging in an upper concha of a user's ear.

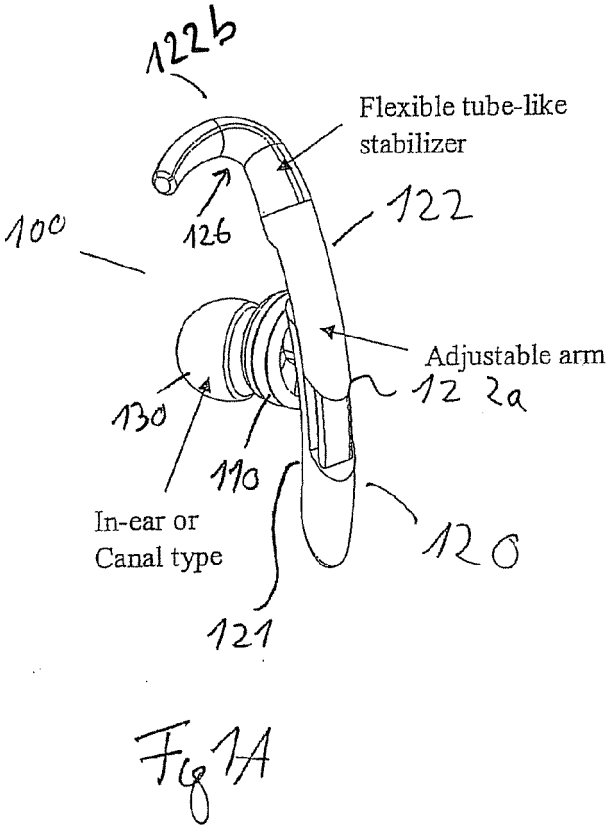

Fig 1A

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Description

[0001] The present invention relates to an in-ear phone.

[0002] In- ear phones have become very popular in recent years and are in particular used during vigorous activity like sport or the like. However, due to the different sizes of the human ears, the in- ear phones or channel-type ear phones will not fit into each ear equally well.

[0003] US 2008/0181444 A1 shows an in-ear communication device.

[0004] US 7,379,557 shows a headset with an auxiliary positioning device.

[0005] Therefore, in- ear phones are known which have stabilizing or securing means for stabilizing or securing the in- ear phone in the ear of the user.

[0006] It is an object of the present invention to provide an improved in-ear phone or channel-type ear phone which allows a stable wearing of the ear phone in a great variety of human ears.

[0007] This object is solved by an in-ear phone according to claim 1.

[0008] Accordingly, an in- ear phone having a housing for receiving an electro- acoustic transducer and a stabilizing unit is provided. The stabilizing unit comprises a first section fixedly connected to the housing and a second section being adjustable along a longitudinal direction of the stabilizing unit. The second section of the stabilizing unit comprises a first end and a second distal end. The second end is flexible and comprises a surface contact area for engaging in an upper concha of a user's ear. The second section remains in its position relative to the first section when no force is applied to the stabilizing unit. The length of the stabilizing unit is adjustable when the in- ear phone is placed inside in an ear of a user.

[0009] According to an aspect of the invention, the second section moves along a curved path relative to the first section when adjusting the length of the stabilizing unit.

[0010] According to a further aspect of the invention, the second section moves along a circular arc relative to the first section when adjusting the length of the stabilizing unit.

[0011] According to an aspect of the invention, the second end is implemented as a flexible tube-like element substantially perpendicular to the longitudinal direction of the stabilizing unit.

[0012] According to a further aspect of the invention, the second end is implemented as a curved adjustable arm. The curve of the second end is adapted to engage into an anti-helix of an ear of a user.

[0013] According to an aspect of the invention the in-ear phone comprises a flexible appendix which is attached to the flexible second and of the second section. The appendix points back from the second end of the second section substantially parallel to the longitudinal direction of the stabilizing unit and is directed towards the housing.

[0014] According to a further aspect of the invention the flexible appendix bulges when a force is applied to the flexible second end in the longitudinal direction of the stabilizing unit and the bulging causes to fill up the void inside the anti-helix of the ear of a user when the in-ear phone is worn in a human ear.

[0015] The present invention relates to the idea to provide an in-ear phone having a housing for receiving an electro-acoustic transducer and a stabilizing unit which is coupled to the housing for the electro-acoustic transducer. The stabilizing unit has an adjustable length to be able to fit securely into different kinds of ears of the user.

[0016] The stabilizing unit comprises a first end which is interacting with the housing for receiving the electro-acoustic transducer and a second end which is engaging in the ear of the user. The second end can comprise a flexible end of the stabilizing unit. This flexible end can be for example implemented as a flexible tube-like element. Preferably, the stabilizing unit can be adjusted in its length along its longitudinal axis.

[0017] The flexible end of the stabilizing unit is adapted to be in contact with the upper concha of the user's ear. The flexible end of the stabilizing unit is also used to increase the surface contact between the stabilizing unit and the upper concha of the ear. The second end of the stabilizing unit can also be implemented as a curved adjustable arm with an angle which is adapted to the anti-helix of the ear. In addition, the second end of the stabilizing unit can be implemented as a flexible stabilizer and with an increasing size when it is bended inside the anti-helix.

[0018] Further aspects of the invention are described in the dependent claims.

[0019] Advantages and embodiments of the invention will now be described in more detail with reference to the Figures:

Fig. 1A shows a schematic representation of an in-ear phone according to a first embodiment,

Fig. 1B shows a schematic representation of the in-ear phone of Fig. 1A inside a human ear,

Fig. 2A shows a schematic representation of an in-ear phone according to a second embodiment,

Fig. 2B shows a schematic representation of the in-ear phone according to the second embodiment inside a human ear,

Fig. 2C shows a schematic representation of a cross-section of the in-ear phone according to a the second embodiment,

Fig. 3A shows a schematic representation of an in-ear phone according to a third embodiment,

Fig. 3B shows a schematic representation of the in-ear phone according to the third embodiment in a second operating position,

Fig. 3C shows a schematic representation of a cross-section of the in-ear phone according to the third embodiment inside a human ear,

Fig. 3D shows a schematic representation of the in-ear phone according to the third embodiment inside a human ear, and

Fig. 4 shows a schematic cross section of an in-ear phone according to a fourth embodiment.

[0020] Fig. 1A shows a schematic representation of an in-ear phone according to a first embodiment. The in-ear phone 100 according to the first embodiment comprises a housing 110 for receiving the electro-acoustic transducer (not shown), a stabilizing unit 120 and an in-ear cushion 130 if the in-ear phone is implemented as a channel-type ear phone. The stabilizing unit 120 comprises a first section 121 fixedly connected to the housing 110 and a second adjustable section 122. The second section 122 comprises a first end 122a and a second end 122b. The first end 122a is arranged towards the first section 121. The second end 122b is arranged at the distal end of the second section 122. The stabilizing unit 120 comprises a longitudinal direction and the length of the stabilizing unit 120 (including the first and second section) is adjustable in the longitudinal direction, i.e. the stabilizing unit comprises an adjustable arm as second section 122. In other words, the distance between the distal ends of the first and the second section 120, 122 can be varied to adjust to different ears. At the second end 122b of the second section 122 of the stabilizing unit 120, a flexible tube-like stabilizer 126 is provided. This flexible tube-like stabilizer 126 will be in contact with the anti-helix of the user's ear. The second end 122b of the stabilizing unit, i. e. the flexible tube-like stabilizer can comprise a bend in order to improve the secure fitting of this second end in the anti-helix of the user's ear.

[0021] Fig. 1 B shows a schematic representation of the in-ear phone of Fig. 1 A inside a human ear. Here, the in-ear phone according to the first embodiment is placed in the ear 200 of the user. In case that the in-ear phone is implemented as a channel-type ear phone, the cushion 130 is placed inside an ear channel. The second end 122b of the second section 122 is in contact with the anti-helix 210 of the user's ear. As the length of the stabilizing unit 120 is adjustable, the in-ear phone according to the first embodiment can fit into almost every ear of a user.

[0022] An in-ear phone according to a second embodiment substantially corresponds to the in-ear phone according to the first embodiment. Therefore, the in-ear phone 100 comprises a housing 110 for receiving the electro-acoustic transducer (not shown), a stabilizing unit 120 and a cushion 130 if the in-ear phone is implemented as a channel-type ear phone. The stabilizing unit 120 comprises a second adjustable section 122 having a first end 122a and a second end 122b, wherein the second end 122b will be placed into the contact of the upper concha of the ear of the user. The main difference between the in-ear phone according to the first and the second embodiment is that the stabilizing unit and in particular the second end of the second section of the stabilizing unit has a different shape. Here, the second end of the second section of the stabilizing unit 120 is bend towards the housing 110 while the second end of the second section of the stabilizing unit 120 according to the first embodiment is bend substantially in parallel to the outer ear of a user.

[0023] Fig. 2A shows a schematic representation of an in-ear phone according to the second embodiment. The earphone according to the second embodiment substantially corresponds to the earphone according to the first embodiment. In particular, the arrangement of the in-ear cushion 130, the housing 110 and the first section 121 of the stabilizing unit 120 corresponds to the respective parts according to the first embodiment. Accordingly, merely the second section 122 of the stabilizing unit is different. The first section 121 of the stabilizing unit 120 will substantially and functionally correspond to the first section 121 of the stabilizing unit according to the first embodiment. While the tube-like stabilizer 126 at the second end of the second section of the stabilizing unit 120 according to the first embodiment is arranged in an angle substantially perpendicular to the longitudinal direction of the stabilizing unit, the second end of the second adjustable section 122 of the stabilizing unit 120 according to the second embodiment carries an appendix 122c substantially parallel to the longitudinal direction of the stabilization unit 120. The second end 122b of the second adjustable section 122 is preferred to be flexible and to allow a more comfortable and secure fitting of this second end into the upper concha of a user's ear.

[0024] As can be seen in Fig. 2A, the second end 122b of the stabilizing unit according to the second embodiment can be very flexible. The appendix 122c is attached to the outer end of the flexible second end 122b of the second section 122. The appendix 122c is flexible. It points back from the second end 122b of the second section 122 substantially parallel to the longitudinal direction of the stabilizing unit 120, directing towards the housing 110. When a force F is applied to the flexible second end 122b in the longitudinal direction of the stabilizing unit 120 the flexible appendix 122c will bulge as indicated in Fig. 2A. The purpose of this bulge effect is to fill up the void inside the anti-helix 210 of the ear 200 of a user as shown in Fig. 2C when the in-ear phone worn in a human ear.

[0025] Fig. 2B shows a schematic representation of the in-ear phone according to the second embodiment inside a human ear. Here, the in-ear phone according to the second embodiment is depicted inside a human ear.

[0026] Fig. 2C shows a schematic representation of a cross-section of the in-ear phone according to the second embodiment inside a human ear. The in-ear phone 100 comprises a housing 110 for receiving the electro-acoustic transducer 115, a stabilizing unit 120 and an ear cushion 130. The stabilizing unit 120 comprises a first section 121 which is fixedly connected to the housing 110 and a second section 122, which is adjustable along the longitudinal direction of the stabilizing unit. The adjustable portion of the stabilizing unit, i.e. the second section 122, comprises a first end 122a which interacts with the first section 121. The second end 122b of the second section 122 is flexible. In particular, the surface contact area of the flexible appendix 122c is depicted, which will be in contact with the inside area of the anti-helix to improve the secure and comfortable fitting of the in-ear phone.

[0027] Fig. 3A shows a schematic representation of an in-ear phone according to a third embodiment. The earphone according to the third embodiment can be based on an earphone according to the first or second embodiment. In particular, the in-ear phone according to the third embodiment comprises a housing 110 for receiving an electro-acoustic transducer and a stabilizing unit 120 which comprises a first section 121 which is fixedly connected to the housing 120 and a second adjustable section 122. The adjustment mechanism between the first and second section 121, 122 according to the third embodiment can be based on the adjustment mechanism according to the first or second embodiment. The in-ear phone comprises a housing 110 for receiving an electro-acoustic transducer (not shown) and a stabilizing unit 120. A first section 121 of the stabilizing unit is fixedly connected to the housing 110 and a second section 122 is adjustably connected to the first section 121. In particular, the length of the stabilizing unit 120 can be adjusted. This is advantageous to allow a comfortable and secure fitting of the in-ear phone into almost every upper contour of a user's ear. The second section 122 comprises a first end 122a and a second end 122b. The second end 122b is preferably flexible to allow a more comfortable fitting into the upper contour of a human's ear. At the second end 122b, a surface contact area 122d is provided, which will be in contact with the inner area of the anti-helix of the human's ear.

[0028] Fig. 3B shows a schematic representation of the in-ear phone according to the third embodiment in a second operating position. In Fig. 3B, the in-ear phone according to the third embodiment is depicted in a second position. In this position, the length of the stabilizing unit is reduced to its minimum, such that the second end 122b will not be in contact with the inner portion of the anti-helix of a user's ear. In this position, the in-ear phone can be worn like a normal in-ear phone without a stabilizing unit.

[0029] Fig. 3C shows a schematic representation of a cross-section of the in-ear phone inside a human ear. The in-ear phone according to the third embodiment comprises a housing 110 for receiving an electro-acoustic transducer 115, as well as a first section 121 and a second section 122 of a stabilizing unit 120. The first section 121 of the stabilizing unit is fixedly connected to the housing 110, while the second section 122 is adjustable along a longitudinal direction of the stabilizing unit 120. The second end 122b of the adjustable part 122 of the stabilizing unit is preferably flexible and will be in contact with the inner area of the anti-helix.

[0030] Fig. 3D shows a schematic representation of the in-ear phone according to the third embodiment inside a human ear. With the in-ear phone according to the first, second or third embodiment, an in-ear phone with an adjustable stabilizing unit is provided, wherein the stabilizing unit comprises a flexible tip which comes into contact to the upper concha of the user's ear. The second end can be implemented as a tube-like flexible stabilizer extending from the anti-helix to the crux of helix. The second end can also be implemented as a flexible stabilizer, which is able to bend and thereby increase the surface contact area between the second end and the inside of the anti-helix. As the stabilizing unit is adjustable along its longitudinal direction, the movable part of the stabilizing unit can be retracted such that the ear phone can be worn without the stabilizer being in contact with the anti-helix.

[0031] Fig. 4 shows a schematic cross-section of an in-ear phone according to a fourth embodiment. The in-ear phone 100 according to the fourth embodiment can be based on the first, second or third embodiment and comprises a housing 110 for receiving an electro-acoustic transducer (not shown) and a stabilizing unit 120. A first section 121 of the stabilizing unit 120 is fixedly connected to the housing 110 and a second section 122 is adjustably connected to the first section 121. In particular, the length of the stabilizing unit 120 can be adjusted. The second section 122 comprises a first end 122a and a second end 122b. The second end 122b can be implemented according to the first, second or third embodiment of the in-ear phone 100.

[0032] The dashed line shows the second section 122 in a second operating position. In this second operating position the stabilizing unit 120 is elongated compared to the first operating position and the second end 122b of the second section is moved to position 122b'. The arrow 410 demonstrates the direction of the movement of the second section 122 relatively to the first section 121 when adjusting the length of the stabilizing unit 120. It can be seen that this movement does not follow a straight line but a curved path. Particularly the second end 122b tends towards the housing 110 when the stabilizing unit 120 is elongated by moving the second section 122 from the first operating position to the second operating position bringing its second end 122b to the second position 122b'. This curved path is advantageous to provide an optimal angle of the housing 110 to an ear when the in-ear phone 100 is worn by users with different sized ears.

[0033] In the in-ear phone according to the fourth em-

bodiment the second section 122 of the stabilizing unit 120 is connected to the first section 121 e.g. by a guide 420. In a preferred embodiment the second section 122 moves along a circular arc relatively to the first section 121 when adjusting the length of the stabilizing unit 120. This provides a simple construction for the guide 420 whereat the second section 122 is extractable from the first section 121 on a curved path.

[0034] With the in-ear phone according to the first, second, third and fourth embodiment, an in-ear phone with an adjustable part of a stabilizing unit is provided. The adjustable end can be implemented to increase the surface contact area between the second end and the anti-helix.

[0035] According to the invention, a flexible tube-like stabilizer is provided at an adjustable end of the stabilizing unit. The flexible tube-like stabilizer can be secured inside the upper concha extending from the anti-helix to the crux of helix. Accordingly, a surface contact is provided which can also improve a secure fitting. In addition or alternatively, a flexible stabilizer can be provided at the second end of the stabilizing unit which can increase in size when it is bend and provide a greater contact area in the anti-helix improving a secure fitting.

[0036] According to the invention, a stabilizing unit with an adjustable arm with a flexible stabilizer can be provided which should fit the majority of the population. The adjustable arm can be interchangeable.

[0037] According to the invention, the curved adjustable arm can be provided for the stabilizing unit which provides an optimum entry angle into the anti-helix.

[0038] An in-ear phone 100 according to any of the disclosed embodiments comprises a mechanism to adjust of the length of the stabilizing unit 120. The second section 122 remains in its position relative to the first section 121 when no force is applied to the stabilizing unit 120. Hence, the stabilizing unit 120 holds the length adjusted by the user when taken out of the ear. This is advantageous as the user can put the in-ear phone 100 back into the ear without the need for new adjustment.

[0039] An in-ear phone 100 according to any of the disclosed embodiments is constructed in a way that a user can easily reach the first section 121 and the second section 122 with his fingers allowing adjusting the length of the stabilizing unit 120 when the in-ear phone 100 is placed inside the ear of the user and is in use. This can be achieved by a construction in that the first and the second section 121, 122 do not cover each other completely when viewed from a viewing direction opposite to the housing 110.

Claims

1. In- ear phone, comprising
a housing (110) for receiving an electro- acoustic transducer (115) and
a stabilizing unit (120) having a first section (121) fixedly connected to the housing (110) and a second section (122), being adjustable along a longitudinal direction of the stabilizing unit (120),
wherein the second section (122) comprises a first end (122a) and a second distal end (122b),
wherein the second end (122b) is flexible and comprises a surface contact area for engaging in an upper concha of a user's ear,
wherein the second section (122) remains in its position relative to the first section (121) when no force is applied to the stabilizing unit (120), and
wherein the length of the stabilizing unit (120) is adjustable when the in- ear phone (100) is placed inside the ear (200) of the user.

2. In-ear phone according to claim 1, wherein
the second section (122) moves along a curved path relative to the first section (121) when adjusting the length of the stabilizing unit (120).

3. In-ear phone according to claim 1, wherein
the second section (122) moves along a circular arc relative to the first section (121) when adjusting the length of the stabilizing unit (120).

4. In-ear phone according to claim 1, 2 or 3, wherein
the second end (122b) is implemented as a flexible tube-like element substantially perpendicular to the longitudinal direction of the stabilizing unit (120).

5. In-ear phone according to claim 1, 2 or 3, wherein
the second end (122b) of the second section (122) is implemented as a curved adjustable arm,
wherein the curve of the second end (122b) is adapted to engage into the anti-helix (210) of an ear (200).

6. In-ear phone according to any one of the claims 1 to 3, wherein
a flexible appendix (122c) is attached to the flexible second end (122b) of the second section (122), and
wherein the appendix (122c) points back from the second end (122b) of the second section (122) substantially parallel to the longitudinal direction of the stabilizing unit (120), and is directed towards the housing (110).

7. In-ear phone according to claim 6, wherein
the flexible appendix (122c) bulges when a force (F) is applied to the flexible second end (122b) in the longitudinal direction of the stabilizing unit (120) and the bulging causes to fill up the void inside the anti-helix (210) of the ear of a user when the in-ear phone worn in a human ear (200).

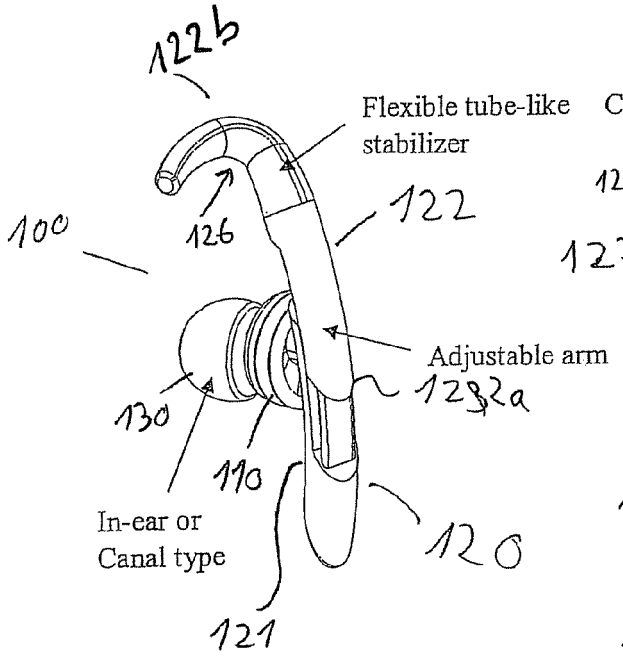
122b
Flexible tube-like stabilizer
126
122
100
Adjustable arm
1232a
130
110
In-ear or Canal type
120
121

Fig 1A

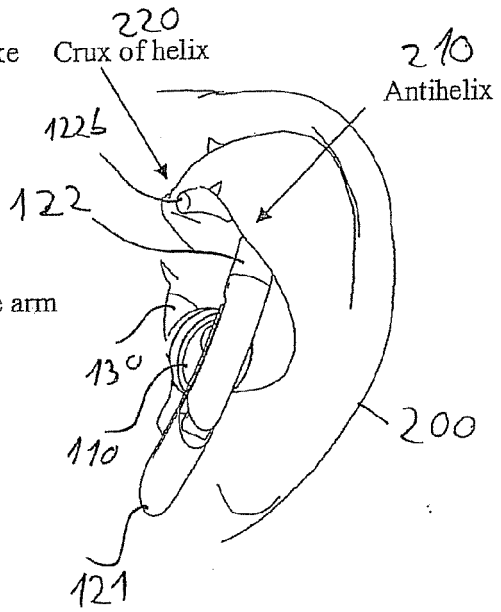
220
Crux of helix
210
Antihelix
122b
122
130
110
200
121

Fig 1B

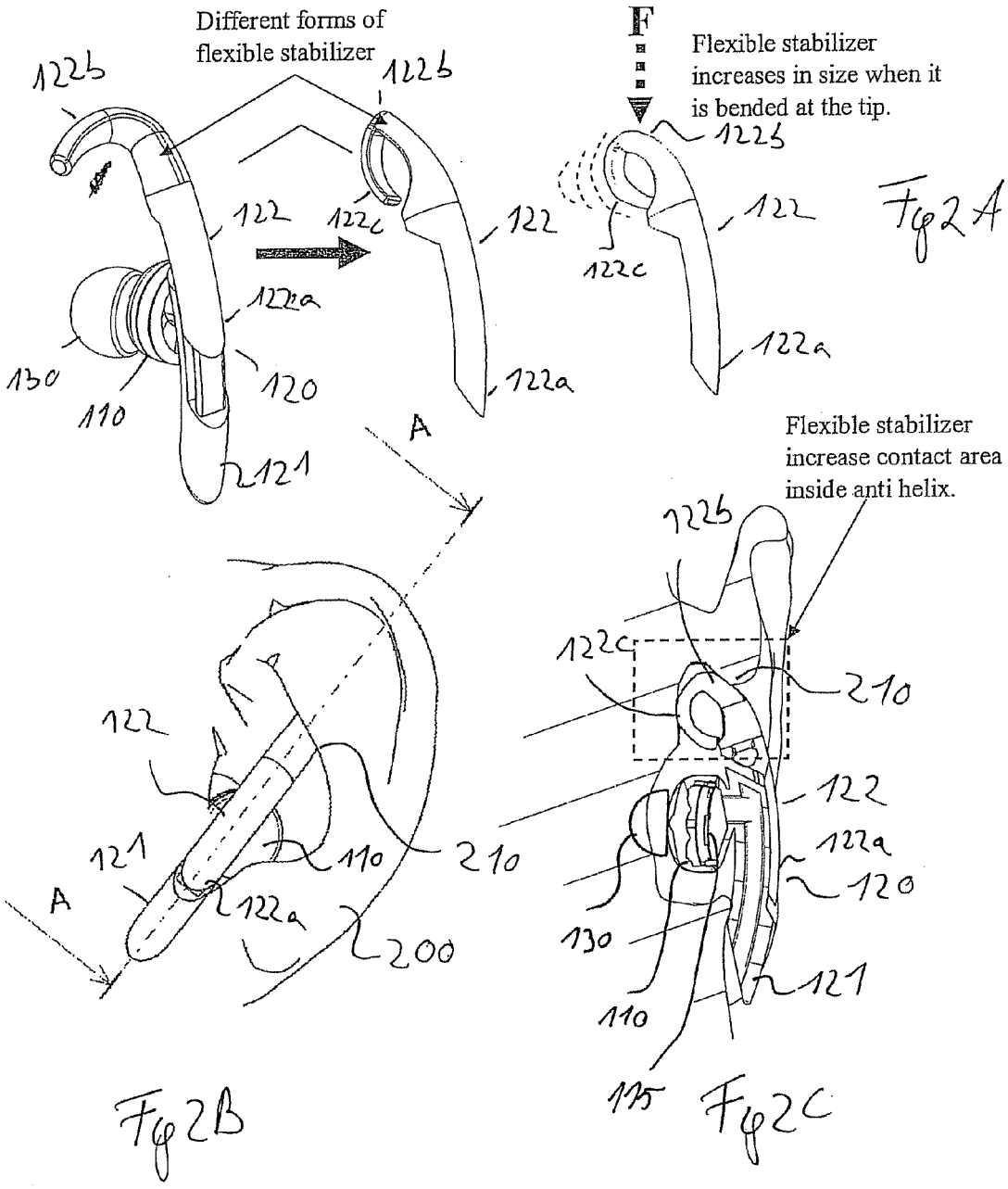

Fig 2A

Fig 2B

Fig 2C

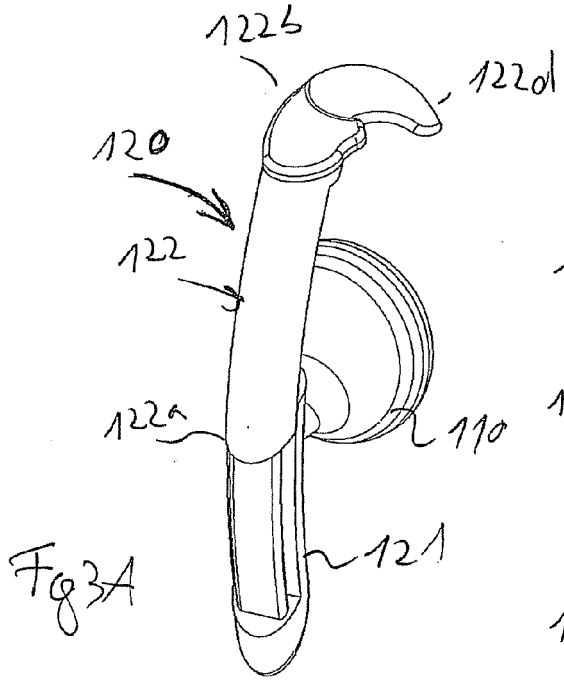

Fig 3A

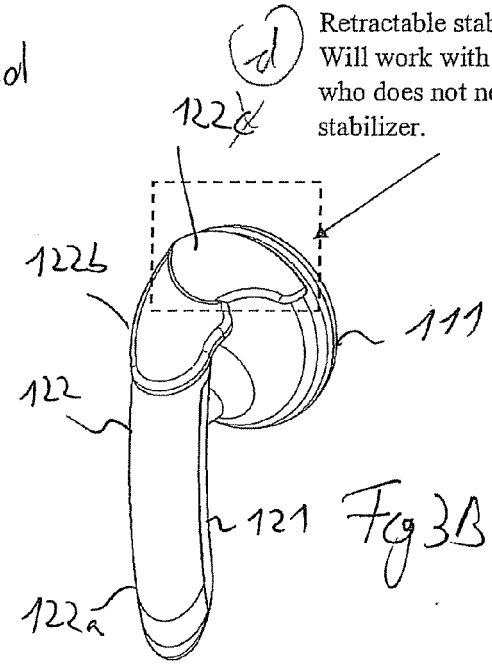

Fig 3B

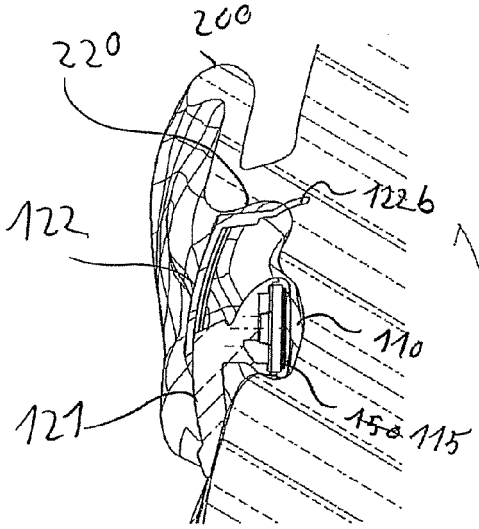

Fig 3C

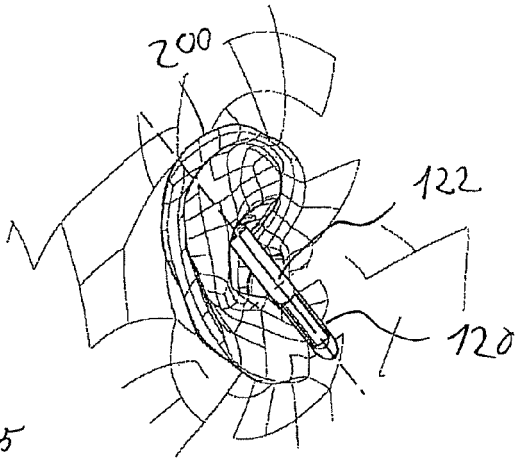

Fig 3D

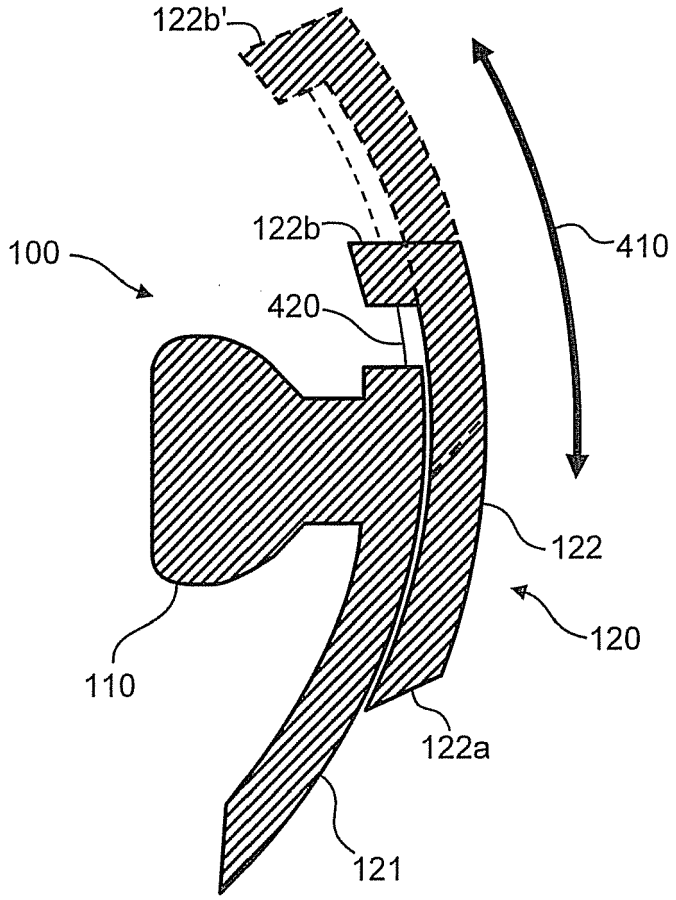

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 2511

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 2003/174853 A1 (HOWES MICHAEL [US] ET AL) 18 September 2003 (2003-09-18) * paragraph [0011] * * page 36 * * figures 1,3,9 *	6,7	TECHNICAL FIELDS SEARCHED (IPC) H04R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 July 2012	Fülöp, István

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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25-07-2012

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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