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(54) **A HEADPHONE**

KOPFHÖRER

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EP 3 222 052 B1

Description

[0001] The present invention relates to a headphone and more particularly to a headset having a pair of headphones.

[0002] Reference to an ear in the specification means the outer ear which is the external part of the ear (i.e. that which is beyond the side of the head).

[0003] A conventional full size or circumaural or standard over-ear headphone or ear-cup has an ear cushion of foam around its speaker or transducer so that a chamber is formed for enclosing an ear of a wearer of the headphone. The foam provides two distinct functions: audio isolation, and transferring mechanical pressure loading from the headphone.

[0004] When a person is using a headphone over a long period, the headphone can become uncomfortable due to the retention of heat where the user's head is in contact with the ear cushion.

[0005] Furthermore, a conventional headphone has a shape that often extends outwardly a significant distance perpendicular to the surface engaging the user's head. If a user is in bed and is wearing a headset having a pair of such headphones, this causes a significant obstruction/restriction to movement of the head. As the user moves in bed the headphones can be dislodged into an unintended position making them uncomfortable. This may also compromise the audio performance of the headphones. If a person rolls onto one of the headphones whilst in bed, the foam is significantly compressed increasing pressure in the ear chamber making the headphone uncomfortable to wear. The significant pressure may be applied in a non-uniform fashion which also makes the headphone uncomfortable to wear. Furthermore, this pressure may also be applied to a sensitive region behind and below the ear.

[0006] A user may wear the headset in bed to listen to audio (e.g. music, audio book) to relax the mind or simply for entertainment. However, if a user falls asleep the audio may continue which may disturb the user's sleep later.

[0007] US 2008/0128198, on which the preamble of claim 1 is based, discloses a headphone comprising an inner shell forming a chamber for enclosing an ear of a user of the headphone. The inner shell has an inner seal ring surrounding the chamber. The headphone also has an outer shell having an outer seal ring extending around the inner seal ring and separate from the inner seal ring.

[0008] It is an object of the present invention to provide a headphone to alleviate at least one of the above-mentioned problems.

[0009] According to one aspect of the present invention there is provided a headphone comprising a body forming a chamber for enclosing an ear of a user of the headphone, the body having an acoustic seal made of a flexible material surrounding the chamber, the body having at least one cushion extending around the acoustic seal and separate from the acoustic seal, the at least one cushion having a first side face for engaging with the head of the user, and the body having a second side face opposite the first side face, the headphone having venting means in the at least one cushion, characterized in that the venting means is between the first side face and the second side face, the venting means comprising a plurality of openings in the first side face, a plurality of openings in the second side face, and a cavity which connects the first side face openings to the second side face openings.

[0010] A plurality of flexible supports may extend through the cavity between the first and second side faces.

[0011] According to another aspect of the present invention there is provided a headphone comprising a body forming a chamber for enclosing an ear of a user of the headphone, the body having an acoustic seal made of a flexible material surrounding the chamber, the body having at least one cushion extending around the acoustic seal and separate from the acoustic seal, the at least one cushion having a first side face for engaging with the head of the user, and the body having a second side face opposite the first side face, the headphone having venting means in the at least one cushion, characterized in that the venting means is between the first side face and the second side face, the venting means comprising a plurality of conduits, each said conduit extending between the first and second side faces.

[0012] The at least one cushion can be made from a flexible material which is the same or different from the flexible material of the acoustic seal.

[0013] By having a headphone with an acoustic seal made of a flexible material, and at least one cushion separate from the acoustic seal, this gives more freedom in selecting materials which may be more particularly suited for the function of audio isolation, or the function of transferring mechanical pressure loading from the headphone. The acoustic seal requires a smaller area of contact with the skin of a user of the headphone than a conventional headphone. The acoustic seal can be very soft and flexible as it does not need to support the mechanical load. The at least one cushion, as it has no audio barrier requirements, can be made to provide much more comfort than a conventional headphone.

[0014] The headphone may be made of predominantly flexible materials, such as rubber/silicon, allowing the body of the headphone to mould to the shape of the head. As the body moulds to the shape of the head it enables pressure to spread consistently over the maximum area thus increasing comfort.

[0015] The flexible material of the acoustic seal may be expandable so that the acoustic seal is arranged to expand towards the at least one cushion when the headphone is pressed against the head of the user.

[0016] The headphone may include a channel separating the acoustic seal from the at least one cushion extending around the acoustic seal. The acoustic seal may be arranged to expand into the channel when the headphone is pressed against the head of the user.

[0017] The body may have one continuous cushion extending around the acoustic seal. Alternatively, the body may have a plurality of cushions extending around the acoustic seal with or without a gap between adjacent cushions.

[0018] The venting means are for circulating and venting air, and heat is able to dissipate easily via the venting means. The venting means are in the at least one cushion, and since the at least one cushion has no audio barrier requirements, this makes the at least one cushion extremely breathable. This ensures that the headphone remains cool and comfortable, particularly if a headset including the headphone is, say, worn through the night.

[0019] A headset may be provided which comprises a headband, and at least one headphone wherein the headphone is as described above. The at least one headphone is connected to the headband and comprises a speaker, and said headband includes at least one of a power source and a main circuit board for the at least one headphone. By accommodating the power source and/or the main circuit board in the headband, the size of the headphone can be reduced to provide the lowest or shallowest headphone profile possible relative to the head without making contact with the ear of the user.

[0020] The main circuit board of the headband of the headset may comprise a plurality of circuit boards electrically connected to each other. The circuit boards may be connected to each other in series.

[0021] The headset may include at least one electroencephalography (EEG) sensor mounted in or on an underside of the headband, the underside arranged to face the scalp of a user of the headphone. An EEG sensor is a known sensor used in reading brain activity of a user such as when the user is asleep. The at least one EEG sensor may be used to monitor when a user using the headset falls asleep so that any audio being played can be automatically stopped.

[0022] The headphone described above may include at least one EEG sensor mounted in the first side face.

[0023] At least part of the second side face may be covered by a flexible porous material.

[0024] Embodiments of the present invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which:

Figure 1 is a perspective view of a headset comprising a pair of headphones wherein each headphone is in accordance with a first embodiment of the present invention;

Figures 2 to 4 are top, front and side views, respectively, of the headset;

Figure 5 is a sectional view of a headphone of the headset taken along lines 5-5 of Figure 3;

Figure 6 is a front view of the headset showing an exploded view of one of the headphones;

Figures 7 and 8 are exploded side and perspective views, respectively, of an outer shell and cushion of the headphone of Figure 6;

Figure 9 is a view of an inner side face of the headphone of Figure 6;

Figure 10 is a sectional view of the headset taken along lines 10-10 of Figure 4;

Figure 11 is a perspective view of the headset in a stored position;

Figure 12 is a block diagram of the headset;

Figure 13 is a sectional view similar to Figure 5 with the headphone on the side of a head of a user of the headset;

Figure 14 is a sectional view of a modified headphone in accordance with a second embodimet of the present invention; and

Figure 15 is a view of an inner side face of another modified headphone.

[0025] Referring to Figures 1 to 4 of the accompanying drawings, a headset 1 comprises a headband 2 connecting a pair of headphones 3, 4 together.

[0026] Referring to Figures 5 to 9, each headphone 3, 4 comprises a body 5 having a central body portion 6, an acoustic or audio seal 7 surrounding a chamber 26, a cushion 8 surrounding the acoustic seal 7 and separate from the acoustic seal 7, and an outer shell 9 having a convex outer surface 10 and a concave inner surface 11.

[0027] The central body portion 6 has a base 12 with a convex outer surface 13 and a concave inner surface 14. The central body portion 6 is fixed to the outer shell 9 so that base convex outer surface 13 of the central body portion 6 is against the shell concave inner surface 11. A continuous outer wall 15 extends from a perimeter of the base concave inner surface 14, and an inner wall 16 extends from the base 12 and is surrounded by the outer wall 15. The inner wall 16 has an inner step 17 towards the end of the wall 16 distal from the base 12. A transducer assembly 18 is mounted on the step 17 and is surrounded by the inner wall 16. A cap 19 is fixed over the distal end of the wall 16 to hold the transducer assembly 18 within the inner wall 16 of the central body portion 6, and the cap 19 has apertures 20.

[0028] The acoustic seal 7 is made of a first flexible expandable material such as silicon. The acoustic seal 7 has a continuous main wall portion 21 surrounding the chamber 26 and an inner wall portion 22 extending in from the main wall portion 21 at a base of the main wall portion 21 so as to form a groove 23 into which a distal end of the central body portion outer wall 15 is received. The acoustic seal main wall portion 21 has a flange 24 extending into the groove 23 so that the central body portion outer wall 15 is held in the groove 23 by an interference grip between the flange 24 and the acoustic seal inner wall portion 22. The end 25 of the acoustic seal main wall portion 21 distal from the base of the seal 7 tapers and bends or flares outwardly.

[0029] The central body portion 6 and the acoustic seal 7 extending from the central body portion outer wall 15 form the chamber 26 for enclosing an ear 70 (see Figure 13) of a user of the headphone 3, 4, wherein the distal

end 25 of the acoustic seal 7 defines the periphery of the chamber 26. The chamber periphery 25 has a substantially straight portion 28 for positioning in front of the ear and a substantially curved portion 29 substantially conforming to the shape of the helix and lobe parts of the ear. The two portions 28, 29 join at first upper and lower points 30, 31 of the periphery 25. The chamber periphery 25 has a second lower point 32 at the lowest part of the curved portion 29, and a second upper point 33 where an upper part 34 of the curved portion 29 joins a rear part 35 of the curved portion 29. The chamber periphery 25 has another or a third point 69 where the rear part 35 of the curved portion 29 joins a lower part 72 of the curved portion 29.

[0030] The cushion 8 is made of a material such as rubber or silicon. The cushion 8 surrounds the central body portion outer wall 15 and the acoustic seal 7 and is against the portion 36 of the concave inner surface 14 of the outer shell 9 which extends beyond the central body portion 6. The cushion 8 has a base portion 37 with a central opening or aperture 68, and a bottom face of the base portion 37 comprises a first side face 38 for engaging the head of the user of the headphone 3, 4. The first side face 38 has a radial width which extends from an inner edge 66 of the base portion 37 surrounding the opening 68 and adjacent the chamber periphery 25 to an outer edge or periphery 39 of the base portion 37. The radial width has a maximum value r_{max} at a point between the first upper point 30 and the first lower point 31 wherein this point is closer to the first upper point 30.

[0031] The surface area of one section A of the first side face 38 extends around the acoustic seal 7 between approximately the second lower and upper points 32, 33 in front of the chamber 26. The one section A is larger than the surface area of the remaining section B of the first side face 38. The surface area of the one section A of the first side face 38 may be at least 1.4 times larger than the surface area of the remaining section B of the first side face 35.

[0032] The cushion base portion 37 has an aperture 40 in the portion of the first side face 38 to be in front of the ear of the user, and in this aperture 40 is mounted an electroencephalography (EEG) sensor 41.

[0033] The cushion base portion outer edge 39 has a rim 42 and the outer shell 9 is fitted within the rim 42 so that the perimeter edge 43 of the outer shell 9 engages the rim 42. An inner wall 44 extends from the cushion base portion inner edge 66 and surrounds the central body portion 6. The cushion inner wall is slanted inwardly from the base portion 37 so that its distal end engages the place where the central body portion outer wall 15 meets the outer shell 9. The cushion base portion inner wall 44 is adjacent the base 45 of the acoustic seal main wall portion 21, and a gap or channel 46 is formed between the rest of the acoustic seal main wall portion 21 and the cushion base portion inner wall 44. A cavity 47 is formed between the cushion base portion 37 and the outer shell 9 and is bounded by the cushion base portion rim 42 and the cushion base portion inner wall 44. The cushion 8 has a plurality of flexible tube supports 48 which extend from the cushion base portion 37 to the outer shell 9. There is a plurality of vent openings 49 extending through, and spread around, the cushion base portion 37.

[0034] The convex outer surface 10 of the outer shell 9 forms a second second side face of the body 5 which is opposite the first side face 38. There is a plurality of vent openings 50 extending through, and spread around, the outer shell portion 36 which extends beyond the central body portion 6. The second side face 10 is covered by a porous flexible fabric 51.

[0035] The second side face 10 joins the first side face 38 and forms an acute angle θ (see Figure 3) with the first side face 38 at the joining of not more than approximately 45° around the periphery of the headphone 3, 4 except for the portion of the headphone 3, 4 radial from the upper part 34 of the chamber periphery curved portion 29. Part of this headphone portion extends beyond the first side face 38 which engages the head of the user. This part is referred to as the top portion 52 of the headphone 3, 4 and the top portion 52 extends to the headband 2. The boundary between the top portion 52 and the first side face 38 is indicated by a dashed line 67 on Figure 9. The top portion 52 is configured so that where it is adjacent the headband 2 it has the same sectional shape and size as the headband 2.

[0036] Referring to Figures 10 to 12, the headband 2 extending between the top portion 52 of each headphone 3, 4 is connected by a hinged and rotatable connector 53 to each headphone 3, 4. This enables the headphones 3, 4 to be swung inwards and be rotated through 90° so that when the headset 1 is not in use it can be stored compactly (see Figure 11).

[0037] The headband 2 is hollow and the underside 55 of the headband 2, which is arranged to face the scalp of a user of headset 1, has a plurality of apertures 65 spaced in series along the underside 55 and an EEG sensor 54 is mounted in each aperture 65. The EEG sensors 54 in the headband 2, together with the EEG sensor 41 in each headphone 3, 4, are connected to a central processor 56 mounted on a main circuit board 57 inside the headband 2. The main circuit board 57 comprises a plurality of circuit boards 57a, 57b, 57c, 57d electrically connected to each other in series so that the main circuit board 57 can fit inside the headband 2. Each circuit board 57a, 57b, 57c, 57d is mounted to a mounting 58 which connects the circuit board 57a, 57b, 57c, 57d to a side 59 of the headband 2, and the circuit boards 57a, 57b, 57c, 57d are above the EEG sensors 54.

[0038] The transducer assembly 18 in each headphone 3, 4 is connected to the central processor 56 in the headband 2 and each transducer assembly 18 comprises a speaker 60 and a driver 61.

[0039] A Bluetooth module 62 is mounted on the main circuit board 57 in the headband 2 and the Bluetooth module 62 can communicate with a portable electronic communication device such as a smart phone or a hand-

held tablet PC.

[0040] Also inside the headband 2, there is a power source in the form of a battery 63 for providing power to the headset 1. The battery 63 is held by a mounting 64 to the side 59 of the headband 2

[0041] In use, the headset 1 is worn on the head of a user with each ear of the user being received in the chamber 26 of a respective headphone 3, 4, and the headband 2 being positioned over the scalp of the user.

[0042] As each headphone 3, 4 is placed against the head or skull 71 of the user, the body 5 moulds to the shape of the head (see Figure 13). The loading of the headphone 3,4 causes the acoustic seal 7 to expand so that the tapered end 25 of the seal 7 engages the inner edge 66 of the cushion base portion 37 closing the opening to the gap 46 between the acoustic seal 7 and the cushion base portion 37.

[0043] The EEG sensors 54 in the headband 2 and the EEG sensor 41 in each headphone 3, 4 are arranged to measure EEG signals associated with brain activity in the head of the user. These signals are monitored by the central processor 56, and the central processor 56 is arranged to control the volume of sound from each speaker 60 via their respective speaker driver 61 in relation to these signals.

[0044] Signals from the EEG sensors 41, 54 received by the central processor 56 could be transmitted by the Bluetooth module 62 to a said portable electronic communication device, and the portable electronic communication device could be used to change or control the sound coming from the speakers 60 of the headphones 3, 4.

[0045] In a modification as illustrated in Figure 14, the body 80 of each headphone 81 has a plurality of conduits 82 extending between the first and second side faces 83, 84 to provide venting, the conduits 82 extending through the cushion 85 and the outer shell 86 of the body 80.

[0046] In another modification as illustrated in Figure 15, the body 90 of each headphone 91 has a plurality of cushions 92 spaced around the acoustic seal 93 with there being gaps 94 between the cushions 92.

[0047] Whilst particular embodiments have been described, it will be understood that various modifications may be made without departing from the scope of the appended claims.

Claims

1. A headphone (3, 4) comprising a body (5) forming a chamber (26) for enclosing an ear of a user of the headphone (3, 4), the body (5) having an acoustic seal (7) made of a flexible material surrounding the chamber (26), the body (5) having at least one cushion (8) extending around the acoustic seal (7) and separate from the acoustic seal (7), the at least one cushion (8) having a first side face (38) for engaging with the head of the user, and the body (5) having a second side face (10) opposite the first side face (38), the headphone having venting means (47, 49, 50) in the at least one cushion (8),
characterized in that
the venting means (47, 49, 50) is between the first side face (38) and the second side face (10), the venting means comprising a plurality of openings (49) in the first side face (38), a plurality of openings (50) in the second side face (10), and a cavity (47) which connects the first side face openings (49) to the second side face openings (50).

2. The headphone as claimed in claim 1, wherein a plurality of flexible supports (48) extends through the cavity (47) between the first and second side faces (38, 10).

3. A headphone (81) comprising a body (80) forming a chamber for enclosing an ear of a user of the headphone (81), the body (80) having an acoustic seal made of a flexible material surrounding the chamber, the body (80) having at least one cushion (85) extending around the acoustic seal and separate from the acoustic seal, the at least one cushion (85) having a first side face (83) for engaging with the head of the user, and the body (80) having a second side face (84) opposite the first side face (83), the headphone having venting means (82) in the at least one cushion (85),
characterized in that
the venting means is between the first side face (83) and the second side face (84), the venting means comprising a plurality of conduits (82), each said conduit extending between the first and second side faces.

4. The headphone as claimed in claim 1, 2 or 3, wherein the flexible material of the acoustic seal (7) is expandable so that the acoustic seal (7) is arranged to expand towards the at least one cushion (8) when the headphone (3, 4) is pressed against the head of the user.

5. The headphone as claimed in any preceding claim, wherein at least part of the second side face (10) is covered by a flexible porous material (51).

6. The headphone as claimed in any preceding claim, including at least one electroencephalography (EEG) sensor (41) mounted in the first side face (38).

7. A headset (1) comprising a headband (2), and at least one headphone (3, 4) as claimed in any preceding claim, wherein said at least one headphone (3, 4) is connected to the headband (2) and comprises a speaker, and said headband (2) includes at least one of a power source and a main circuit board for the at least one headphone (3, 4).

8. The headset as claimed in claim 7, wherein the headband (2) includes both the power source and the main circuit board.

9. The headset as claimed in claim 7 or 8, wherein the main circuit board comprises a plurality of circuit boards electrically connected to each other.

10. The headset as claimed in claim 9, wherein the circuit boards are connected to each other in series.

11. The headset as claimed in any one of claims 7 to 10, including at least one electroencephalography (EEG) sensor mounted in or on an underside of the headband (2), the underside arranged to face the scalp of a user of the headphone (3, 4).

Patentansprüche

1. Kopfhörer (3, 4), umfassend ein Gehäuse (5), das eine Kammer (26) zum Einschließen eines Ohrs eines Benutzers des Kopfhörers (3, 4) ausbildet, wobei das Gehäuse (5) eine aus einem flexiblen Material hergestellte akustische Dichtung (7) hat, die die Kammer (26) umschließt, wobei das Gehäuse (5) mindestens ein Polster (8) hat, das sich um die akustische Dichtung (7) herum erstreckt und von der akustischen Dichtung (7) getrennt ist, wobei das mindestens eine Polster (8) eine erste Seitenfläche (38) zum In-Kontakt-Kommen mit dem Kopf des Benutzers hat und das Gehäuse (5) eine zweite Seitenfläche (10) gegenüber der ersten Seitenfläche (38) hat, wobei der Kopfhörer Belüftungsmittel (47, 49, 50) in dem mindestens einen Polster (8) hat,

   dadurch gekennzeichnet, dass
   die Belüftungsmittel (47, 49, 50) zwischen der ersten Seitenfläche (38) und der zweiten Seitenfläche (10) sind, wobei die Belüftungsmittel eine Mehrzahl von Öffnungen (49) in der ersten Seitenfläche (38), eine Mehrzahl von Öffnungen (50) in der zweiten Seitenfläche (10) und einen Hohlraum (47) umfassen, der die Öffnungen (49) der ersten Seitenfläche mit den Öffnungen (50) der zweiten Seitenfläche verbindet.

2. Kopfhörer gemäß Anspruch 1, wobei sich eine Mehrzahl von flexiblen Stützen (48) durch den Hohlraum (47) zwischen der ersten und der zweiten Seitenfläche (38, 10) erstreckt.

3. Kopfhörer (81), umfassend ein Gehäuse (80), das eine Kammer zum Einschließen eines Ohrs eines Benutzers des Kopfhörers (81) ausbildet, wobei das Gehäuse (80) eine aus einem flexiblen Material hergestellte akustische Dichtung hat, die die Kammer umschließt, wobei das Gehäuse (80) mindestens ein Polster (85) hat, das sich um die akustische Dichtung herum erstreckt und von der akustischen Dichtung getrennt ist, wobei das mindestens eine Polster (85) eine erste Seitenfläche (83) zum In-Kontakt-Kommen mit dem Kopf des Benutzers hat und das Gehäuse (80) eine zweite Seitenfläche (84) gegenüber der ersten Seitenfläche (83) hat, wobei der Kopfhörer Belüftungsmittel (82) in dem mindestens einen Polster (85) hat,

   dadurch gekennzeichnet, dass
   die Belüftungsmittel zwischen der ersten Seitenfläche (83) und der zweiten Seitenfläche (84) sind, wobei die Belüftungsmittel eine Mehrzahl von Kanälen (82) umfassen, wobei sich jeder Kanal zwischen der ersten und der zweiten Seitenfläche erstreckt.

4. Kopfhörer gemäß Anspruch 1, 2 oder 3, wobei das flexible Material der akustischen Dichtung (7) dehnbar ist, sodass die akustische Dichtung (7) dazu angeordnet ist, sich zu dem mindestens einen Polster (8) hin auszudehnen, wenn der Kopfhörer (3, 4) gegen den Kopf des Benutzers gedrückt wird.

5. Kopfhörer gemäß einem der vorhergehenden Ansprüche, wobei mindestens ein Teil der zweiten Seitenfläche (10) von einem flexiblen porösen Material (51) abgedeckt ist.

6. Kopfhörer gemäß einem der vorhergehenden Ansprüche, aufweisend mindestens einen Elektroenzephalographie-Sensor (EEG-Sensor) (41), der in der ersten Seitenfläche (38) angebracht ist.

7. Headset (1), umfassend einen Kopfhörerbügel (2) und mindestens einen Kopfhörer (3, 4) gemäß einem der vorhergehenden Ansprüche, wobei der mindestens eine Kopfhörer (3, 4) mit dem Kopfhörerbügel (2) verbunden ist und einen Lautsprecher umfasst, und der Kopfhörerbügel (2) mindestens eines aus einer Stromquelle und einer Hauptplatine für den mindestens einen Kopfhörer (3, 4) enthält.

8. Headset gemäß Anspruch 7, wobei der Kopfhörerbügel (2) sowohl die Stromquelle als auch die Hauptplatine enthält.

9. Headset gemäß Anspruch 7 oder 8, wobei die Hauptplatine eine Mehrzahl von Leiterplatten umfasst, die elektrisch miteinander verbunden sind.

10. Headset gemäß Anspruch 9, wobei die Leiterplatten in Reihe miteinander verbunden sind.

11. Headset gemäß einem der Ansprüche 7 bis 10, aufweisend mindestens einen Elektroenzephalographie-Sensor (EEG-Sensor), der in oder an einer Un-

terseite des Kopfhörerbügels (2) angebracht ist, wobei die Unterseite dazu angeordnet ist, der Kopfhaut eines Benutzers des Kopfhörers (3, 4) zugewandt zu sein.

Revendications

1. Ecouteur (3, 4) comprenant un corps (5) formant une chambre (26) pour enfermer une oreille d'un utilisateur de l'écouteur (3, 4), le corps (5) disposant d'un joint acoustique (7) réalisé en un matériau flexible entourant la chambre (26), le corps (5) disposant d'au moins un coussin (8) s'étendant autour du joint acoustique (7) et séparé du joint acoustique (7), le au moins un coussin (8) ayant une première face latérale (38) pour s'accrocher à la tête de l'utilisateur, et le corps (5) ayant une deuxième face latérale (10) opposée à la première face latérale (38), l'écouteur disposant d'un moyen de ventilation (47, 49, 50) dans le au moins un coussin (8),
caractérisé en ce que
le moyen de ventilation (47, 49, 50) se trouve entre la première face latérale (38) et la deuxième face latérale (10), le moyen de ventilation comprenant une pluralité d'ouvertures (49) dans la première face latérale (38), une pluralité d'ouvertures (50) dans la deuxième face latérale (10), et une cavité (47) qui relie les ouvertures de la première face latérale (49) aux ouvertures de la deuxième face latérale (50).

2. Ecouteur selon la revendication 1, dans lequel une pluralité de supports flexibles (48) s'étend à travers la cavité (47) entre les première et deuxième faces latérales (38, 10).

3. Ecouteur (81) comprenant un corps (80) formant une chambre pour enfermer une oreille d'un utilisateur de l'écouteur (81), le corps (80) disposant d'un joint acoustique réalisé en un matériau flexible entourant la chambre, le corps (80) disposant d'au moins un coussin (85) s'étendant autour du joint acoustique et séparé du joint acoustique, le au moins un coussin (85) ayant une première face latérale (83) pour s'accrocher à la tête de l'utilisateur, et le corps (80) ayant une deuxième face latérale (84) opposée à la première face latérale (83), l'écouteur disposant d'un moyen de ventilation (82) dans le au moins un coussin (85),
caractérisé en ce que le moyen de ventilation se trouve entre la première face latérale (83) et la deuxième face latérale (84), le moyen de ventilation comprenant une pluralité de conduits (82), chacun desdits conduits s'étendant entre les première et deuxième faces latérales.

4. Ecouteur selon la revendication 1, 2 ou 3, dans lequel le matériau flexible du joint acoustique (7) est expansible de sorte que le joint acoustique (7) est agencé pour s'élargir vers le au moins un coussin (8) lorsque l'écouteur (3, 4) est pressé contre la tête de l'utilisateur.

5. Ecouteur selon l'une quelconque des revendications précédentes, dans lequel au moins une partie de la deuxième face latérale (10) est recouverte d'un matériau poreux flexible (51).

6. Ecouteur selon l'une quelconque des revendications précédentes, comportant au moins un capteur (41) d'électroencéphalographie (EEG) monté sur la première face latérale (38).

7. Casque (1) comprenant un serre-tête (2), et au moins un écouteur (3, 4) selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un écouteur (3, 4) est relié au serre-tête (2) et comprend un haut-parleur, et ledit serre-tête (2) comporte au moins l'une parmi une source de puissance et une carte de circuit imprimé principale pour le au moins un écouteur (3, 4).

8. Casque selon la revendication 7, dans lequel le serre-tête (2) comporte à la fois la source de puissance et la carte de circuit imprimé principale.

9. Casque selon la revendication 7 ou 8, dans lequel la carte de circuit imprimé principale comprend une pluralité de cartes de circuit imprimé reliées électriquement entre elles.

10. Casque selon la revendication 9, dans lequel les cartes de circuit imprimé sont reliées entre elles en série.

11. Casque selon l'une quelconque des revendications 7 à 10, comportant au moins un capteur d'électroencéphalographie (EEG) monté dans ou sur une face inférieure du serre-tête (2), la face inférieure étant agencée pour faire face au cuir chevelu d'un utilisateur de l'écouteur (3, 4).

FIG. 1

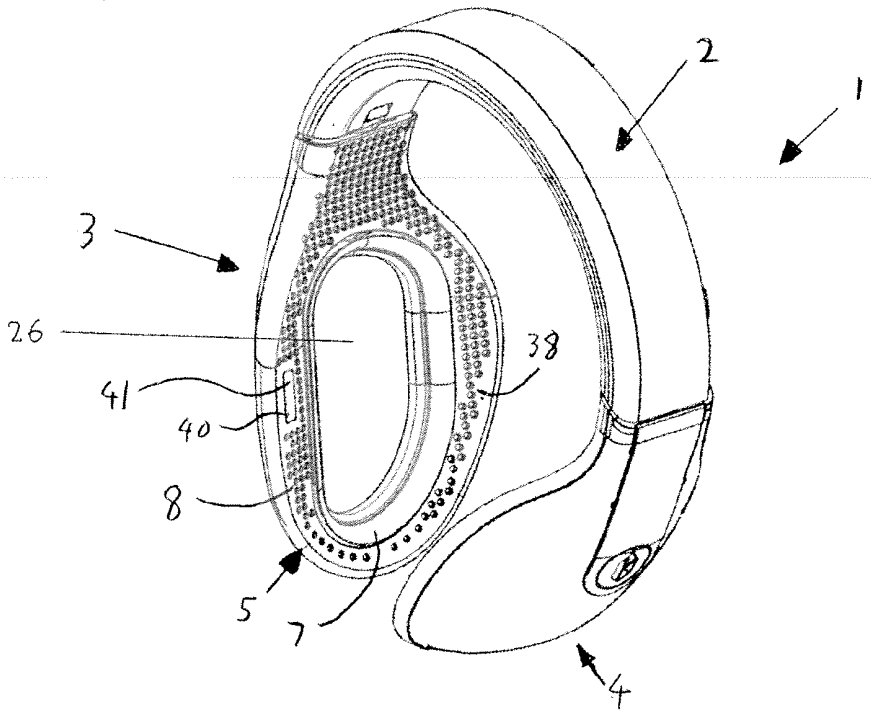


FIG. 2

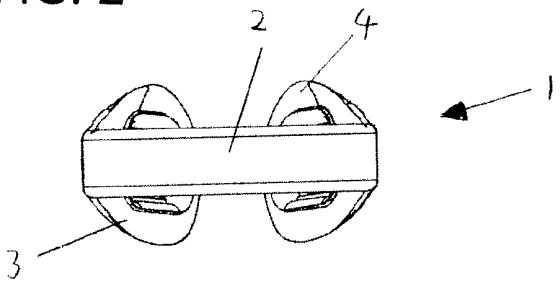


FIG. 3

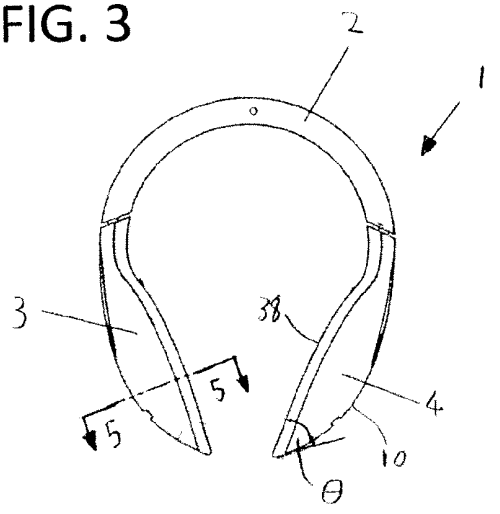


FIG. 4

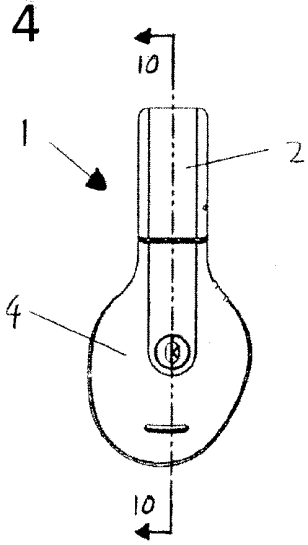
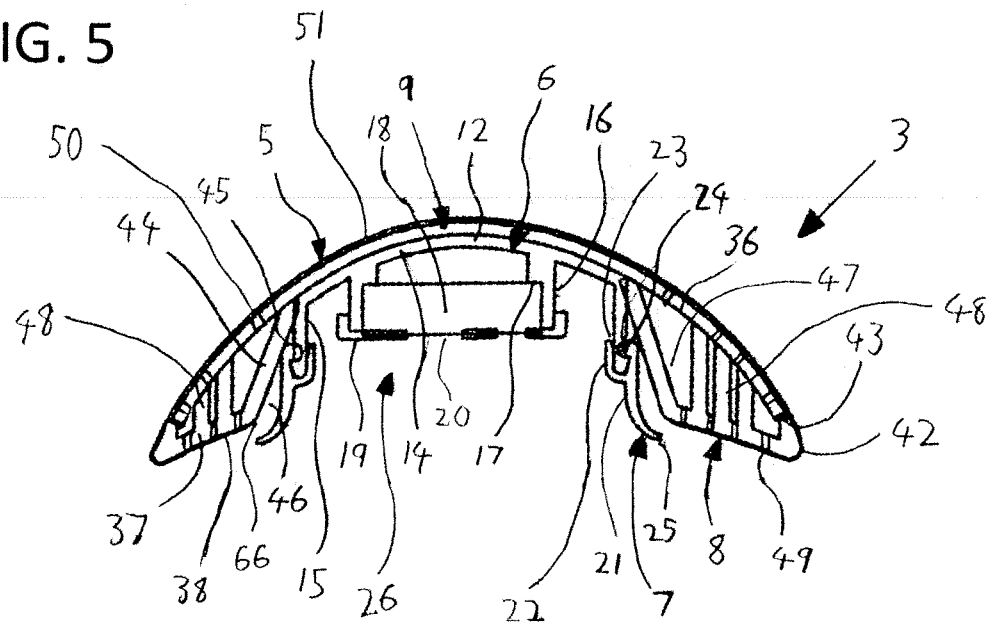


FIG. 5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9
6
50
5
18
12
16
3
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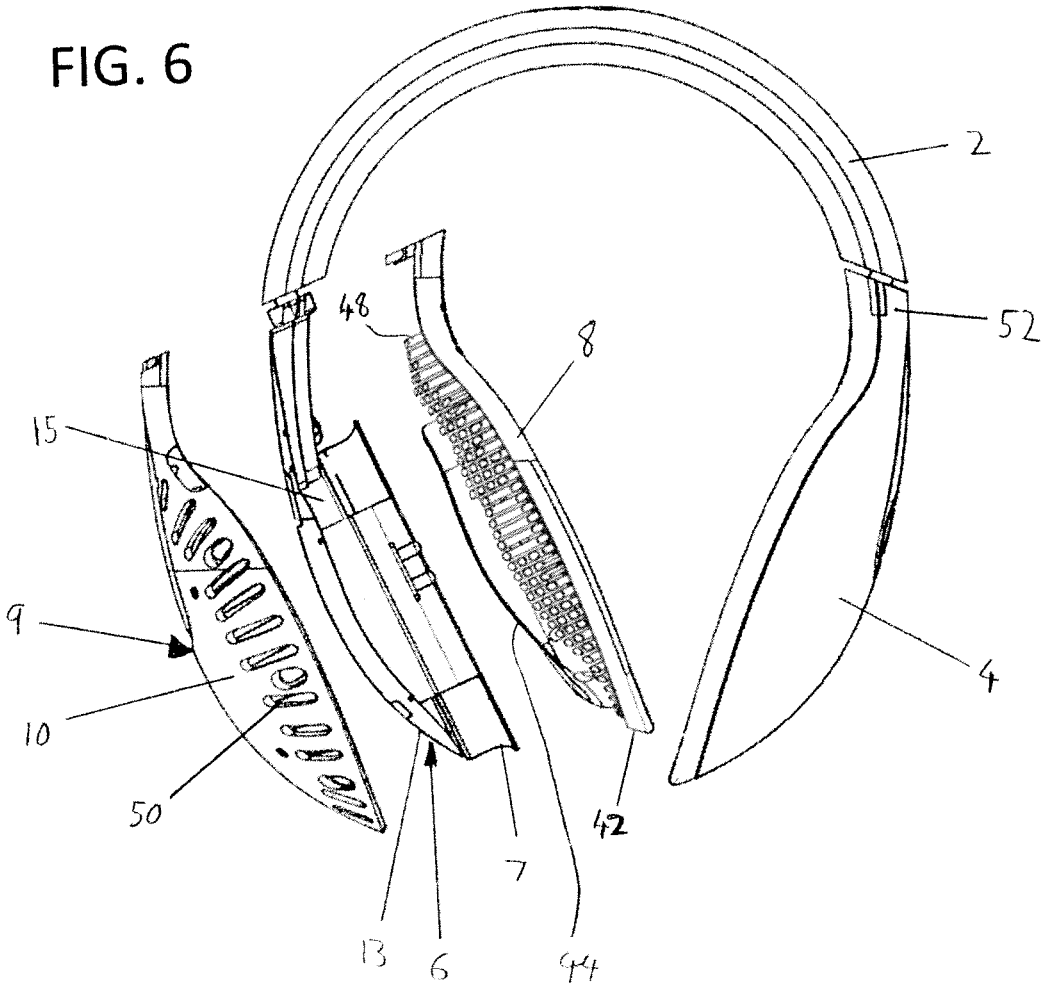
49
7

FIG. 6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52
48
8
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9
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42
7
13
6
44

FIG. 7

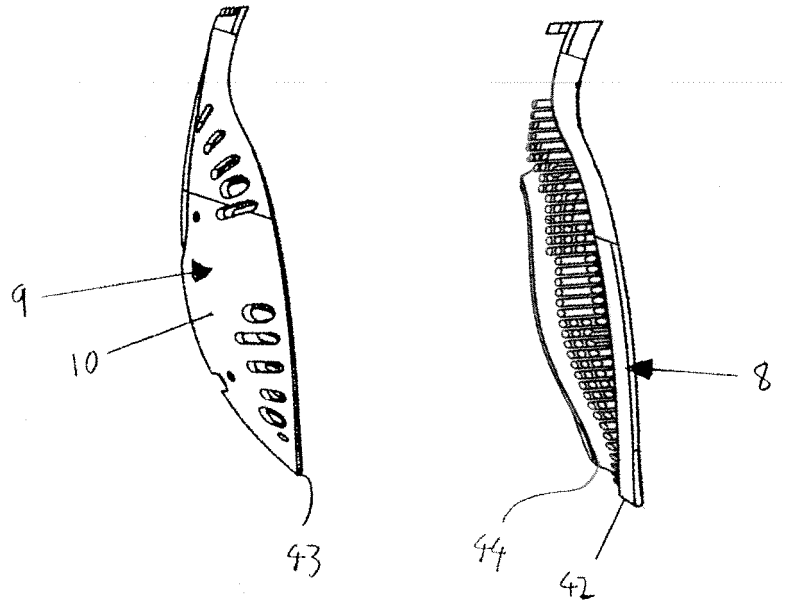


FIG. 8

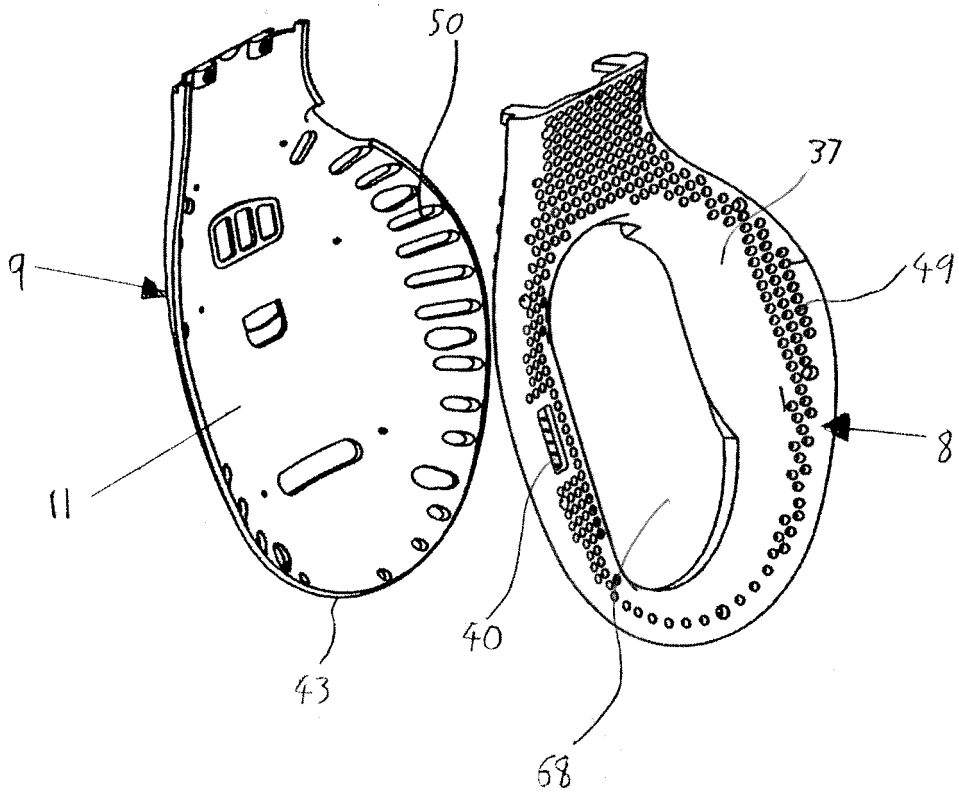
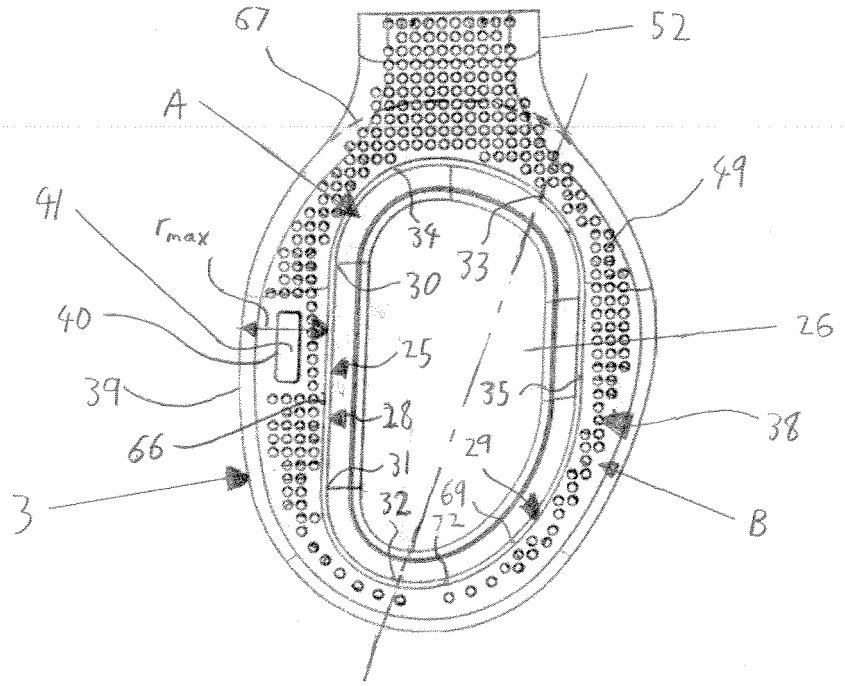


FIG. 9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52
A
49
41
r_{max}
34
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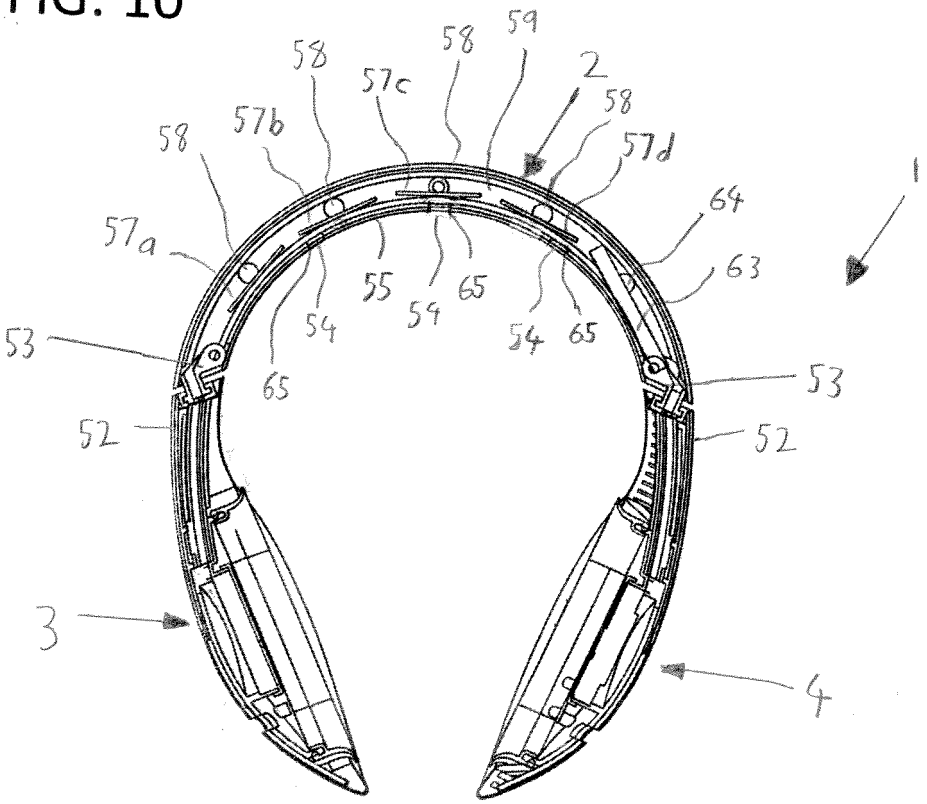
28
38
66
29
31
3
32
69
72
B

FIG. 10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57b
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57d
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53
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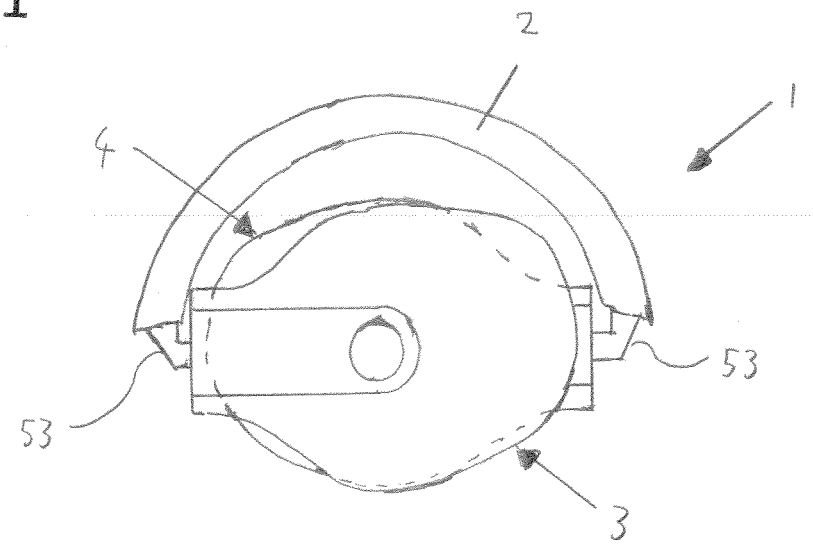
52
3
4

FIG. 11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53
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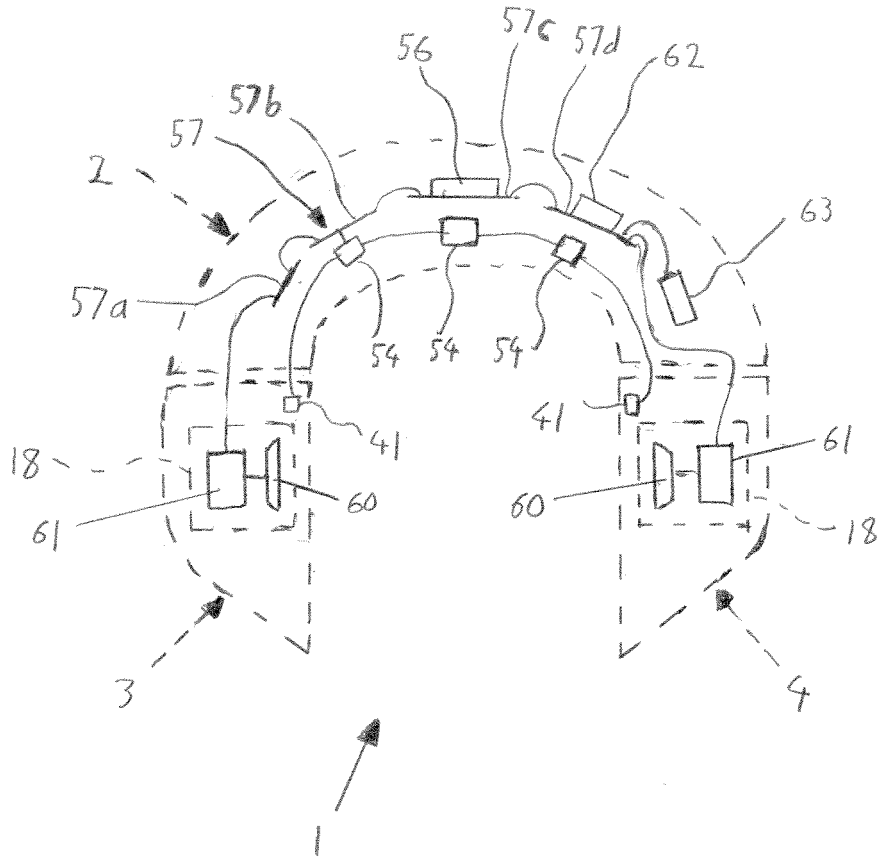
FIG. 12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57d
62
57b
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57a
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41
18
61
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61
18
3
4
1

FIG. 13

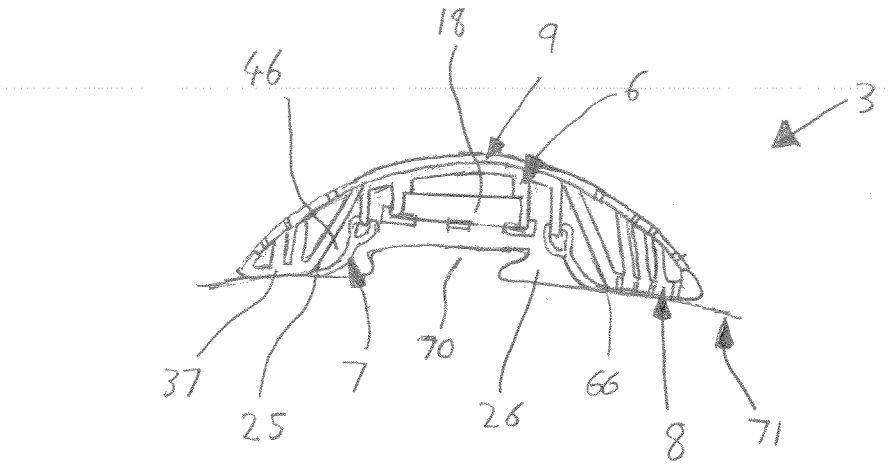


FIG. 14

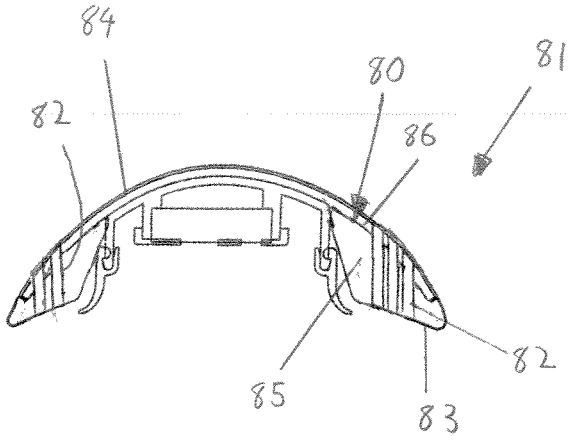
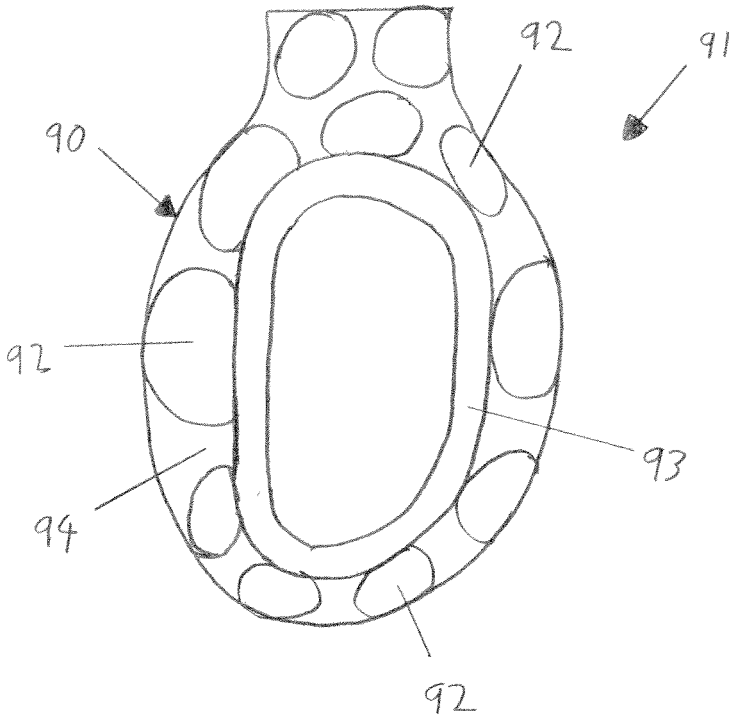


FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20080128198 A **[0007]**

专利名称(译)	头戴式耳机		
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当前申请(专利权)人(译)	KOKOON科技有限公司		
[标]发明人	ANTOS TIMOTHY HALL RICHARD		
发明人	ANTOS, TIMOTHY HALL, RICHARD		
IPC分类号	H04R1/10 H04R5/033 A61B5/0478 A61B5/00		
CPC分类号	A61B5/0478 A61B5/4812 A61B5/4815 A61B5/6803 H04R1/1008 H04R1/1041 H04R5/033 H04R1/1091 H04R5/0335 H04R2201/10 A61B5/0476 A61B5/4809		
优先权	2014020565 2014-11-19 GB 62/149731 2015-04-20 US		
其他公开文献	EP3222052A1		
外部链接	Espacenet		

摘要(译)

耳机（3、4）包括形成腔室（26）的主体（5），该腔室（26）用于封闭耳机（3、4）的使用者的耳朵。 主体（5）具有围绕腔室（26）的由柔性材料制成的声密封件（7），并且主体（5）具有在声密封件（7）周围延伸并与声密封件（分开）的垫子（8）。 7）。 垫子（8）具有用于与使用者的头部接合的第一侧面（38）。

FIG. 1

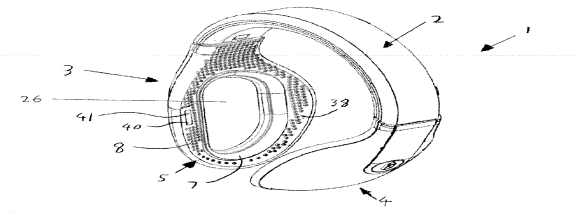

FIG. 2

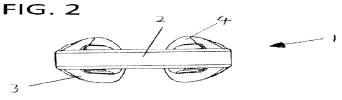

FIG. 3

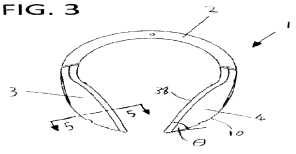

FIG. 4