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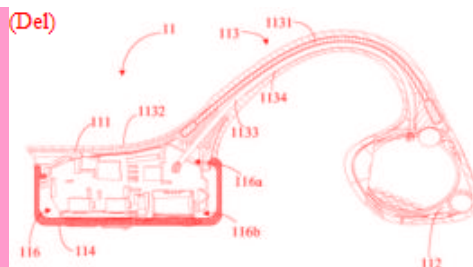
Claims: 2 pages; Description Specification: 10 pages; Drawings: 8 pages

{54} Title of invention

A bone conduction earphone

{57} Abstract

The embodiments of the present invention provide a bone conduction earphone, comprising an ear hook assembly, wherein the ear hook assembly comprises a first housing, a second housing, and a connecting component connecting the first housing and the second housing, wherein the connecting component comprises a first elastic metal wire connecting the first housing and the second housing at both ends, and a first elastic coating layer wrapped around the first elastic metal wire. With the above methods, the present invention can effectively enhance the bending performance of bone conduction earphones.



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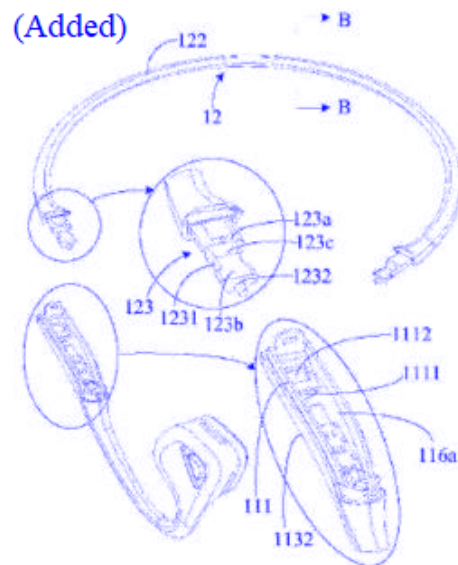
(54) Title of Invention

A bone conduction earphone

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(57) Abstract

The embodiment of the present invention provides a bone conduction earphone including two ear hook assemblies. Each ear hook assembly includes a first housing, a second housing, and a connecting component connecting the first housing and the second housing. The bone conduction earphone further includes a rear hook assembly. Both ends of the rear hook assembly are provided with plug-in parts, which are respectively connected with the first housing of the two ear hook assemblies in a plug-in manner and fixedly connected. Through the above method, the present invention can make the structure of the bone conduction earphones simpler.



1. A bone conduction earphone, characterized in that ~~the bone conduction earphone comprises an~~ it includes two ear hook assemblies, ~~wherein the each~~ each ear hook assembly ~~comprises~~ consisting of a first housing shell, a second housing shell, and a connecting component connecting the first housing shell and the second housing, wherein the connecting component comprises a first elastic metal wire ~~connecting the first housing and the second housing at both ends respectively, and a first elastic coating layer wrapped around the first elastic metal wire.~~ shell. The earphone further includes a rear hook assembly, with connection ports provided at both ends of the rear hook assembly, which are respectively in connection fit with the first shells of the two ear hook assemblies and fixedly attached.

2. The bone conduction earphone according to claim 1, characterized in that the first housing and the second housing are fixedly connected to both ends of the first elastic metal wire by injection molding, wherein the first elastic coating layer is fixedly wrapped on the first elastic metal wire by injection molding.

3. The bone conduction earphone according to claim 1, characterized in that the first elastic coating layer is composed of two sub-elastic coating layer and of different colors, wherein the joint seams of the two sub-elastic coating layers are located on the two opposite side surfaces of the connecting component, respectively, wherein the projections of the joint seams on the same side surface are staggered from each other.

4. The bone conduction earphone according to claim 2, characterized in that the ~~two ends of the first elastic~~ metal wire are arranged in a flat shape and are respectively embedded in the first housing ~~and the second housing.~~ is

5. The bone conduction earphone according to claim 1, characterized in that the interior of the first elastic coating layer is further provided with a lead channel for connecting the first housing and the second housing, and the ear hook assembly further comprises a first wire set extending from the first housing to the second housing through the lead channel, and the radial size of the lead channel is set to allow the first wire set to move along the lead channel. 6. The bone conduction earphone according to claim 5, characterized in that the ear hook assembly comprises a third housing and a fourth housing, wherein the third housing cooperates with the first housing to form a first accommodating space for accommodating battery packs or control circuit assembly, the fourth housing cooperates with the second housing to form a second accommodating space for accommodating bone conduction speakers, and the first wire set is used to electrically connect the bone conduction speaker with the battery packs or control circuit assembly.

provided with a socket for the insertion of the connector and an opening that connects the socket with the outside in a direction perpendicular to the insertion direction of the connector, configured to allow glue or locking members to be applied from the outside through the opening so as to fix the connector in the socket using the glue or clamp-locking members.

3. The bone conduction earphone according to claim 2, characterized in that a slot is provided on the side wall of the plug-in portion, the slot being exposed through the opening and configured to receive the glue or clamp-locking member.

7. The bone conduction earphone according to claim 6, characterized in that the ~~connecting component~~ includes a first housing ~~and the second housing are~~ plastic housings, and ~~are~~ metal wire with both ends respectively fixedly connected to the two ends of first shell and the second shell, and a first elastic coating covering the first elastic metal wire by injection molding; and/or, the first elastic metal wire is made of at least titanium alloy material; and/or, the first elastic coating layer is a silicone layer, fixed and coated on the first ~~elastic metal wire by injection molding; and/or, the third housing and the fourth housing are plastic housings.~~

; the rear-hanging 8. The bone conduction earphone according to claim 6, characterized in that the first housing is provided with a first sub-accommodating space inside, and the third housing is provided with a second sub-accommodating space inside, and when the third housing cooperates with the first housing, it forms the first accommodating space together with the first sub-accommodating space, wherein the volume of the second sub-accommodating space is larger than that of the first sub-accommodating space.

9. The bone conduction earphone according to claim 6, characterized in that the fourth housing is arranged in a prism shape, wherein a strip-shaped sound hole is provided on at least one side of the fourth housing, wherein the length direction of the strip-shaped sound hole is arranged in parallel to the bottom surface of the fourth housing, and the length of the strip-shaped sound hole is not less than two thirds of the width of the side where it is located.

10. The bone conduction earphone according to claim 1, characterized in that the number of ear hook assemblies is two, and the bone conduction earphone further comprises a rear hook assembly, wherein the rear hook assembly ~~comprises~~ assembly includes a second elastic metal wire, and a second elastic coating layer wrapped around covering the second elastic metal wire, and plug-in portions with the insertion part arranged at both ends of the second elastic metal wire, wherein the plug-in portions are respectively connected to the first housing of the two ear hook assemblies and fixedly connected.

11. The bone conduction earphone according to claim 10, characterized in that the ~~end of the first housing is~~ provided with a socket for allowing the insertion of the plug-in portion and an opening connecting the socket with the outside in the vertical direction of the insertion direction of the plug-in portion, to allow the application of adhesive or installation of a locking piece into the socket from the outside through the opening. plug-in portion includes a

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so that the plug-in portion is fixed in the socket under the action of the adhesive or locking piece.

12. The bone conduction earphone according to claim 11, characterized in that the plug-in portion comprises a first plug-in section connected to the second elastic metal wire and a second plug-in section connected to the first plug-in section and ~~set positioned~~ away from the second elastic metal wire, ~~and the socket.~~ The plug-in hole is divided along the insertion direction of the plug-in portion into a first hole section for receiving the first plug-in section and a second hole section for receiving the second plug-in section ~~along the insertion direction of the plug-in portion~~, wherein the size of the first hole section is ~~set configured~~ to allow the second plug-in section to move freely ~~in~~ within the first hole section along the insertion direction, ~~and to enable the first plug-in section to tightly fit~~ tightly with the first hole section.

13. The bone conduction earphone according to claim 12, characterized in that the bottom surfaces of the first plug-in section and the second plug-in section are arranged in a stepped manner and a first wedge-shaped transition section is provided at the connection between the first plug-in section and the second plug-in section, and a second wedge-shaped transition section corresponding to the first wedge-shaped transition section is provided at the connection between the first hole section and the second hole section.

14. The bone conduction earphone according to claim 6, characterized in that a third housing for accommodating the control circuit assembly is provided with a key opening and an accommodating groove connected to the key opening, and the control circuit assembly comprises a circuit board, a switch fixed on the circuit board, a waterproof lining board, and a key, wherein the key is set in the key opening and exposed via the key opening, the waterproof lining board comprises a lining board main body and a third elastic coating layer wrapped on the lining board main body by injection molding, the waterproof lining board is set in the accommodating groove and the third elastic coating layer is in elastic contact with the side of the accommodating groove, the key and the switch are respectively set on both sides of the waterproof lining board and respectively in contact with the waterproof lining board.

15. The bone conduction earphone according to claim 14, characterized in that the control circuit assembly further comprises an antenna arranged on the circuit board, wherein the antenna comprises an antenna body arranged at a distance from the circuit board, and a grounding portion and a feeding portion connecting the antenna body and the circuit board, wherein when viewed in a direction perpendicular to the circuit board, the antenna body bends and extends from the grounding portion to one side of the circuit board.

6. The bone conduction earphone according to claim 5, characterized in that the size of the second hole section is configured such that the second plug-in section fits tightly with the first hole section; and/or,

The shapes of the contact surfaces on both sides of the first plug-in section that contact the first hole section are different.

7. The bone conduction earphone according to claim 5, characterized in that the slot is provided on the second plug-in section.

8. The bone conduction earphone according to claim 5, characterized in that the bottom surfaces of the first plug-in section and the second plug-in section are arranged in a stepped shape, and a first wedge-shaped transition section is provided at the junction of the first plug-in section and the second plug-in section, while a second wedge-shaped transition section corresponding to the first wedge-shaped transition section is provided at the junction of the first hole section and the second hole section.

9. The bone conduction earphone according to claim 4, characterized in that the rear hanging assembly further includes a second wire group covered by the second elastic coating, wherein both ends of the second wire group are exposed from the second elastic coating. The top surface of the plug-in portion is provided with a wire embedding groove for accommodating the exposed part of the second wire group.

160. The bone conduction earphone according to claim 14, characterized in that the first ~~elastic coating layer further covers at least a portion of the outer surfaces of the first housing and the~~ second housing, ~~a through hole is formed on the second housing,~~ are fixedly connected to both ends of the first elastic coating layer covers the through hole and further forms a key accommodating portion above the through hole and on the side away from the second housing, the ear hook assembly further comprises a key and a switch assembly, wherein the key is set in the key accommodating portion, and the switch assembly is set on the side of the second housing far from ~~metal wire by injection molding.~~ The first elastic coating is fixedly coated onto the first elastic coating layer and in contact with the first elastic coating layer below the key ~~metal wire by injection molding,~~ and the plug-in portion is fixed to both ends of the second ~~elastic metal wire by injection molding.~~

A bone conduction earphone

Field of the invention

[0001] The present invention relates to the field of earphones, and more particularly to a bone conduction earphone.

Background of the invention

[0002] Bone conduction is a ~~method of sound transmission that~~conduction method, which converts sound into mechanical vibrations of different frequencies, and transmits sound waves ~~are transmitted by~~through the human skull, ~~bony~~ labyrinth, inner ear lymphatic fluid, ~~organum spirale~~organ, auditory nerves, and auditory ~~center~~cortex. Bone conduction earphones use bone conduction technology to receive ~~speech and~~sound, adhering closely ~~adhere to~~ the bones, ~~and~~allowing sound waves ~~are to be~~ directly transmitted ~~by the bone~~ to the auditory nerve. ~~Therefore, through the bones. This allows both ears can be exposed to stay open without damaging the eardrums, and it is therefore loved by a large number of making them increasingly favored by consumers.~~ However, the various parts of existing bone conduction earphones are generally fixed and connected by screws, etc. Specifically, the rear hanger and ear hanger of the existing bone conduction earphones have poor bending performance and are prone to damage during bending need to be connected by screws. The presence of screws and screw holes prevents the overall size of the earphones from being reduced, making assembly inconvenient.

Contents of the invention

[0003] The main technical ~~issue solved~~problem addressed by the present invention is to provide a bone conduction earphone that can effectively improve the ~~poor bending performance of~~issue of the size of the earphones not being able to be reduced due to the connection between the rear hanger and ear hanger of the existing bone conduction earphones through screws and screw holes.

[0004] ~~In order to~~To solve the above technical ~~issue~~problems, an embodiment of the present invention provides a bone conduction earphone, ~~comprising~~ an ~~two~~ ear hook ~~assembly, wherein the~~components. Each ear hook ~~assembly comprises~~component includes a first housing, a second housing, and a connecting component ~~connecting that links~~ the first housing and the second housing, ~~wherein the connecting component comprises a first elastic metal wire connecting the first housing and the second housing at both ends respectively, and a first elastic coating layer wrapped around the first elastic metal wire. The bone conduction earphone further includes a rear hanging component, with plug-in portions at both ends. These plug-in portions are engaged with and fixedly connected to the first housings of the two ear hook components.~~

[0005] Compared with the prior art, the beneficial effects of the present invention are ~~as follows: the embodiment of the; The present invention connects the first housing and the second housing by a first elastic metal wire, and the first elastic coating layer covers the first elastic metal wire, and due to the elastic effect of the elastic metal wire and the first elastic coating layer, the bending performance of the ear hook can be effectively enhanced, and it can effectively recover to its original state when bent, with no deformation, and the issue of easy damage caused by the use of plastic as the material of the ear hook assembly in conventional provides plug-in portions at both ends of the rear hook component, with these portions respectively engaging with the first shells of the two ear hook components. This innovation eliminates the screw-based fixation method of existing bone conduction earphones can be improved, effectively reducing the size at the connection point between the rear hook and ear hook components, thereby minimizing the overall earphone size and facilitating assembly.~~

Description of figures

[0006] Figure 1 is a schematic diagram of the structure of the ear hook assembly in an embodiment of the bone

conduction earphone of the present invention;

[0007] Figure 2 is a schematic diagram of the overall structure disassembly of the bone conduction earphone in the

embodiment of the present invention;

[0008] Figure 3 is another structural schematic diagram of the ear hook assembly in the embodiment of the bone

conduction earphone of the present invention;

[0009] Figure 4 is a schematic diagram of the cross-sectional structure of A-A in figure 3;

[0010] Figure 5 is a schematic diagram of the partial structure disassembly of the bone conduction earphone in the

embodiment of the present invention;

[0011] Figure 6 is a schematic diagram of the cross-sectional structure of C-C in figure 5;

[0012] Figure 7 is a schematic diagram of the circuit in an embodiment of the bone conduction earphone of the

present invention;

[0013] Figure 8 is a schematic diagram of the structure of the fourth housing in the embodiment of the bone

conduction earphone of the present invention;

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[0014] Figure 9 is a magnified schematic diagram of the structure of the bone conduction earphone plug-in portion and socket in an embodiment of the present invention;

[0015] Figure 10 is a schematic diagram of the cross-sectional structure of the plug-in portion and socket in the embodiment of the bone conduction earphone of the present invention;

[0016] Figure 11 is a schematic diagram of the socket structure in an embodiment of the bone conduction earphone of the present invention;

[0017] Figure 12 is a schematic diagram of the structure of the plug-in portion in an embodiment of the bone conduction earphone of the present invention;

[0018] Figure 13 is a schematic diagram of the cross-sectional structure of B-B in figure 9;

[0019] Figure 14 is a schematic diagram of the disassembly of another portion of the structure of the bone

conduction earphone in the embodiment of the present invention;

[0020] Figure 15 is a schematic sectional view of the partial structure of figure 14;

[0021] Figure 16 is a schematic diagram of the structure of the control circuit assembly in an embodiment of the

bone conduction earphone of the present invention;

[0022] Figure 17 is a schematic diagram of another structure of the control circuit assembly in the embodiment of

the bone conduction earphone of the present invention.

Specific embodiments

[0023] Referring to figures 1 and 2, the embodiment of the bone conduction earphone of the present invention comprises an ear hook assembly 11, wherein the ear hook assembly 11 comprises a first housing 111, a second housing 112, and a connecting component 113 connecting the first housing 111 and the second housing 112, wherein the connecting component 113 comprises a first elastic metal wire 1131 connecting the first housing 111 and the second housing 112 at both ends, and a first elastic coating layer 1132 wrapped around the first elastic metal wire 1131.

[0024] Generally, a bone conduction earphone also comprises bone conduction speakers, batteries, control circuits, and other components. For example, bone conduction speakers are used to output sound to users via vibration in a bone conduction manner. The battery is used to power the various components of the bone conduction earphone. The control circuit is used to control the bone conduction earphone, such as for adjusting volume, turning on and off, playing audio, and Bluetooth communication.

[0025] The ear hook assembly 11 is generally used for users to hang the bone conduction earphone on their ears when wearing them, which can make the bone conduction earphone more firmly worn on the user's ear. The ear hook assembly 11 needs to have good resistance to pressure and deformation, so that users will not easily damage or deform the bone conduction earphone during use.

[0026] In this embodiment, the connecting component 113 can directly contact the ear and support the bone conduction earphone via the base of human ear. The connecting component 113 comprises a first elastic metal wire 1131 and a first elastic coating layer 1132 wrapped around the first elastic metal wire 1131. The first housing 111 and the second housing 112 are connected by the first elastic metal wire 1131, which can effectively enhance the bending performance and structural stability of the bone conduction earphone, so that the ear hook assembly 11 can effectively undergo elastic recovery and restore its original state when bent, and is not easily deformed. In addition, using the first elastic metal wire 1131 can improve the issue of easy damage caused by conventional bone conduction earphones using plastic as the material for the ear hook assembly. Optionally, the connecting component 113 may comprise multiple first elastic metal wires 1131. For example, multiple thin first elastic metal wires 1131 can be set to further improve the bending reliability of the ear hook assembly 11. For example, 3 first elastic metal wires 1131 can be set, each with a diameter of 0.3 mm. At this time, the materials of the 3 first elastic metal wires can be the same, partially the same, or completely different. Of course, the diameter of each first elastic metal wire 1131 can also be the same, partially the same, or completely different.

[0027] In this embodiment, optionally, the first elastic metal wire 1131 can be a metal element or an alloy material comprising multiple metal materials, such as spring steel, aluminum alloy, magnesium alloy, titanium alloy, nickel alloy, titanium nickel alloy, magnesium lithium alloy, chromium molybdenum steel, etc. It can also be a composite material comprising metal and non-metal materials. Optionally, the first elastic metal wire 1131 can be made of titanium alloy wire, or at least made of titanium alloy material, such as titanium alloy wire with a diameter of 0.8-1.5 mm, which can be selected as 1.0-1.25 mm.

[0028] In this embodiment, the first elastic metal wire 1131 is wrapped with a first elastic coating layer 1132, which directly contacts the ear. Due to the elastic effect of the first elastic coating layer 1132, the user can wear the bone conduction earphone comfortably. In addition, due to its elastic effect, the first elastic coating layer 1132 can be more effectively wrapped around the first elastic metal wire 1131, even after multiple bends, ensuring the effectiveness of the bone conduction earphone structure. Optionally, the first elastic coating layer 1132 is a silicone layer. Of course, in other embodiments, the first elastic coating layer 1132 can also be a latex layer or a rubber layer, or other elastic plastic layers, or a composite material layer containing silicone.

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[0029] Optionally, the first housing 111 and the second housing 112 are fixedly connected to both ends of the first elastic metal wire 1131 by injection molding, and the first elastic coating layer 1132 is fixedly wrapped around the first elastic metal wire 1131 by injection molding. Optionally, the first housing 111 and the second housing 112 are plastic housings, fixed at both ends of the first elastic metal wire 1131 by injection molding, and the first elastic coating layer 1132 is integrally formed to cover the first elastic metal wire 1131. This makes the connection between the first housing 111, the second housing 112, and the first elastic metal wire 1131 more stable, and enhances the sense of unity and texture of the bone conduction earphone, making the structure of the bone conduction earphone more compact and lightweight. In this embodiment, the injection molding method can be one of injection molding, thermoplastic molding, compression molding, etc., but is not limited to these.

[0030] Referring to figures 3 and 4, optionally, the first elastic coating layer 1132 is composed of two sub-elastic coating layers 1132a and 1132b of different colors, wherein the joint seams of the two sub-elastic coating layers 1132a and 1132b are located on the two opposite side surfaces 113a and 113b of the connecting component 113, respectively. The projections of the joint seams on the same side surface, such as the outer side surface 113a, are staggered from each other. For example, during injection molding, at least two sets of molds are used to separately mold the two sub-elastic coating layers 1132a and 1132b of the first elastic coating layer 1132, thereby forming two different color combinations such as light gray and dark gray or other colors with different ratios, and the joint seam is located on the two opposite sides 113a and 113b of the connecting component 113, and the projections on the same side are staggered, making the visual effect of the bone conduction earphone better. Furthermore, the staggered wrapping of the first elastic metal wire 1131 makes the wrapping effect better. Of course, the first elastic coating layer 1132 can also be formed by combining two sub-elastic coating layers of the same color. By forming two sub-elastic coating layers 1132a and 1132b on the two side surfaces 113a and 113b of the connecting component 113 by two injection molding processes, it is possible to improve the injection molding quality of the connecting component 113 by reducing the displacement of components such as the first elastic metal wire 1131 inside the first elastic coating layer 1132 due to the presence of injection pressure during one-time injection molding or separate upper and lower injection molding. Of course, in other embodiments, the first elastic coating layer 1132 can directly form one coating layer, or form more than two sub-elastic coating layers.

[0031] In this embodiment, the two sides of the connecting component 113 comprise opposite inner side surface 113b and outer side surface 113a, which means that when worn, the ear hook assembly 11 is hung on the human ear, and the side of the connecting component 113 facing the human head is the inner side surface 113b, and the side facing the human ear is the outer side surface 113a.

[0032] Continuing to refer to figures 3 and 4, optionally, the joint seams of the two sub-elastic coating layers 1132a and 1132b are located on the inner side 113b and outer side 113a of the connecting component 113, respectively, and the projection of the joint seam located on the outer side 113a of the connecting component 113 is closer to the contact position between the connecting component 113 and the human ear compared to the projection of the joint seam located on the inner side 113b of the connecting component 113. From this, it can be known that one joint seam is located near the contact with the human ear on the outer side surface 113a, while the other joint seam is located on the inner side surface 113b, so that the sub-elastic coating layer 1132a or 1132b of almost the same color is shown on the outer side surface 113a, for example, the outer side surface 113a is almost light gray, making the bone conduction earphone more integrated and beautiful.

[0033] Optionally, the joint seam is set so that the areas of the two sub-elastic coating layers 1132a and 1132b on the same side, such as 113a or 113b, are different from each other. In other embodiments, the joint seam can be set so that the areas of the two sub-elastic coating layers 1132a, 1132b on the same side are the same or substantially the same.

[0034] Referring to figures 2 to 4, optionally, the joint seam is set so that the sub-elastic coating layer 1132a, which has a relatively lighter color in the sub-elastic coating layer 1132a and 1132b, occupies a relatively larger area on the outer side surface 113a. That is to say, the light colored sub-elastic coating layer 1132a is primarily located on the outer side surface 113a, while the dark colored sub-elastic coating layer 1132b is primarily located on the inner side surface 113b. This makes the surface of the connecting component 113 more coordinated, enhancing the aesthetic performance of the bone conduction earphone while ensuring structural performance.

[0035] Continuing to refer to figure 1, optionally, the two ends of the first elastic metal wire 1131 are arranged in a flat shape and embedded into the first housing 111 and the second housing 112, respectively. That is, the first housing 111 and the second housing 112 are formed by injection molding and fixed to the two ends of the first elastic metal wire 1131 arranged in a flat shape. This can increase the contact area between the first elastic metal wire 1131 and the first housing

111 and the second housing 112, making the first elastic metal wire 1131 and the first housing 111 and the second housing 112 more stably fixed to each other. Optionally, the width of the two ends of the first elastic metal wire 1131 arranged in a flat shape is greater than the width of the connecting component connecting the two ends arranged in a flat shape, so as to play a limiting role after molding, preventing the first elastic metal wire 1131 from being pulled out or falling off from the first housing 111 and the second housing 112. Optionally, the two ends of the first elastic metal wire 1131 are threaded. During molding, portion of the housing can be molded in the threads to serve as a fixing mechanism. Of course, the two ends of the first elastic metal wire 1131 can be arranged in a flat or threaded shape, respectively. In other embodiments, the two ends of the first elastic metal wire 1131 can also be concave to form a concave portion, and the first housing 111 and the second housing 112 are partially located within the concave portion during molding to provide a fixing effect.

[0036] Referring to figures 1 and 2, optionally, the first elastic coating layer 1132 further covers at least portion of the outer surfaces of the first housing 111 and the second housing 112, such as the entire outer surface. That is, the first elastic coating layer 1132 covers the first elastic metal wire 1131, at least a portion of the outer surface of the first housing 111, and at least a portion of the outer surface of the second housing 112 by injection molding. This enhances the texture and unity of the bone conduction earphone, and the presence of the first elastic coating layer 1132 can further protect the housing and internal components, making the bone conduction earphone more wear-resistant.

[0037] Referring to figures 5 and 6, optionally, a through hole 1121 is formed on the second housing 112. That is, the through hole 1121 goes into the inner and outer surfaces of the second housing 112. The first elastic coating layer 1132 covers the through hole 1121 and further forms a key accommodating portion 1121a on the side above the through hole 1121 and away from the second housing 112 (i.e., away from the inner side of the second housing 112). The key accommodating portion 1121a is formed by the first elastic coating layer 1132 covering the through hole 1121 during the injection molding process. The presence of the first elastic coating layer 1132 in the key accommodating portion 1121a can isolate moisture, dust, etc. from entering the second housing 112. The ear hook assembly 11 further comprises a key 118 and a switch assembly 119, wherein the key 118 is provided in the key accommodating portion 1121a. The switch assembly 119 is located on the side of the second housing 112 away from the first elastic coating layer 1132, that is, on the inner side of the second housing 112, and is in contact with the first elastic coating layer 1132 below the key 118. Optionally, a protrusion 1121b is provided inside the key accommodating portion 1121a, and the key 118 is fixed to the protrusion 1121b, for example, by adhesive bonding. In this embodiment, the first elastic coating layer 1132 is fixed and wrapped around the second housing 112 by injection molding, and covers the through hole 1121, which has a better waterproof effect. Optionally, the protrusion 1121b is formed by integrated molding of the first elastic coating layer 1132 when the first elastic coating layer 1132 covers the through hole 1121.

[0038] In this embodiment, the switch assembly 119 on the second housing 112 is mainly used to control the functional switches of the bone conduction earphone, such as playing and pausing music, answering and hanging up voice, connecting wireless signals to mobile devices such as Bluetooth communication, or selecting the working mode of the bone conduction earphone, etc., but not limited to these.

[0039] Referring to figures 1, 2, 4, and 7, optionally, the interior of the first elastic coating layer 1132 is further provided with a lead channel 1134 for connecting the first housing 111 and the second housing 112, the ear hook assembly 11 further comprises a first wire set 1133 extending from the first housing 111 to the second housing 112 through the lead channel 1134, and the radial size of the lead channel 1134 is set to allow the first wire set 1133 to move along the lead channel 1134.

[0040] By setting a lead channel 1134, for example, during later assembly, one end of the first wire set 1133 can be connected first (e.g., in a board mounted manner) to the components inside the second housing 112, such as a bone conduction speaker. Then, the other end of the first wire set 1133 can be passed through the lead channel 1134 to connect to the components inside the first housing 111, such as the battery pack 13, control circuit assembly 14, or adapter circuit board 15. This can reduce the assembly processes and improve the issue of difficult wiring and unfavorable maintenance caused by embedding the first wire set 1133 in the first elastic coating layer 1132 during injection molding of the existing bone conduction earphones. Of course, during later assembly, one end of the first wire set 1133 can also be connected (for example, in a board mounted manner) to the components inside the first housing 111, such as the battery pack 13, control circuit assembly 14, or adapter circuit board 15. Then, the other end of the first wire set 1133 can be passed through the lead channel 1134 to connect to the components inside the second housing 112, such as bone conduction speakers.

[0041] In this embodiment, the specific molding method of the lead channel 1134 includes, for example, first providing an assembly of the first housing 111 and the second housing 112 connected by a first elastic metal wire 1131, further providing an additional metal wire (not shown in the figure) in a detachable manner between the second housing 112 and the first housing 111, and further forming a first elastic coating layer 1132 on the outer surfaces of the first elastic metal wire 1131, the additional metal wire, and portions of the first housing 111 and the second housing 112 by injection molding, and extracting the additional metal wire to form the lead channel 1134 after molding. In other embodiments, for example, during injection molding of the first elastic coating layer 1132, a fusible material is embedded. When the first elastic coating layer 1132 is injection molded, the fusible material melts and flows out, forming a lead channel 1134. For example, the lead channel 1134 can be formed by threading a needle after the first elastic coating layer 1132 is formed, and then expanded by hot melting to form the lead channel 1134.

[0042] Continuing to refer to figures 1 and 4, in this embodiment, it is optional to set the lead channel 1134 on the lower side of the first elastic metal wire 1131, so as to be closer to the contact position between the connecting component 113 and the human ear compared to the first elastic metal wire 1131 during use. In this embodiment, the first lead channel 1134 is independently spaced from the first elastic metal wire 1131. In other embodiments, the first lead channel 1134 can be combined with the first elastic metal wire 1131, that is, the first wire set 1133 can contact the first elastic metal wire 1131 within the first lead channel 1134. In this embodiment, the lead channel 1134 is provided on the lower side of the first elastic metal wire 1131, so as to be closer to the contact position between the connecting component 113 and the human ear compared to the first elastic metal wire 1131 during use. Due to the presence of the lead channel 1134, the first elastic coating layer 1132 near the human ear can be more elastic, softer, and more comfortable to wear. In other embodiments, of course, the first lead channel 1134 can also be provided on the upper side of the first elastic metal wire 1131, which is closer to the human ear during use.

[0043] Referring to figures 1, 2, and 8, optionally, the ear hook assembly 11 comprises a third housing 114 and a fourth housing 115. The third housing 114 cooperates with the first housing 111 to form a first accommodating space 116 for accommodating the battery pack 13 or the control circuit assembly 14. The fourth housing 115 cooperates with the second housing 112 to form a second accommodating space 117 for accommodating the bone conduction speaker. Optionally, the fourth housing 115 and the third housing 114 are plastic housings.

[0044] Optionally, the second housing 112 and the fourth housing 115 are connected by a first buckle assembly (not shown in the figure), wherein the first buckle assembly comprises a first clamping portion and a first locking portion, the first clamping portion is set on the fourth housing 115, and the first locking portion is set on the second housing 112. When the second housing 112 is matched with the fourth housing 115, the first clamping portion on the fourth housing 115 is engaged with the first locking portion of the second housing 112 to fix the second housing 112 and the fourth housing 115 together. Optionally, the second housing 112 and the fourth housing 115 are connected by at least one set of first buckle assembly, such as four sets of first buckle assembly. Of course, the second housing 112 and the fourth housing 115 can also be bonded together by adhesive, or fixed together by the first clamping assembly and adhesive, or connected and fixed by fasteners such as screws.

[0045] Optionally, the third housing 114 is connected to the first housing 111 with a second buckle assembly (not shown in the figure), wherein the second buckle assembly comprises a second clamping portion and a second locking portion, the second clamping portion is set on the third housing 114, and the second locking portion is set on the first housing 111. When the first housing 111 is matched with the third housing 114, the second clamping portion of the third housing 114 is engaged with the second locking portion of the first housing 111 to fix the first housing 111 and the third housing 114 together.

[0046] In this embodiment, the third housing 114 of the ear hook assembly 11 cooperates with the first housing 111 to form a first accommodating space 116 for accommodating the battery pack 13 or the control circuit assembly 14, and the fourth housing 115 cooperates with the second housing 112 to form a second accommodating space 117 for accommodating the bone conduction speaker. The first wire set 1133 can move through the lead channel 1134 for electrically connecting the bone conduction speaker with the battery pack 13 or the control circuit assembly 14. In this embodiment, the battery pack 13 comprises, for example, a battery and a battery management circuit. The battery supplies power to the other components of the bone conduction earphone via the battery management circuit. For example, the battery management circuit comprises a charging circuit, an overcurrent protection circuit, an over discharge protection circuit, an overvoltage protection circuit, etc. For example, the battery is a rechargeable battery, such as a lithium ion battery. Referring to figure 7, optionally, the bone conduction earphone further comprises, for example,

an adapter circuit board 15, which is arranged in the first accommodating space 116. The battery pack 14 is divided into multiple wiring points through the adapter circuit board 15 to correspondingly connect the two bone conduction speakers, control circuit assembly 14, microphone, and switch assembly 119 of the bone conduction earphone. The relevant wires of the above components are connected to the wiring points and conduct power in the manner shown in figure 7, which facilitates wiring and assembly. For example, the battery pack 14 is connected to adapter circuit board 15 via two positive and negative wiring points, and the adapter circuit board 15 is split into 10 wiring points to connect the other components of the bone conduction earphone.

[0047] Referring to figures 1 and 2, optionally, the first housing 111 is provided with a first sub-accommodating space 116a inside, and the third housing 114 is provided with a second sub-accommodating space 116b inside. When the third housing 114 is matched with the first housing 111, it forms the first accommodating space 116 together with the first sub-accommodating space 116a, for example, through a first buckle assembly for fixed connection. The volume of the second sub-accommodating space 116b is larger than that of the first sub-accommodating space 116a. For example, the volume of the second sub-accommodating space 116b is 2-5 times that of the first sub-accommodating space 116a, such as 3-4 times, 3.2 times, or 2.5 times.

[0048] When assembling the battery pack 13 or the control circuit assembly 14, for example, the battery pack 13 or the control circuit assembly 14 is first placed in the first sub-accommodating space 116a. For example, the battery is attached to the first sub-accommodating space 116a with adhesive or double-sided tape, or the control circuit assembly 14 is fixed to the first sub-accommodating space 116a with a clamping structure, so that most of the battery pack 13 or the control circuit assembly 14 is exposed for the assembly and wiring processes. Then, the third housing 114 is covered with the first housing 111 via a second clamping assembly, and the first sub-accommodating space 116a and the second sub-accommodating space 116b form the first accommodating space 116. This improves the issue of complex assembly process caused by the conventional bone conduction earphones requiring the battery or control circuit board to be assembled and accommodated in a housing integrated with the ear hook, and further using silicone strips to wrap around the external portion of the battery control circuit board, simplifying the structure and assembly process.

[0049] Referring to figures 2 and 8, optionally, the fourth housing 115 is arranged in a prism shape, wherein a strip-shaped sound hole 1151 is provided on at least one side of the fourth housing 115, wherein the length direction of the strip-shaped sound hole 1151 is parallel or approximately parallel to the bottom surface of the fourth housing 115, and the length of the strip-shaped sound hole 1151 is not less than two-thirds of the width of the side where it is located. In this embodiment, the bottom surface 115e of the strip-shaped sound hole, which is relatively parallel, refers to the plane defined by the opening edge of the fourth housing 115 facing the human face when worn.

[0050] Generally, bone conduction speaker transmits sound to the surrounding environment during vibration. In addition to the wearer, others in the environment can also hear the sound from the speaker. For example, the vibration of the bone conduction speaker causes the vibration of the air in the second accommodating space 117 and the vibration of the fourth housing 115, resulting in sound leakage and affecting the sound quality of the bone conduction earphone. The sound hole 1151 guides the sound waves in the second accommodating space 117 to propagate outside the space, interferes with the sound leakage waves in the air, and reduces the amplitude of the sound leakage waves, thereby reducing the sound leakage.

[0051] Continuing to refer to figure 8, in order to further improve the sound leakage phenomenon, this embodiment improves the serious issue of sound leakage caused by conventional bone conduction earphones by providing a strip-shaped sound hole 1151 on at least one side of the fourth housing 115, and appropriately setting its size and direction. Furthermore, the length direction of the strip-shaped sound hole 1151 is arranged parallel to the bottom surface of the fourth housing 115, which not only ensures aesthetics, but also ensures the uniformity of the sound wave intensity guided in parallel, thereby ensuring the interference effect. In this embodiment, the length of the strip-shaped sound hole 1151 is not less than two-thirds of the width of the side where it is located, which can effectively guide the sound waves in the second accommodating space 117. Optionally, the length of the strip-shaped sound hole 1151 is three-quarters of the width of the side where it is located. Of course, in other embodiments, at least two strip-shaped sound holes 1151 are arranged in parallel on at least one side of the fourth housing 115, for example, two parallel strip-shaped sound holes 1151 are arranged on at least one side and parallel to the bottom surface 115e of the fourth housing 115.

[0052] Optionally, the fourth housing 115 does not have a strip-shaped sound hole 1151 on the side 115d near the human ear when using the bone conduction earphone. Of course, in other embodiments, a sound hole can also be provided on the side 115d of the fourth housing 115 near the human ear when using the bone conduction earphone,

which can be a point shaped sound hole or a strip-shaped sound hole 1151.

[0053] Continuing to refer to figures 2 and 8, optionally, the fourth housing 115 is arranged in a square prism shape, wherein the strip-shaped sound holes 1151 are provided on the two side surfaces 115a and 115c adjacent to the connecting component 113. Furthermore, the side surface 115b of the remaining two side surfaces 115b and 115d, which is far away from the human ear during use of the bone conduction earphone, is also provided with a strip-shaped sound hole 1151, while the side surface 115b of the remaining two side surfaces 115b and 115d, which is close to the human ear during use of the bone conduction earphone, is not provided with a strip-shaped sound hole 1151. That is to say, three strip-shaped sound holes 1151 are set on the three sides 115a, 115b, and 115c. When using bone conduction earphones, the side 115d near the human ear does not have a strip-shaped sound hole 1151. This can further reduce sound leakage and ensure the sound quality of the bone conduction earphone.

[0054] In this embodiment, the fourth housing 115 is arranged in a square prism shape, for example, including a regular square prism and a quasi-square prism shape. For example, specifically, the length of any one of the two sides 115a and 115c of the fourth housing 115 adjacent to the connecting component 113 is greater than the length of any one of the remaining two sides 115b and 115d. Furthermore, the lengths of the two sides 115a and 115c of the fourth housing 115 adjacent to the connecting component 113 are not equal or equal. In other embodiments, the fourth housing 115 is arranged in a square prism shape, and the lengths of its four sides can be equal.

[0055] In this embodiment, optionally, the angle between the two side surfaces 115a and 115c of the fourth housing 115 adjacent to the connecting component 113 is 90°-150°, 100°-130°, or 110°-120°.

[0056] Optionally, a waterproof and dustproof filter screen, such as a waterproof breathable membrane (not shown in the figure), is further arranged inside the fourth housing 115 to cover the strip-shaped sound hole 1151. Setting waterproof and dustproof filter screens can prevent dust outside the bone conduction earphone and prevent water from entering the earphone and damaging the bone conduction speaker.

[0057] In this embodiment, a microphone hole (not shown in the figure) is respectively provided on the second housing 112 and the fourth housing 115. Specifically, the first microphone hole is provided at the connection between the remaining two side surfaces 115b and 115d of the fourth housing 115 that are not directly connected to the connecting component 113, and the second microphone hole is provided on the outer side of the second housing 112 and near the connection between the fourth housing 115 and the connecting component 113. By placing two microphones in two staggered microphone holes, the quality of voice input can be enhanced and effective noise reduction can be achieved, thereby improving the fidelity of voice input.

[0058] Referring to figures 2 and 9, in this embodiment, there are two ear hook assemblies 11, and the bone conduction earphone further includes a rear hook assembly 12. The rear hook assembly 12 comprises a second elastic metal wire 121, a second elastic coating layer 122 wrapped around the second elastic metal wire 121, and plug-in portions 123 provided at both ends of the second elastic metal wire 121. The plug-in portions 123 are respectively connected and fixed to the first housings 111 of the two ear hook assemblies 11. Optionally, the plug-in portion 123 can be fixed to both ends of the second elastic metal wire 121 by injection molding, which can make the plug-in portion 123 more firmly fixed to both ends of the second elastic metal wire 121. Optionally, the second elastic metal wire 121 can be a metal element, or an alloy material including multiple metal materials, such as spring steel, aluminum alloy, magnesium alloy, titanium alloy, nickel alloy, titanium nickel alloy, magnesium lithium alloy, chromium molybdenum steel, etc. It can also be a composite material including metal and non-metal materials. In this embodiment, the second elastic metal wire 121 is a titanium alloy wire, or at least made of titanium alloy material. In this embodiment, the second elastic coating layer 122 is a silicone layer. In other embodiments, the second elastic coating layer 122 can also be a rubber layer or a latex layer, or a composite material layer including silicone.

[0059] By connecting the plug-in portion 123 of the rear hook assembly 12 with the first housing 111 of the two ear hook assemblies 11, the issue of large earphone size caused by screw fixation in existing bone conduction earphones are improved, simplifying the structure, reducing the weight of bone conduction earphones, facilitating later wiring, and reducing costs.

[0060] Referring to figures 9 and 10, optionally, the end of the first housing 111 is provided with a plug-in hole 1111 for allowing the insertion of the plug-in portion 123, and an opening 1112 connecting the plug-in hole 1111 and the outside in the vertical direction of the insertion direction of the plug-in portion 123, to allow the application of adhesive or the installation of a locking piece (not shown in the figure) into the plug-in hole 1111 from the outside via the opening 1112, so that the plug-in portion

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123 is fixed in the plug-in hole 1111 under the action of adhesive or locking piece. In this embodiment, the opening 1112 is located within the first sub-accommodating space 116a. In other embodiments, the end of the first housing 111 is provided with a plug-in hole 1111 for allowing the insertion of the plug-in portion 123. The plug-in portion 123 has a concave portion, and the plug-in hole 1111 has an elastic convex portion inside. When the plug-in portion 123 is inserted into the plug-in hole 1111, the elastic convex portion is engaged with the concave portion to fix the plug-in portion 123 and the plug-in hole 1111 together. For example, when the plug-in portion 123 is inserted into the plug-in hole 1111, the elastic convex portion is first compressed and then snapped into the concave portion under the action of elastic recovery force. Optionally, the depth of insertion of the plug-in portion 123 into the plug-in hole 1111 is 6-11 mm, and can be selected as 8-10 mm.

[0061] Continuing to refer to figures 9 and 10, optionally, a groove 1231 is provided on the side wall of the plug-in portion 123. The groove 1231 is exposed or partially exposed via the opening 1112, and is used to receive adhesive or locking piece. Optionally, at least one side wall of the plug-in portion 123 is provided with a groove 1231, for example, both side walls are provided with a groove 1231. In other embodiments, both adhesive and locking piece can be used simultaneously, for example, fixing with locking piece first and then applying adhesive for further fixation. In this embodiment, the locking piece, such as a wedge or pin, or a fixing piece with certain elasticity, is inserted into groove 1231 for interference fit.

[0062] Referring to figures 2, 9, and 10, optionally, the plug-in portion 123 comprises a first plug-in section 123a connected to the second elastic metal wire 121, and a second plug-in section 123b connected to the first plug-in section 123a and located away from the second elastic metal wire 121. The plug-in hole 1111 is divided into a first hole section 1111a for receiving the first plug-in section 123a and a second hole section 1111b for receiving the second plug-in section 123b along the insertion direction of the plug-in portion 123. The size of the first hole section 1111a is set to allow the second plug-in section 123b to move freely along the insertion direction within the first hole section 1111a, and to ensure a tight fit between the first plug-in section 123a and the first hole section 1111a. By separately fixing the two plug-in sections and the two end hole sections, the plug-in portion 123 can be more firmly fixed inside the first housing 111, enhancing the structural stability of the bone conduction earphone.

[0063] Continuing to refer to figures 9 and 10, it is optional to further set the groove 1231 on the side wall of the second plug-in section 123b. The opening 1112 connects to the second hole section 1111b of the plug-in hole 1111. In this embodiment, the second plug-in section 123b of the plug-in portion 123 passes through the first hole section 1111a and the second hole section 1111b in sequence, so that the first plug-in section 123a fits tightly with the first hole section 1111a. The groove 1231 of the second plug-in section 123b is exposed via the opening 1112 for receiving adhesive or locking piece. By the tight fit between the first plug-in section 123a and the first hole section 1111a, as well as the further fit and fixation between the second plug-in hole 1111 and the second hole section 1111b, the rear hook can be effectively connected to the ear hook. In other embodiments, the groove 1231 may be provided on the side wall of the first plug-in section 123a. The opening 1112 connects to the second hole section 1111b of the plug-in hole 1111.

[0064] Optionally, the size of the second hole section 1111b is set to ensure a tight fit between the second plug-in section 123b and the second hole section 1111b. By the tight fit between the first plug-in section 123a and the first hole section 1111a, the tight fit between the second plug-in hole 1111 and the second hole section 1111b, and the application of adhesive or locking piece for fixation, the rear hook is further effectively connected to the ear hook, and the structure can be simplified, making the bone conduction earphone light in weight. Of course, in other embodiments, the first plug-in section 123a is tightly fitted with the first hole section 1111a, while the second plug-in section 123b and the second hole section 1111b can be in other types of fixed fitting, for example, snap fit.

[0065] Referring to figure 11, optionally, the shape of the contact surface between the two sides of the first plug-in section 123a and the first hole section 1111a is different. The two sides of the first plug-in section 123a have different shapes, and correspondingly, the two side surfaces 1111a1 and 1111a2 where the first hole section 1111a contacts the first plug-in section 123a are also different. For example, both sides of the first hole section 1111a are arranged in an arc shape, and the curvature radius of the inner side 1111a2 is greater than that of the outer side 1111a1, that is, the curvature change of the inner side 1111a2 is relatively gentle, while the curvature change of the outer side 1111a1 is relatively large. The two sides of the first plug-in section 123a are correspondingly arranged. Of course, in other embodiments, both sides of the first hole section 1111a are arranged in an arc shape, and the curvature radius of the inner side 1111a2 is smaller than that of the outer side 1111a1, that is, the curvature change of the inner side 1111a2 is relatively large, while the curvature change of the outer side 1111a1 is relatively small. For the two sides of the first hole section 1111a, the one close to the human head when worn is the inner side 1111a2, and the one away from the human head when worn is

the outer side 1111a1. The shape of the contact surface between the two sides of the first plug-in section 123a and the first hole section 1111a is different, which makes it impossible to reverse insert the first plug-in section 123a and also prevents the two plug-in portions 123 hanging behind from being mixed, effectively preventing errors and facilitating assembly.

[0066] Referring to figures 9 and 10, optionally, the bottom surfaces of the first plug-in section 123a and the second plug-in section 123b are arranged in a stepped shape, and a first wedge-shaped transition section 123c is provided at the connection between the first plug-in section 123a and the second plug-in section 123b, and a second wedge-shaped transition section 1111c corresponding to the first wedge-shaped transition section 123c is provided at the connection between the first hole section 1111a and the second hole section 1111b.

[0067] In this embodiment, the bottom surfaces of the first plug-in section 123a and the second plug-in section 123b refer to the sides close to the base of the human ear when worn. The top surface is the side away from the base of the human ear.

[0068] In this embodiment, the thickness of the first plug-in section 123a is greater than that of the second plug-in section 123b, that is, they are arranged in a stepped manner. There is a thickness difference at the connection between the two sections, and a first wedge-shaped transition section 123c is provided. Correspondingly, a second wedge-shaped transition section 1111c that is adapted to the first wedge-shaped transition section 123c is provided at the connection between the first hole section ~~1111a~~ 1111a and the second hole section 1111b. When the first plug-in section 123a and the second plug-in section 123b are sequentially inserted into the first hole section 1111a and the second hole section 1111b, the first wedge-shaped transition section 123c is in contact with the second wedge-shaped transition section 1111c, which can facilitate the insertion of the second plug-in section 123b and the first plug-in section 123a and plays a role in buffering transition, limiting, and further fixing.

[0069] Referring to figures 9, 12, and 13, optionally, the rear hook assembly 12 further comprises a second wire set 124 wrapped by a second elastic coating layer 122, wherein both ends of the second wire set 124 are exposed from the second elastic coating layer 122, and the top surface of the plug-in portion 123 is provided with a buried wire groove 1232 for accommodating the exposed portion of the second wire set 124. In this embodiment, the second wire set 124 is used to connect the components inside the two ear hook assemblies 11, such as the battery and the control circuit assembly 14. Setting the buried wire groove 1232 can effectively arrange and fix the second wire set 124 on the one hand, and reduce the footprint on the other hand. In other embodiments, the buried wire groove 1232 may not be provided, and the second wire set 124 may be fixed by other means such as adhesive or double-sided tape, or two rows of parallel convex blocks (not shown in the figure) may be provided on the top surface of the plug-in portion 123, and the second wire set 124 can be accommodated between the two rows of convex blocks.

[0070] Referring to figure 2, optionally, the bone conduction earphone further comprises a battery pack 13 and a control circuit assembly 14, wherein the battery pack 13 is disposed in the first accommodating space 116 of one of the two ear hook assemblies 11, and the control circuit assembly 14 is disposed in the first accommodating space 116 of the other of the two ear hook assemblies 11.

[0071] Referring to figures 14 and 15, optionally, the third housing 114 of the ear hook assembly 11 used to accommodate the control circuit assembly 14 is provided with a key opening 1141 and an accommodating groove 1142 connected to the key opening 1141. The control circuit assembly 14 comprises a circuit board 141, a switch 142 fixed to the circuit board 141, a waterproof lining board 143, and a key 144. The key 144 is set inside the key opening 1141 and exposed via the key opening 1141. The waterproof lining board 143 comprises a lining board main body 143a and a third elastic coating layer 143b wrapped around the lining board main body 143a by injection molding. The waterproof lining board 143 is set inside the accommodating groove 1142 and the third elastic coating layer 143b is in elastic contact with the side wall of the accommodating groove 1142, and the key 144 and the switch 142 are respectively set on both sides of the waterproof lining board 143 and in contact with the waterproof lining board 143. In this embodiment, the third elastic coating layer 143b covers one side of the lining board main body 143a and the edge of the lining board main body 143a. Of course, it covers at least a portion of the edge, or it can cover all the edges. In other embodiments, the third elastic coating layer 143b can completely cover the lining board main body 143a, that is, cover both sides of the lining board main body 143a.

[0072] In this embodiment, the switch 142 on the circuit board 141 is mainly used for power on/off, volume adjustment, or other switching functions.

[0073] Continuing to refer to figures 14 and 15, the main body of the waterproof lining board 143 is covered with a third elastic coating layer 143b by injection molding, so that the third elastic coating layer 143b is not easily detached from the main body of the waterproof lining board 143, and the tightness between the third elastic coating layer 143b and the waterproof

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lining board main body 143a is better, improving the waterproof performance of existing bone conduction earphones and ensuring the effectiveness of waterproofing. In this embodiment, the lining board main body 143a can be made of plastic, and the third elastic coating layer 143b can be made of silicone, latex, rubber, or a composite material.

[0074] Optionally, a positioning groove 1431 is provided on the side of the waterproof lining board 143 near the switch 142 to accommodate the switch 142.

[0075] In this embodiment, the method of assembling the control circuit assembly 14 is, for example, as follows: first, the key 144 and the waterproof lining board 143 are sequentially placed on the third housing 114, and the key 144 is exposed via the key opening 1141. Then, the circuit board 141 is in contact with the waterproof lining board 143 via the switch 142 and the positioning groove 1431 of the waterproof lining board 143. By setting the positioning groove 1431, the switch 142 can be accurately positioned and matched with the key 144, so that the switch 142 can be effectively operated with the key 144.

[0076] Referring to figures 16 and 17, optionally, the control circuit assembly 14 further comprises an antenna 145 disposed on the circuit board 141. The antenna 145 comprises an antenna body 145a spaced apart from the circuit board 141, as well as a grounding portion 145b and a feeding portion 145c connecting the antenna body 145a and the circuit board 141. When viewed in a direction perpendicular to the circuit board 141, the antenna body 145a bends and extends from the grounding portion 145b towards one side of the circuit board 141. In this embodiment, the antenna body 145a is bent towards one side of the circuit board 141, which can increase the length of the antenna 145 in a limited space and enhance the radiation efficiency. In this embodiment, the antenna 145 is generally used for wireless communication, such as Bluetooth communication. In other embodiments, it may also be WiFi communication, cellular data communication, NFC near-field communication, etc.

[0077] Optionally, the antenna body 145a comprises a parallel portion 145a1 and a bent portion 145a2. When viewed in a direction perpendicular to the circuit board 141, the width of the parallel portion 145a1 is greater than that of the bent portion 145a2. One end of the parallel portion 145a1 is connected to the grounding portion 145b and the feeding portion 145c, and the other end is connected to the bent portion 145a2. The parallel portion 145a1 and the bent portion 145a2 are arranged in a stepped manner at the connection point, and the bent portion 145a2 is bent towards one side of the circuit board 141 from the connection point.

[0078] Optionally, the control circuit assembly 14 further comprises a grounding component 146 provided on the circuit board 141, wherein the antenna body 145a is bent and extended towards the side of the circuit board 141 away from the grounding component 146. In this embodiment, the grounding component 146 is a switch 142 on the USB interface and/or circuit, or other grounding component 146. Generally, the grounding component 146, such as a USB interface, will cause certain interference to the antenna 145. In this embodiment, the antenna body 145a is bent and extended towards the side of the circuit board 141 away from the grounding component 146, which can improve the interference of the grounding component 146 on the signal of the antenna 145 in a limited space and ensure the signal quality. In this embodiment, the USB interface can be used to transmit data between the bone conduction earphone and external devices such as mobile terminals, and can also be used to charge the battery pack 13.

[0079] Optionally, the width of the antenna body 145a gradually decreases along the extension direction of the antenna body 145a. For example, specifically, the width of the parallel portion 145a1 remains constant from one end to the other, while the width of the bent portion 145a2 gradually decreases along the extension direction. Of course, in other embodiments, the width of the parallel portion 145a1 may gradually decrease from one end to the other, but the width of the other end of the parallel portion 145a1 is still greater than the width of the bent portion 145a2.

[0080] Optionally, the bending angle of the antenna body 145a gradually increases along the extension direction of the antenna body 145a. For example, the bending angle gradually increases, usually to stay away from the grounding component 146 such as USB, so as to ensure the radiation efficiency of the antenna 145. Optionally, there is a bending foot 145a3 at the end of the bending portion 145a2 away from the parallel portion 145a1, where the bending angle is the largest. This is to meet the size requirements of the antenna 145 on the one hand and to improve the radiation efficiency on the other hand.

[0081] The above descriptions are only embodiments of the present invention and do not limit the patent scope of the present invention. Any equivalent structure or equivalent process transformation made using the content of the present invention description and figures, or direct or indirect application in other related technical fields, are also included in the patent protection scope of the present invention.

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