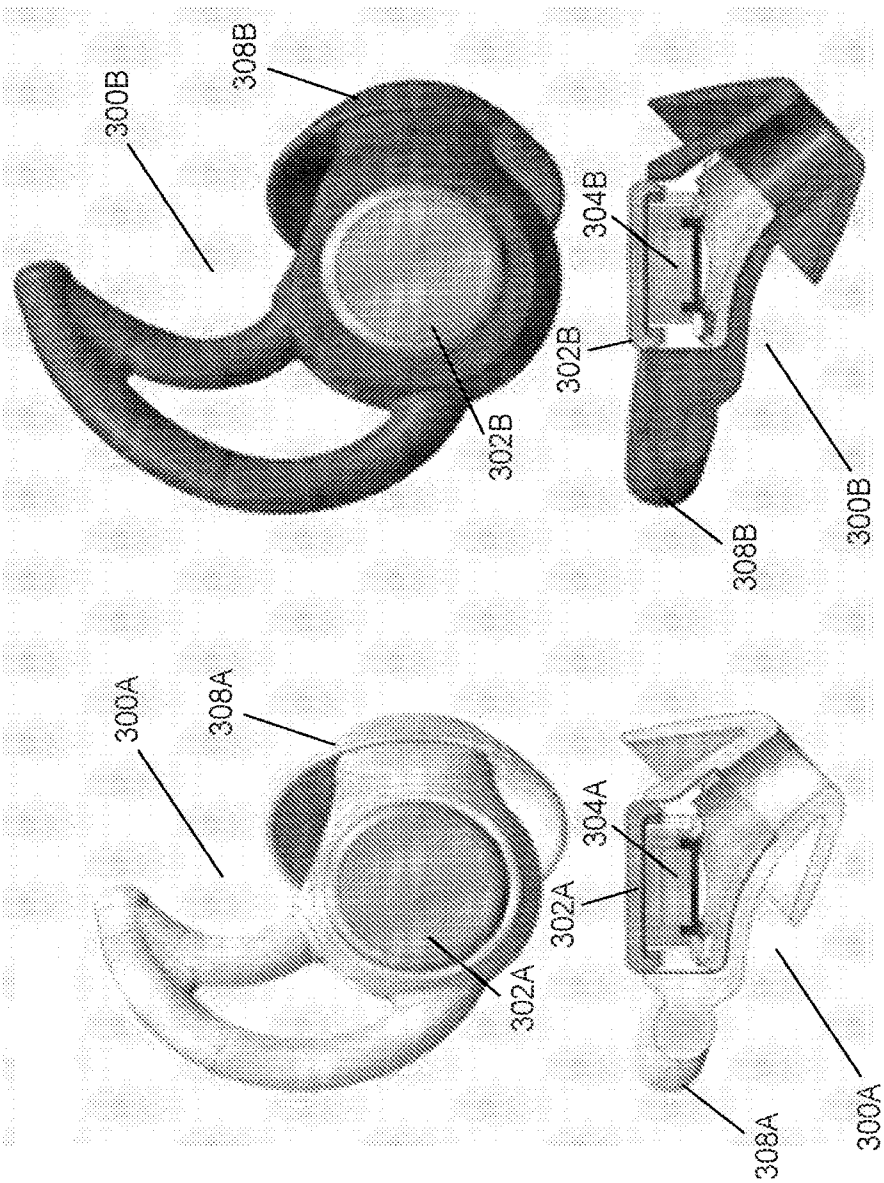

FIG. 3A

FIG. 3B

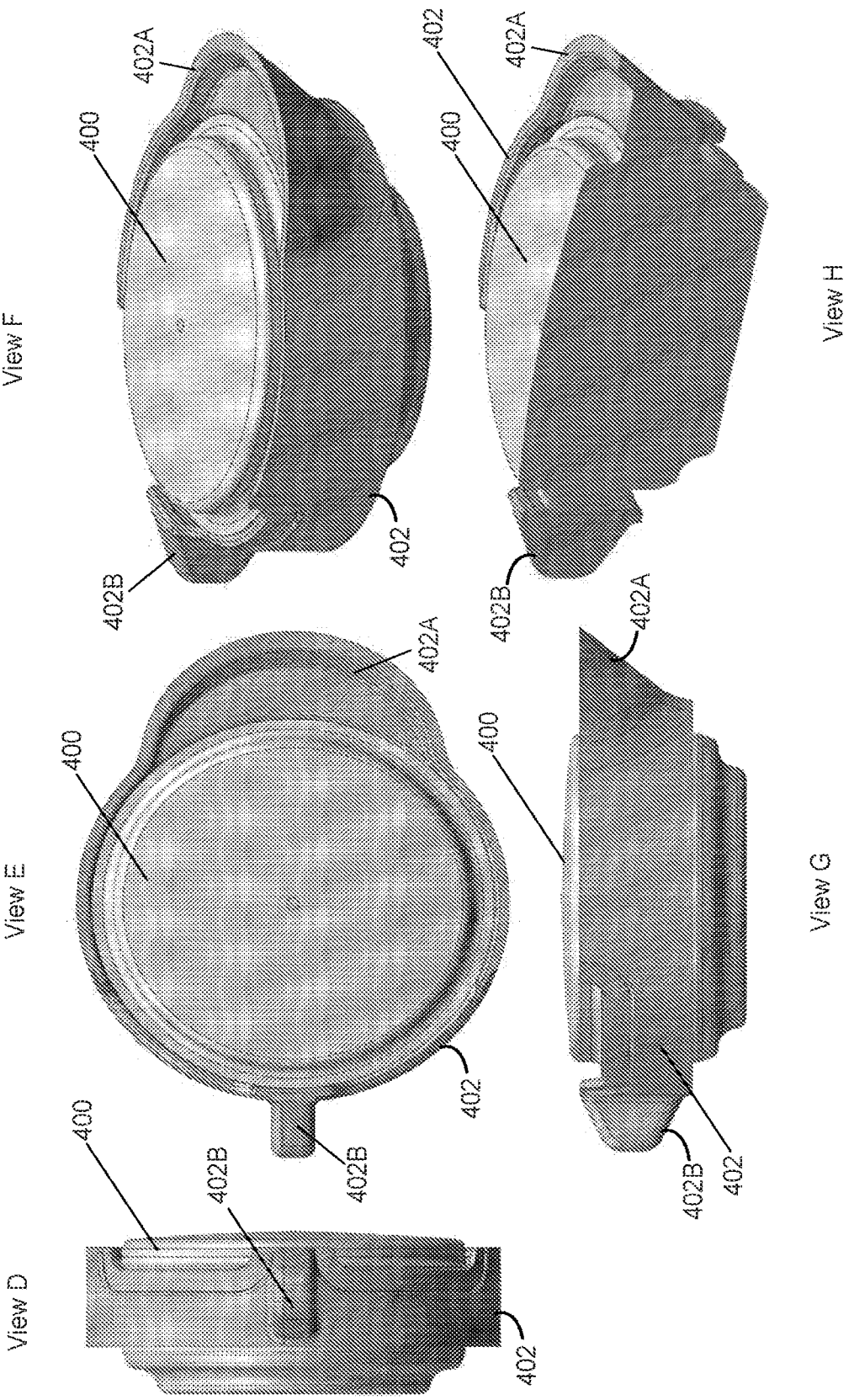
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FIG. 4A

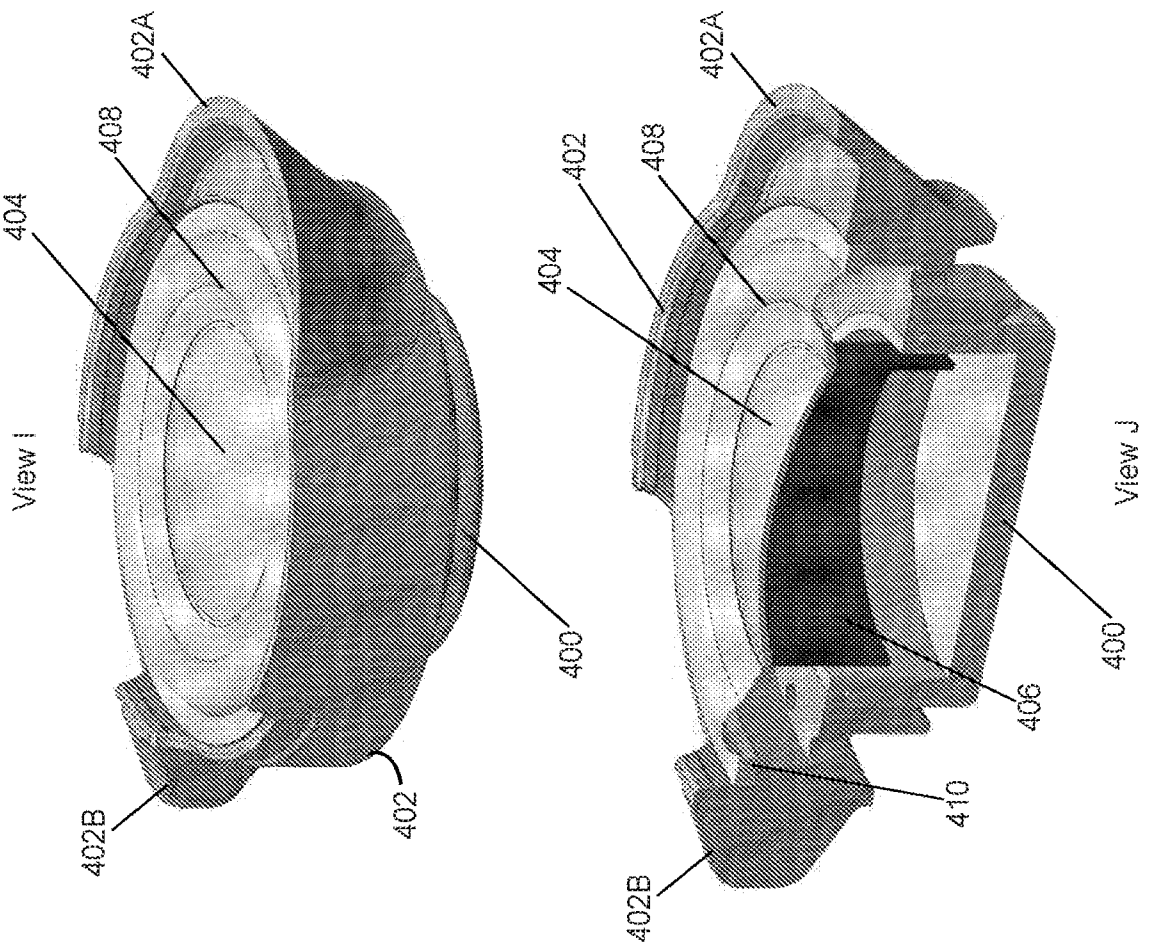
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FIG. 4B

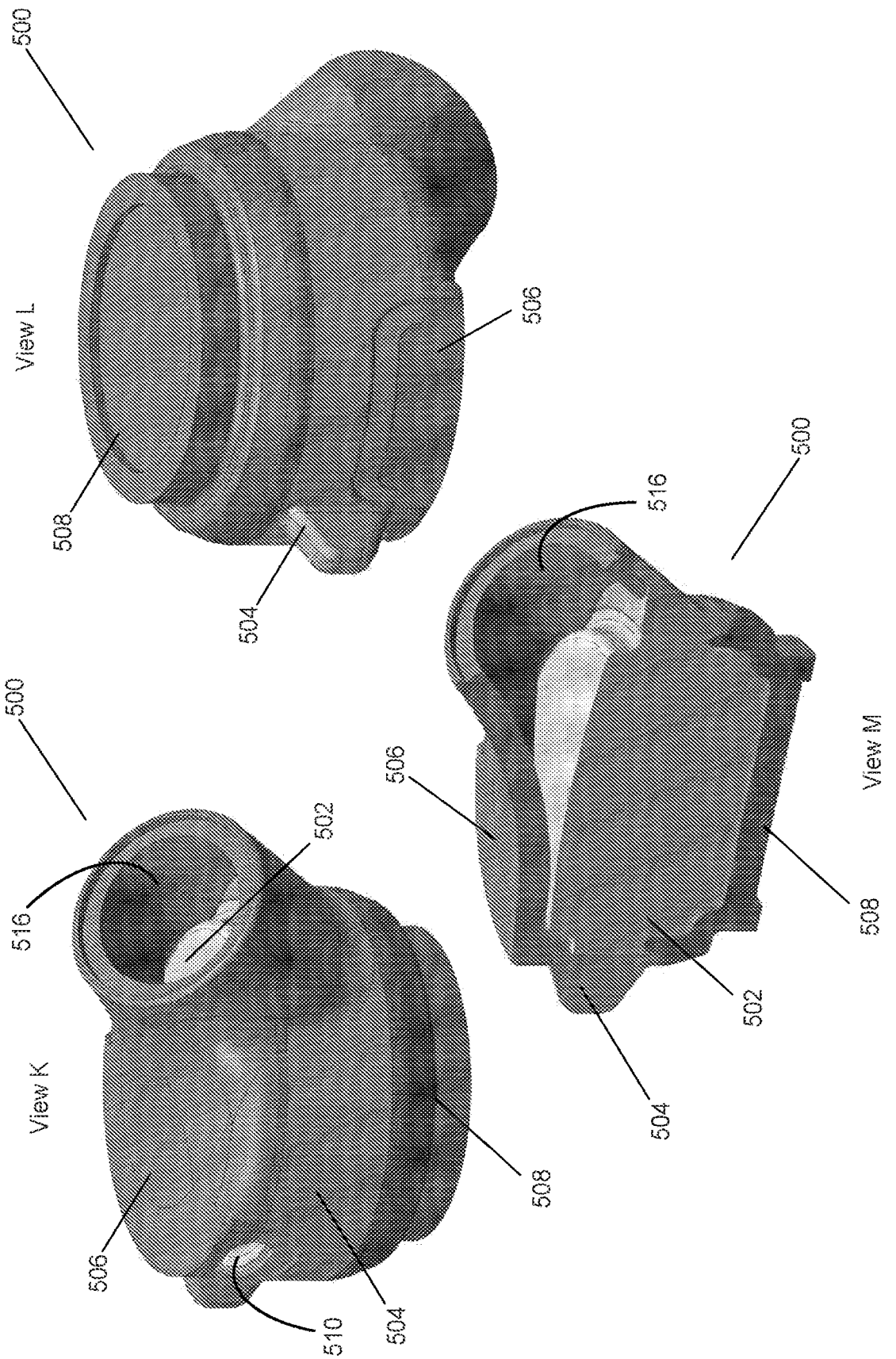
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FIG. 5A

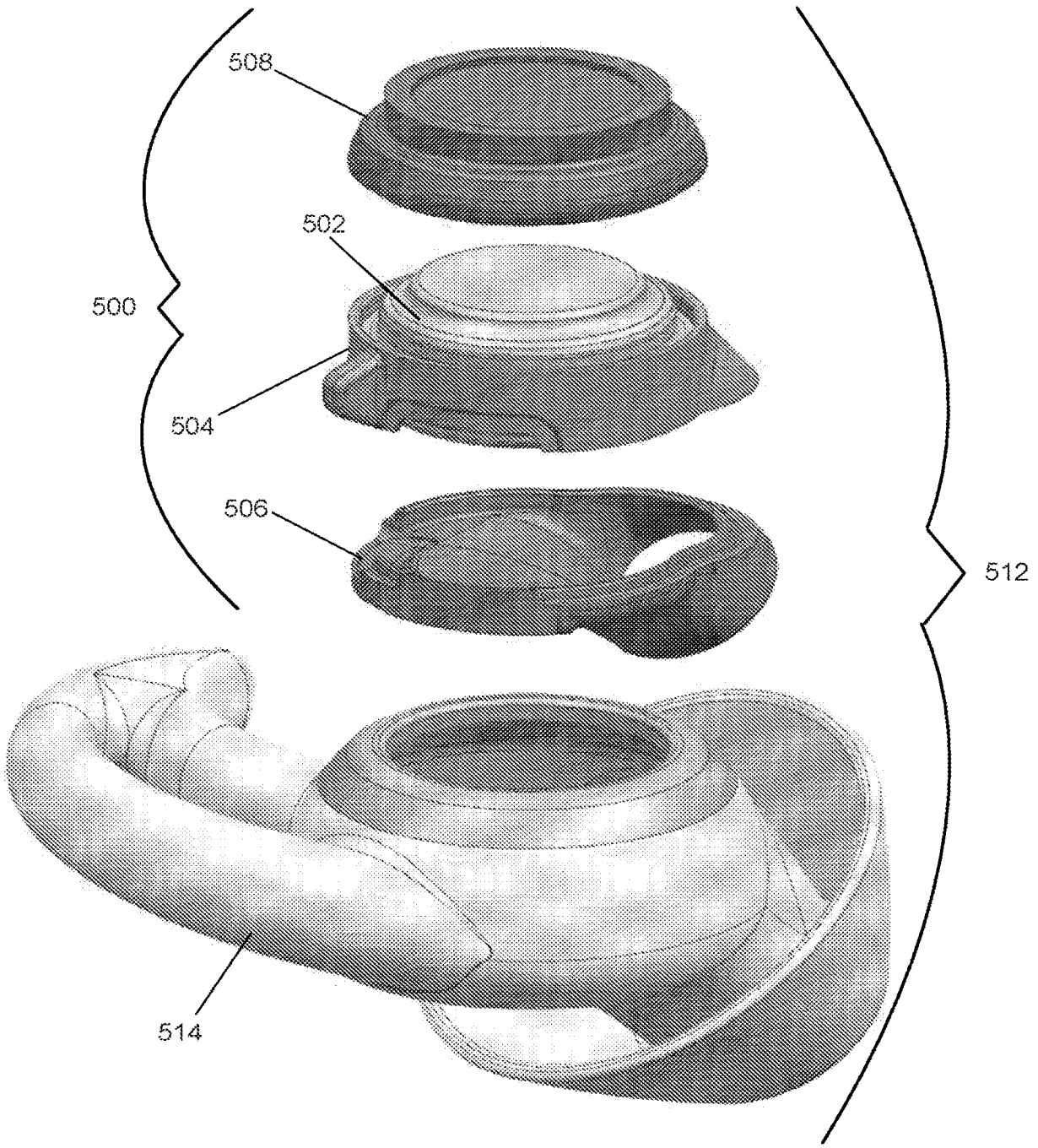
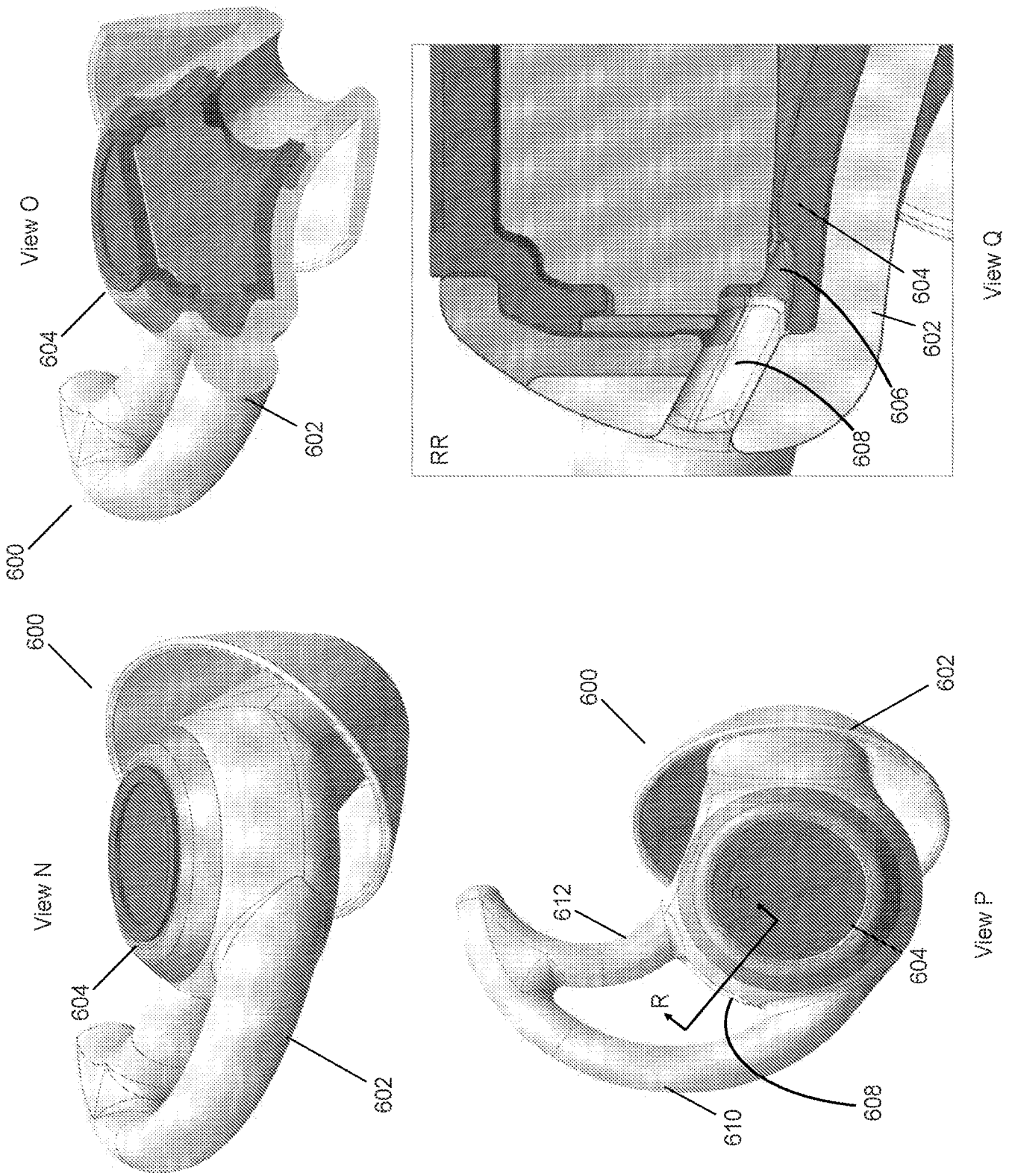


FIG. 5B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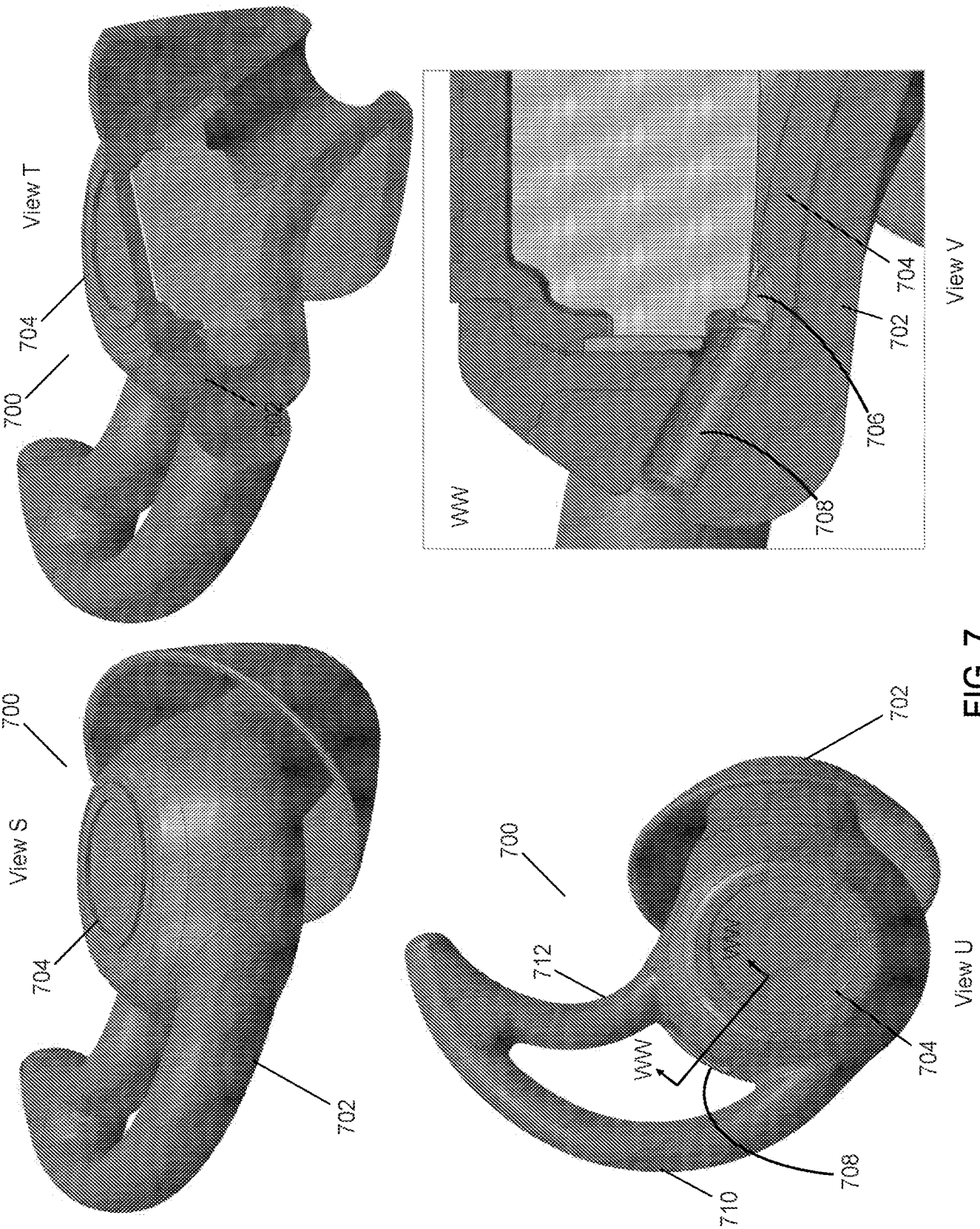
View P

FIG. 6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View S
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View U
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WW
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708
710
View V
WW
708
706
702
704

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/022601

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04R1/02 H04R1/10
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/181341 A1 (AZMI YACINE [US]) 25 June 2015 (2015-06-25)	1-22
A	abstract; figures 1-5 paragraph [0031] - paragraph [0037] paragraph [0023] - paragraph [0047]	23-26
X	US 2012/237074 A1 (AASE JONATHAN [US]) 20 September 2012 (2012-09-20)	1-3, 5-15, 17-22
A	abstract; figures 1, 5A-5D paragraphs [0002], [0003], [0020]	4, 16, 23-26
X	WO 2007/005221 A1 (PLANTRONICS [US]; BRADFORD ERIC [US]; WILSON JAY [US]; ZELLWEGER CLAUD) 11 January 2007 (2007-01-11)	1-3,5-9, 11-13, 15, 17-21
A	abstract; figures 1-10	4, 10, 16, 22-26

-/- .

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" documentwhich may throw doubts on priority claim(s) orwhich is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 July 2018	13/07/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kepesi , Marián

2

Form PCT/ISA/210 (second sheet) (April 2005)

IPR2025-00842; Mojawa
Ex. 1002 - Page 1395

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/022601

C(Continuation). **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2014/140565 A1 (LIU KENG-YUAN [TW]) 22 May 2014 (2014-05-22) abstract; figure 2	1,13, 23-26 2-12, 14-22

X A	US 2011/051981 A1 (LEHDORFER HANNES [AT] ET AL) 3 March 2011 (2011-03-03) abstract; figures 1-3 paragraph [0020] - paragraph [0031]	1,13, 23-26 2-12, 14-22

2

IPR2025-00842; Mojawa
Ex. 1002 - Page 1396

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2018/022601

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015181341 A1	25-06-2015	CN 104735594 A	24-06-2015
		CN 204634039 U	09-09-2015
		DE 102014224061 A1	25-06-2015
		KR 20150072372 A	29-06-2015
		US 2015181341 A1	25-06-2015
US 2012237074 A1	20-09-2012	US 2012237074 A1	20-09-2012
		US 2015163582 A1	11-06-2015
		US 2016142807 A1	19-05-2016
		US 2018146274 A1	24-05-2018
WO 2007005221 A1	11-01-2007	US 2007025581 A1	01-02-2007
		US 2010128916 A1	27-05-2010
		WO 2007005221 A1	11-01-2007
US 2014140565 A1	22-05-2014	CN 203206441 U	18-09-2013
		DE 202013104388 U1	11-11-2013
		TW M453318 U	11-05-2013
		US 2014140565 A1	22-05-2014
US 2011051981 A1	03-03-2011	CN 102014325 A	13-04-2011
		EP 2306755 A1	06-04-2011
		US 2011051981 A1	03-03-2011

IPR2025-00842; Mojawa
Ex. 1002 - Page 1397

Electronic Acknowledgement Receipt

EFS ID:	42326270
Application Number:	17137389
International Application Number:	
Confirmation Number:	1993
Title of Invention:	LOUDSPEAKER APPARATUS
First Named Inventor/Applicant Name:	Chaowu LI
Customer Number:	131839
Filer:	Yangzhou Harry Du/Nie Rui
Filer Authorized By:	Yangzhou Harry Du
Attorney Docket Number:	20608-0081US00
Receipt Date:	30-MAR-2021
Filing Date:	30-DEC-2020
Time Stamp:	22:27:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	2019-10-29-PCT-ISA-210-20608-0081WO00.pdf	1313983 a939dea173500689987532d77746ea5205e193b3	no	6

Warnings:

Information:					
2	Non Patent Literature	2019-10-30-PCT-ISA-210-20608-0082WO00.pdf	1365694 b8941ecddac551c43b2f0e95520c576fa0231bf7	no	7
Warnings:					
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3	Non Patent Literature	2019-11-21-PCT-ISA-210-20608-0079WO00.pdf	1706200 a428a4a2908500e0fc12cdddd5f287624dd9c5e4	no	7
Warnings:					
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4	Non Patent Literature	2019-11-22-PCT-ISA-210-20608-0083WO00.pdf	2014049 93ad12b362c6b316f7f8318387194f235aab5d4	no	8
Warnings:					
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5	Non Patent Literature	2019-11-25-PCT-ISA-210-20608-0080WO00.pdf	1760700 f68725054d7e6453562ad59c5114f4470c90d924	no	7
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Information:					
6	Information Disclosure Statement (IDS) Form (SB08)	2021-03-30-IDS_Disclosure_List-20608-0081US00.pdf	1301729 4c89a09b24f58061dde2e134ad30ad2f8fdef673	no	6
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7	Foreign Reference	CN107484054A.pdf	1706002 73eda59f405821b657eddb7b3332f2707b9812e1	no	47
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8	Foreign Reference	CN109547905A.pdf	3091683 62f76a9dc5eac9ec0936483b232feaccc839893e	no	82
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9	Foreign Reference	CN109660901A.pdf	3132929 1b2fd97014438eb8dc20184d1d242046340e3c8b	no	82
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10	Foreign Reference	CN109714687A.pdf	2969434 2997806acbd6024e54750a255db66ab3d3464fa3	no	82
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11	Foreign Reference	CN109769167A.pdf	3047887 ebbb4b7b568e03ef85daabcc8c9434ac3f6f70b5	no	82
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Information:					
12	Foreign Reference	CN109788386A.pdf	3054466 48d7749a3b3966a64e3f4b1140bbfd0f76775c5e	no	83
Warnings:					
Information:					
13	Foreign Reference	CN203827497U.pdf	498840 5b6a2b09aa12b22cbcc249e8e3e9d2a1ab8faa4d	no	18
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Information:					
14	Foreign Reference	CN204465795U.pdf	584158 696a9dd21bef8718d0ce2695f2b653b025ae99dd	no	14
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Information:					
15	Foreign Reference	CN207010974U.pdf	785007 e11f29cca37a8291b2951294bf6dc02ca1108408	no	27
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16	Foreign Reference	CN207039848U.pdf	1789880 2f9778f2e3f4a9046903c44b6046acfa28b5ec1a	no	49
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Information:					
17	Foreign Reference	CN207039849U.pdf	1790148 0c60e934c82cf7223eff7ad6c556766ff08187b5	no	48
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18	Foreign Reference	CN207039851U.pdf	1824281 cebf5fdc2303e7be02f927ae80d932d2080eb37f	no	49
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19	Foreign Reference	CN207070282U.pdf	1731200 0a2e45fb19822373d6087e6cb4a3b2d578212c3e	no	47
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20	Foreign Reference	CN207783068U.pdf	745703 6898fc9342cf7a1be2e989c6b547446f4be86597	no	22
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21	Foreign Reference	CN209089198U.pdf	2920403 63dc0cc35bad0e1f884e316b14622b489617fade	no	82
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22	Foreign Reference	CN209184800U.pdf	3090730 c796fde8b3af814767a19e53882e78beb0b8ff69	no	82
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24	Foreign Reference	CN209267804U.pdf	2933151 52b8c8d3ac637cff7c46cc1820235b97cf24e4f7	no	81
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25	Foreign Reference	CN209358729U.pdf	2978623 b4f36320b0a2233d3c9421e1f76effd1c5e68b74	no	82
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26	Foreign Reference	WO2018175192A1.pdf	1781134 4b776f96d5407e01a331c2c382722ce4549a8491	no	27
Warnings:					
Information:					
		Total Files Size (in bytes):	52868024		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102397

A. CLASSIFICATION OF SUBJECT MATTER

H04R 1/10(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNABS; CNTXT; CNKI; VEN: 耳机, 耳挂, 壳体, 振动, 驱动, 法线, 不平行, 相交, 平行, earphone, ear w hang+, shell, librat +, driv+, normal line, parallel, corss+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109788386 A (SHENZHEN VOXTECH CO., LTD.) 21 May 2019 (2019-05-21) description, paragraphs 0035-0050 and 0066-099, and figure 1	1-25
X	CN 207039851 U (SHENZHEN VOXTECH CO., LTD.) 23 February 2018 (2018-02-23) description, paragraphs 0023-0053, and figure 2	1-25
A	CN 207070282 U (SHENZHEN VOXTECH CO., LTD.) 02 March 2018 (2018-03-02) entire document	1-25
A	CN 204465795 U (SHENZHEN RUIDIEN SCIENCE & TECHNOLOGY CO., LTD.) 08 July 2015 (2015-07-08) entire document	1-25
A	CN 107484054 A (SHENZHEN VOXTECH CO., LTD.) 15 December 2017 (2017-12-15) entire document	1-25

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 October 2019	**29 October 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/102397

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN	109788386	A	21 May 2019	None	
CN	207039851	U	23 February 2018	None	
CN	207070282	U	02 March 2018	None	
CN	204465795	U	08 July 2015	None	
CN	107484054	A	15 December 2017	None	

IPR2025-00842; Mojawa
Ex. 1002 - Page 1404

专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 206080081WO0	关于后续行为	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2019/102397	国际申请日 *(日/月/年)* 24.8 月 2019(24.08.2019)	(最早的)优先权日 *(日/月/年)* 05.1 月 2019(05.01.2019)

申请人

深圳市韶音科技有限公司

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 4 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. 报告的基础

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12.3(a)和 23.1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43.6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称**，

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要**，

☒ 同意申请人提出的摘要。

☐ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于**附图**，

a.随摘要一起公布的**附图**是：图 2

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

IPR2025-00842; Mojawa
Ex. 1002 - Page 1405

国际申请号
PCT/CN2019/102397

国际检索报告

A. 主题的分类

H04R 1/10(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：H04R

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNABS;CNTXT;CNKI;VEN：耳机，耳挂，壳体，振动，驱动，法线，不平行，相交，平行，earphone, ear w hang+, shell, librat+, driv+, normal line, parallel, corss+

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
PX	CN 109788386A (深圳市韶音科技有限公司) 21.5 月 2019(21.05.2019) 说明书第 0035-0050，0066-0099 段，图 1	1-25
X	CN 207039851U (深圳市韶音科技有限公司) 23.2 月 2018(23.02.2018) 说明书第 0023-0053 段，图 2	1-25
A	CN 207070282U (深圳市韶音科技有限公司) 02.3 月 2018(02.03.2018) 全文	1-25
A	CN 204465795U (深圳瑞迪恩科技有限公司) 08.7 月 2015(08.07.2015) 全文	1-25
A	CN 107484054A (深圳市韶音科技有限公司) 15.12 月 2017(15.12.2017) 全文	1-25

☐其余文件在 C 栏的续页中列出。　　☒见同族专利附件。

IPR2025-00842; Mojawa
Ex. 1002 - Page 1406

国际申请号
PCT/CN2019/102397

国际检索报告

* 引用文件的具体类型： "A" 认为不特别相关的表示了现有技术一般状态的文件 "E" 在国际申请日的当天或之后公布的在先申请或专利 "L" 可能对优先权要求构成怀疑的文件，或为确定另一篇 引用文件的公布日而引用的或者因其他特殊理由而引 用的文件（如具体说明的） "O" 涉及口头公开、使用、展览或其他方式公开的文件 "P" 公布日先于国际申请日但迟于所要求的优先权日的文件	"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了 理解发明之理论或原理的在后文件 "X" 特别相关的文件，单独考虑该文件，认定要求保护的 发明不是新颖的或不具有创造性 "Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件 结合并且这种结合对于本领域技术人员为显而易见时， 要求保护的发明不具有创造性 "&" 同族专利的文件
国际检索实际完成的日期 22. 10 月 2019(22. 10. 2019)	国际检索报告邮寄日期 29. 10 月 2019(29. 10. 2019)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员： 吴江霞 电话号码： 86-(010)-62412034

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国际申请号
PCT/CN2019/102397

国际检索报告

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109788386A	21.05.2019	无	
CN207039851U	23.02.2018	无	
CN207070282U	02.03.2018	无	
CN204465795U	08.07.2015	无	
CN107484054A	15.12.2017	无	

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TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102399

A. CLASSIFICATION OF SUBJECT MATTER

H04R 1/10(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNABS; CNTXT; CNKI; VEN: 耳机, 骨传导, 耳挂, 壳体, 弹性, 贴合, 靠近, 入耳, 耳朵, 耳, 防水, earphone, bone conduct +, ear w hang+, shell, elastic, near, match, ear, water w proof

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109788386 A (SHENZHEN VOXTECH LIMITED CORPORATION) 21 May 2019 (2019-05-21) description, paragraphs [0035]-[0050] and [0066]-[0099], and figure 1	1-22
X	CN 207039851 U (SHENZHEN VOXTECH LIMITED CORPORATION) 23 February 2018 (2018-02-23) description, paragraphs [0023]-[0053], and figure 2	1-22
A	CN 204465795 U (SHENZHEN RUIDIEN SCIENCE & TECHNOLOGY CO., LTD.) 08 July 2015 (2015-07-08) entire document	1-22
A	CN 207039849 U (SHENZHEN VOXTECH LIMITED CORPORATION) 23 February 2018 (2018-02-23) entire document	1-22
A	CN 207070282 U (SHENZHEN VOXTECH LIMITED CORPORATION) 02 March 2018 (2018-03-02) entire document	1-22

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 October 2019	**30 October 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102399

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 107484054 A (SHENZHEN VOXTECH LIMITED CORPORATION) 15 December 2017 (2017-12-15) entire document	1-22

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TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/102399

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN	109788386	A	21 May 2019	None	
CN	207039851	U	23 February 2018	None	
CN	204465795	U	08 July 2015	None	
CN	207039849	U	23 February 2018	None	
CN	207070282	U	02 March 2018	None	
CN	107484054	A	15 December 2017	None	

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专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 206080082WO0	关于后续行为	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2019/102399	国际申请日 *(日/月/年)* 24.8 月 2019(24.08.2019)	(最早的)优先权日 *(日/月/年)* 05.1 月 2019(05.01.2019)
申请人 深圳市韶音科技有限公司		

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 4 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. 报告的基础

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12.3(a)和 23.1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43.6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称**，

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要**，

☒ 同意申请人提出的摘要。

☐ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于**附图**，

a.随摘要一起公布的**附图**是：图 1

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

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国际申请号
PCT/CN2019/102399

国际检索报告

A. 主题的分类

H04R 1/10(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：H04R

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNABS;CNTXT;CNKI;VEN:耳机，骨传导，耳挂，壳体，弹性，贴合，靠近，人耳，耳朵，耳，防水，earphone, bone conduct+, ear w hang+, shell, elastic, near, match, ear, water w proof

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
PX	CN 109788386A (深圳市韶音科技有限公司) 21.5 月 2019(21.05.2019) 说明书第 0035-0050，0066-0099 段，图 1	1-22
X	CN 207039851U (深圳市韶音科技有限公司) 23.2 月 2018(23.02.2018) 说明书第 0023-0053 段，图 2	1-22
A	CN 204465795U (深圳瑞迪恩科技有限公司) 08.7 月 2015(08.07.2015) 全文	1-22
A	CN 207039849U (深圳市韶音科技有限公司) 23.2 月 2018(23.02.2018) 全文	1-22
A	CN 207070282U (深圳市韶音科技有限公司) 02.3 月 2018(02.03.2018) 全文	1-22
A	CN 107484054A (深圳市韶音科技有限公司) 15.12 月 2017(15.12.2017) 全文	1-22

☐其余文件在 C 栏的续页中列出。　　☒见同族专利附件。

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国际申请号
PCT/CN2019/102399

国际检索报告

* 引用文件的具体类型： "A" 认为不特别相关的表示了现有技术一般状态的文件 "E" 在国际申请日的当天或之后公布的在先申请或专利 "L" 可能对优先权要求构成怀疑的文件，或为确定另一篇 引用文件的公布日而引用的或者因其他特殊理由而引 用的文件（如具体说明的） "O" 涉及口头公开、使用、展览或其他方式公开的文件 "P" 公布日先于国际申请日但迟于所要求的优先权日的文件	"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了 理解发明之理论或原理的在后文件 "X" 特别相关的文件，单独考虑该文件，认定要求保护的 发明不是新颖的或不具有创造性 "Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件 结合并且这种结合对于本领域技术人员为显而易见时， 要求保护的发明不具有创造性 "&" 同族专利的文件
国际检索实际完成的日期 22. 10 月 2019(22. 10. 2019)	国际检索报告邮寄日期 30. 10 月 2019(30. 10. 2019)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员： 吴江霞 电话号码： 86-(010)-62412034

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国际检索报告

国际申请号
PCT/CN2019/102399

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109788386A	21.05.2019	无	
CN207039851U	23.02.2018	无	
CN204465795U	08.07.2015	无	
CN207039849U	23.02.2018	无	
CN207070282U	02.03.2018	无	
CN107484054A	15.12.2017	无	

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TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102392

A. CLASSIFICATION OF SUBJECT MATTER

H04R 1/10(2006.01)i; H04R 31/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

WPI, EPODOC, CNPAT, CNKI: 扬声器, 扬声装置, 助听器, 播放器, 播放装置, 机芯壳体, 机芯, 电路壳体, 控制电路, 电池, 振动, 产生, 声音, 两个, 多个, 谐振峰, 耳挂, 壳体护套, 防水, 接插端, 接插孔, 振动板, 传振片, 音圈, 磁路, 接触面, 按键, 指示灯, speaker, loudspeak+, audiphone, ear-hook, ear hook, shell, sheath, control, circuit, battery, sound

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PY	CN 109788386 A (SHENZHEN VOXTECH CO., LTD.) 21 May 2019 (2019-05-21) description, paragraphs [0035]-[0159], and figures 1-17	1-26
Y	CN 102497612 A (SHENZHEN VOXTECH CO., LTD.) 13 June 2012 (2012-06-13) description, paragraphs [0024]-[0034]	1-26
PY	CN 109547905 A (SHENZHEN VOXTECH CO., LTD.) 29 March 2019 (2019-03-29) description, paragraphs [0034]-[0158]	1-26
PY	CN 109714687 A (SHENZHEN VOXTECH CO., LTD.) 03 May 2019 (2019-05-03) description, paragraphs [0035]-[0159]	1-26
PY	CN 109769167 A (SHENZHEN VOXTECH CO., LTD.) 17 May 2019 (2019-05-17) description, paragraphs [0034]-[0223]	1-26
PY	CN 109660901 A (SHENZHEN VOXTECH CO., LTD.) 19 April 2019 (2019-04-19) description, paragraphs [0034]-[0223]	1-26
PY	CN 209184801 U (SHENZHEN VOXTECH CO., LTD.) 30 July 2019 (2019-07-30) description, paragraphs [0034]-[0164]	1-26

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 October 2019	**21 November 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102392

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PY	CN 209267804 U (SHENZHEN VOXTECH CO., LTD.) 16 August 2019 (2019-08-16) description, paragraphs [0034]-[0221]	1-26
A	US 2017318369 A1 (NEATRON CORPORATION) 02 November 2017 (2017-11-02) entire document	1-26

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TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/102392

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	109788386	A	21 May 2019	CN	209358729	U	06 September 2019
CN	102497612	A	13 June 2012	EP	2773133	A1	03 September 2014
				US	2015030186	A1	29 January 2015
				US	2013163791	A1	27 June 2013
				WO	2013091504	A1	27 June 2013
				US	2019082266	A1	14 March 2019
				US	2016316300	A1	27 October 2016
				KR	20140091602	A	21 July 2014
				EP	3163909	A1	03 May 2017
				JP	2015505204	A	16 February 2015
				ES	2621198	T3	03 July 2017
CN	109547905	A	29 March 2019	CN	209089198	U	09 July 2019
CN	109714687	A	03 May 2019	CN	209184798	U	30 July 2019
CN	109769167	A	17 May 2019	CN	209184800	U	30 July 2019
CN	109660901	A	19 April 2019	CN	209358760	U	06 September 2019
CN	209184801	U	30 July 2019		None		
CN	209267804	U	16 August 2019		None		
US	2017318369	A1	02 November 2017	GB	2550132	A	15 November 2017

IPR2025-00842; Mojawa
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专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 206080079W00	关于后续行为	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2019/102392	国际申请日 *(日/月/年)* 24. 8 月 2019(24. 08. 2019)	(最早的)优先权日 *(日/月/年)* 05. 1 月 2019(05. 01. 2019)
申请人 深圳市韶音科技有限公司		

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 4 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. 报告的基础

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12. 3(a)和 23. 1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43. 6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称**，

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要**，

☒ 同意申请人提出的摘要。

☐ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于**附图**，

a.随摘要一起公布的**附图**是：图 2

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

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国际申请号
PCT/CN2019/102392

国际检索报告

A. 主题的分类

H04R 1/10(2006.01)i; H04R 31/00(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：H04R

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

WPI，EPODOC，CNPAT，CNKI：扬声器，扬声装置，助听器，播放器，播放装置，机芯壳体，机芯，电路壳体，控制电路，电池，振动，产生，声音，两个，多个，谐振峰，耳挂，壳体护套，防水，接插端，接插孔，振动板，传振片，音圈，磁路，接触面，按键，指示灯，speaker，loudspeaker，audiphone，ear-hook，ear hook，shell，sheath，control，circuit，battery，sound

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
PY	CN 109788386A (深圳市韶音科技有限公司) 21.5 月 2019(21.05.2019) 说明书第[0035]- [0159]段，图 1-17	1-26
Y	CN 102497612A (深圳市韶音科技有限公司) 13.6 月 2012(13.06.2012) 说明书第[0024]-[0034]段	1-26
PY	CN 109547905A (深圳市韶音科技有限公司) 29.3 月 2019(29.03.2019) 说明书第[0034]-[0158]段	1-26
PY	CN 109714687A (深圳市韶音科技有限公司) 03.5 月 2019(03.05.2019) 说明书第[0035]-[0159]段	1-26
PY	CN 109769167A (深圳市韶音科技有限公司) 17.5 月 2019(17.05.2019) 说明书第[0034]-[0223]段	1-26
PY	CN 109660901A (深圳市韶音科技有限公司) 19.4 月 2019(19.04.2019) 说明书第[0034]- [0223]段	1-26
PY	CN 209184801U (深圳市韶音科技有限公司) 30.7 月 2019(30.07.2019) 说明书第[0034]-[0164]段	1-26
PY	CN 209267804U (深圳市韶音科技有限公司) 16.8 月 2019(16.08.2019) 说明书第[0034]- [0221]段	1-26
A	US 2017318369A1 (NEATRON CORPORATION) 02.11 月 2017(02.11.2017) 全文	1-26

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国际申请号
PCT/CN2019/102392

国际检索报告

☐其余文件在C栏的续页中列出。　　☒见同族专利附件。

* 引用文件的具体类型：
"A" 认为不特别相关的表示了现有技术一般状态的文件
"E" 在国际申请日的当天或之后公布的在先申请或专利
"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）
"O" 涉及口头公开、使用、展览或其他方式公开的文件
"P" 公布日先于国际申请日但迟于所要求的优先权日的文件
"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件
"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性
"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性
"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
24. 10 月 2019(24. 10. 2019)	21. 11 月 2019(21. 11. 2019)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员：　杜少凤 电话号码：　86-(10)-53961593

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Ex. 1002 - Page 1421

国际检索报告

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109788386A	21.05.2019	CN209358729U	06.09.2019
CN102497612A	13.06.2012	EP2773133A1	03.09.2014
		US2015030186A1	29.01.2015
		US2013163791A1	27.06.2013
		WO2013091504A1	27.06.2013
		US2019082266A1	14.03.2019
		US2016316300A1	27.10.2016
		KR20140091602A	21.07.2014
		EP3163909A1	03.05.2017
		JP2015505204A	16.02.2015
		ES2621198T3	03.07.2017
CN109547905A	29.03.2019	CN209089198U	09.07.2019
CN109714687A	03.05.2019	CN209184798U	30.07.2019
CN109769167A	17.05.2019	CN209184800U	30.07.2019
CN109660901A	19.04.2019	CN209358760U	06.09.2019
CN209184801U	30.07.2019	无	
CN209267804U	16.08.2019	无	
US2017318369A1	02.11.2017	GB2550132A	15.11.2017

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TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102400

A. CLASSIFICATION OF SUBJECT MATTER

H04R 1/10(2006.01)i; H04R 25/00(2006.01)i; H04R 9/06(2006.01)i; H04R 9/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNPAT, CNKI, WPI, EPODOC: 深圳市韶音, 防水, 接插, 抵接, 插接, 辅助片, 耳挂, 后挂, 耳机, 扬声器, 传声器, 麦克风, 耳麦, 喇叭, 电路, 电池, 管套, 套管, 护套, 包裹层, 硅胶套, 覆盖层, 橡胶套, 凸缘, 突块, 凸台, 限位, 卡接, 凸部, 突部, 退模, 模具, 凸块, 卡止, earphone, piece, circuit, mould, current, pattern, electrocircuit, electric, plate?, board?, waterproof

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109547905 A (SHENZHEN VOXTECH CO., LTD.) 29 March 2019 (2019-03-29) claims 1-12, description, paragraphs [0034]-[0065], [0081]-[0090] and [0122]-[0197], and figures 1-25	1-31
PX	CN 209089198 U (SHENZHEN VOXTECH CO., LTD.) 09 July 2019 (2019-07-09) claims 1-12, description, paragraphs [0034]-[0065], [0081]-[0090] and [0122]-[0197], and figures 1-25	1-31
PX	CN 109769167 A (SHENZHEN VOXTECH CO., LTD.) 17 May 2019 (2019-05-17) claims 1-11, description, paragraphs [0034]-[0086], [0111]-[0251], and figures 1-25	1-31
PX	CN 209184800 U (SHENZHEN VOXTECH CO., LTD.) 30 July 2019 (2019-07-30) claims 1-11, description, paragraphs [0034]-[0086], [0111]-[0251], and figures 1-25	1-31
PX	CN 109788386 A (SHENZHEN VOXTECH CO., LTD.) 21 May 2019 (2019-05-21) claims 1-14, description, paragraphs [0005], [0035]-[0085] and [0112]-[0195], and figures 1-25	1-31
E	CN 209358729 U (SHENZHEN VOXTECH CO., LTD.) 06 September 2019 (2019-09-06) claims 1-10, description, paragraphs [0005], [0035]-[0085] and [0112]-[0195], and figures 1-25	1-31

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2019	**22 November 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102400

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 207039848 U (SHENZHEN VOXTECH CO., LTD.) 23 February 2018 (2018-02-23) description, paragraphs [0023]-[0048] and [0058]-[0063], figures 1-12	1, 11-14, 24-31
Y	CN 207039848 U (SHENZHEN VOXTECH CO., LTD.) 23 February 2018 (2018-02-23) description, paragraphs [0023]-[0048] and [0058]-[0063], figures 1-12	2-9
Y	CN 207010974 U (USNEWSOUND LLC) 13 February 2018 (2018-02-13) description, paragraphs [0029]-[0031] and [0035]-[0036], and figures 1-5	2-9
A	CN 203827497 U (MA, Qiang) 10 September 2014 (2014-09-10) entire document	1-31
A	CN 207783068 U (SHENZHEN GRANDSUN ELECTRONIC CO., LTD.) 28 August 2018 (2018-08-28) entire document	1-31
A	WO 2018175192 A1 (BOSE CORP.) 27 September 2018 (2018-09-27) entire document	1-31

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Ex. 1002 - Page 1424

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/102400

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	109547905	A	29 March 2019	None			
CN	209089198	U	23 February 2018	None			
CN	109769167	A	17 May 2019	None			
CN	209184800	U	21 May 2019	None			
CN	109788386	A	21 May 2019	None			
CN	209358729	U	21 May 2019	None			
CN	207039848	U	23 February 2018	None			
CN	207010974	U	13 February 2018	None			
CN	203827497	U	10 September 2014	None			
CN	207783068	U	28 August 2018	None			
WO	2018175192	A1	27 September 2018	US	2018270558	A1	20 September 2018

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专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 206080083W00	关于后续行为	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2019/102400	国际申请日 *(日/月/年)* 24. 8 月 2019(24. 08. 2019)	(最早的)优先权日 *(日/月/年)* 05. 1 月 2019(05. 01. 2019)
申请人 深圳市韶音科技有限公司		

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 5 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. 报告的基础

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12. 3(a)和 23. 1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43. 6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称**，

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要**，

☐ 同意申请人提出的摘要。

☒ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于**附图**，

a.随摘要一起公布的**附图**是：图 1

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

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国际检索报告

第 IV 栏 摘要正文(续第 1 页第 5 项)

一种扬声器装置（7400），该装置（7400）包括，用于容纳耳机芯（50，1104，7402）的机芯壳体（20，41，751）；用于容纳控制电路（60）或电池（70）的电路壳体（30），控制电路（60）或电池（70）驱动耳机芯（50，1104，7402）振动以产生声音；用于连接机芯壳体（20，41，751）和电路壳体（30）的耳挂（10）；以及壳体护套（17），至少部分包覆于电路壳体（30）和耳挂（10）的外围，壳体护套（17）由防水材料制成。该扬声器装置（7400）通过各个部件间的密封连接，提高了扬声器装置（7400）整体的防水效果。

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Ex. 1002 - Page 1427

国际申请号
PCT/CN2019/102400

国际检索报告

A. 主题的分类

H04R 1/10(2006.01)i；H04R 25/00(2006.01)i；H04R 9/06(2006.01)i；H04R 9/02(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和IPC两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：H04R

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNPAT, CNKI, WPI, EPODOC：深圳市韶音，防水，接插，抵接，插接，辅助片，耳挂，后挂，耳机，扬声器，传声器，麦克风，耳麦，喇叭，电路，电池，管套，套管，护套，包裹层，硅胶套，覆盖层，橡胶套，凸缘，突块，凸台，限位，卡接，凸部，突部，退模，模具，凸块，卡止，earphone，piece，circuit，mould，current，pattern，electrocircuit，electric，plate?，board?，waterproof

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
PX	CN 109547905A (深圳市韶音科技有限公司) 29.3 月 2019(29.03.2019) 权利要求 1-12、说明书第[0034]-[0065]，[0081]-[0090]，[0122]-[0197]段、图 1-25	1-31
PX	CN 209089198U (深圳市韶音科技有限公司) 09.7 月 2019(09.07.2019) 权利要求 1-12、说明书第[0034]-[0065]，[0081]-[0090]，[0122]-[0197]段、图 1-25	1-31
PX	CN 109769167A (深圳市韶音科技有限公司) 17.5 月 2019(17.05.2019) 权利要求 1-11、说明书第[0034]-[0086]，[0111]-[0215]段、图 1-25	1-31
PX	CN 209184800U (深圳市韶音科技有限公司) 30.7 月 2019(30.07.2019) 权利要求 1-11、说明书第[0034]-[0086]，[0111]-[0215]段、图 1-25	1-31
PX	CN 109788386A (深圳市韶音科技有限公司) 21.5 月 2019(21.05.2019) 权利要求 1-14，说明书第[0005]，[0035]-[0085]、[0112]-[0195]段、图 1-25	1-31
E	CN 209358729U (深圳市韶音科技有限公司) 06.9 月 2019(06.09.2019) 权利要求 1-10，说明书第[0005]，[0035]-[0085]、[0112]-[0195]段、图 1-25	1-31

IPR2025-00842; Mojawa
Ex. 1002 - Page 1428

国际检索报告

X	CN 207039848U (深圳市韶音科技有限公司) 23.2 月 2018(23.02.2018) 说明书第[0023]-[0048]，[0058]-[0063]段、图 1-12	1，11-14，24-31
Y	CN 207039848U (深圳市韶音科技有限公司) 23.2 月 2018(23.02.2018) 说明书第[0023]-[0048]，[0058]-[0063]段、图 1-12	2-9
Y	CN 207010974U (厦门新声科技有限公司) 13.2 月 2018(13.02.2018) 说明书第[0029]-[0031]，[0035]-[0036]段，图 1-5	2-9
A	CN 203827497U (马强) 10.9 月 2014(10.09.2014) 全文	1-31
A	CN 207783068U (深圳市冠旭电子股份有限公司) 28.8 月 2018(28.08.2018) 全文	1-31
A	WO 2018175192A1 (BOSE CORP.) 27.9 月 2018(27.09.2018) 全文	1-31

☐其余文件在 C 栏的续页中列出。　　☒见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
14. 11 月 2019(14. 11. 2019)	22. 11 月 2019(22. 11. 2019)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员：　闫薇 电话号码：　86-(10)-53962455

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Ex. 1002 - Page 1429

国际申请号
PCT/CN2019/102400

国际检索报告

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109547905A	29.03.2019	无	
CN209089198U	23.02.2018	无	
CN109769167A	17.05.2019	无	
CN209184800U	21.05.2019	无	
CN109788386A	21.05.2019	无	
CN209358729U	21.05.2019	无	
CN207039848U	23.02.2018	无	
CN207010974U	13.02.2018	无	
CN203827497U	10.09.2014	无	
CN207783068U	28.08.2018	无	
WO2018175192A1	27.09.2018	US2018270558A1	20.09.2018

IPR2025-00842; Mojawa
Ex. 1002 - Page 1430

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102393

A. CLASSIFICATION OF SUBJECT MATTER

H04R 1/10(2006.01)i; H04R 31/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

WPI, EPODOC, CNPAT, CNKI: 扬声器, 扬声装置, 助听器, 播放器, 播放装置, 机芯壳体, 机芯, 电路壳体, 控制电路, 电池, 振动, 耳挂, 接插端, 振动, 频率, 相位, 外壳, 面板, 背面, speaker, loudspeak+, audiphone, ear-hook, ear hook, shell, sheath, control, circuit, battery, sound

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PY	CN 109788386 A (SHENZHEN VOXTECH LIMITED CORPORATION) 21 May 2019 (2019-05-21) description, paragraphs [0035]-[0159], and figures 1-17	1-24
PY	CN 209120433 U (SHENZHEN VOXTECH LIMITED CORPORATION) 16 July 2019 (2019-07-16) description, paragraphs [0006]-[0045] and [0090]-[0192]	1-24
PY	CN 109547905 A (SHENZHEN VOXTECH LIMITED CORPORATION) 29 March 2019 (2019-03-29) description, paragraphs [0034]-[0158]	1-24
PY	CN 109769167 A (SHENZHEN VOXTECH LIMITED CORPORATION) 17 May 2019 (2019-05-17) description, paragraphs [0034]-[0223]	1-24
PY	CN 109714687 A (SHENZHEN VOXTECH LIMITED CORPORATION) 03 May 2019 (2019-05-03) description, paragraphs [0035]-[0159]	1-24

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 October 2019	**25 November 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/102393

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PY	CN 109660901 A (SHENZHEN VOXTECH LIMITED CORPORATION) 19 April 2019 (2019-04-19) description, paragraphs [0034]-[0223]	1-24
PY	CN 209267804 U (SHENZHEN VOXTECH LIMITED CORPORATION) 16 August 2019 (2019-08-16) description, paragraphs [0034]-[0221]	1-24
PY	CN 209184801 U (SHENZHEN VOXTECH LIMITED CORPORATION) 30 July 2019 (2019-07-30) description, paragraphs [0034]-[0164]	1-24
A	CN 103716739 A (SHENZHEN VOXTECH LIMITED CORPORATION) 09 April 2014 (2014-04-09) entire document	1-24
A	US 2017318369 A1 (NEATRON CORPORATION) 02 November 2017 (2017-11-02) entire document	1-24

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TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/102393

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	109788386	A	21 May 2019	CN	209358729	U	06 September 2019
CN	209120433	U	16 July 2019		None		
CN	109547905	A	29 March 2019	CN	209089198	U	09 July 2019
CN	109769167	A	17 May 2019	CN	209184800	U	30 July 2019
CN	109714687	A	03 May 2019	CN	209184798	U	30 July 2019
CN	109660901	A	19 April 2019	CN	209358760	U	06 September 2019
CN	209267804	U	16 August 2019		None		
CN	209184801	U	30 July 2019		None		
CN	103716739	A	09 April 2014	WO	2015101181	A1	09 July 2015
				CN	106470371	A	01 March 2017
				JP	2017502615	A	19 January 2017
				CN	106303861	A	04 January 2017
				KR	20170061184	A	02 June 2017
				EP	3094103	A1	16 November 2016
				US	2017374479	A1	28 December 2017
				US	2016329041	A1	10 November 2016
				KR	20170061188	A	02 June 2017
				US	2019132689	A1	02 May 2019
				KR	20160110365	A	21 September 2016
				IN	201617026062	A	31 August 2016
				BR	112016015742	A2	08 August 2017
US	2017318369	A1	02 November 2017	GB	2550132	A	15 November 2017

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专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 206080080WO0	关于后续行为	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2019/102393	国际申请日 *(日/月/年)* 24.8 月 2019(24.08.2019)	(最早的)优先权日 *(日/月/年)* 05.1 月 2019(05.01.2019)

申请人

深圳市韶音科技有限公司

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 4 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. 报告的基础

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12.3(a)和 23.1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43.6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称**，

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要**，

☒ 同意申请人提出的摘要。

☐ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于**附图**，

a.随摘要一起公布的**附图**是：图 2

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

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国际检索报告

A. 主题的分类

H04R 1/10(2006.01)i；H04R 31/00(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：H04R

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用））

WPI，EPODOC，CNPAT，CNKI：扬声器，扬声装置，助听器，播放器，播放装置，机芯壳体，机芯，电路壳体，控制电路，电池，振动，耳挂，接插端，振动，频率，相位，外壳，面板，背面，speaker，loudspeaker，audiphone，ear-hook，ear book，shell，sheath，control，circuit，battery，sound

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
PY	CN 109788386A (深圳市韶音科技有限公司) 21.5 月 2019(21.05.2019) 说明书第[0035]-[0159]段，图 1-17	1-24
PY	CN 209120433U (深圳市韶音科技有限公司) 16.7 月 2019(16.07.2019) 说明书第[0006]-[0045]、[0090]-[0192]段	1-24
PY	CN 109547905A (深圳市韶音科技有限公司) 29.3 月 2019(29.03.2019) 说明书第[0034]-[0158]段	1-24
PY	CN 109769167A (深圳市韶音科技有限公司) 17.5 月 2019(17.05.2019) 说明书第[0034]-[0223]段	1-24
PY	CN 109714687A (深圳市韶音科技有限公司) 03.5 月 2019(03.05.2019) 说明书第[0035]-[0159]段	1-24
PY	CN 109660901A (深圳市韶音科技有限公司) 19.4 月 2019(19.04.2019) 说明书第[0034]-[0223]段	1-24
PY	CN 209267804U (深圳市韶音科技有限公司) 16.8 月 2019(16.08.2019) 说明书第[0034]-[0221]段	1-24
PY	CN 209184801U (深圳市韶音科技有限公司) 30.7 月 2019(30.07.2019) 说明书第[0034]-[0164]段	1-24
A	CN 103716739A (深圳市韶音科技有限公司) 09.4 月 2014(09.04.2014) 全文	1-24
A	US 2017318369A1 (NEATRON CORPORATION) 02.11 月 2017(02.11.2017) 全文	1-24

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☐其余文件在C栏的续页中列出。　　☒见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
25. 10 月 2019(25. 10. 2019)	25. 11 月 2019(25. 11. 2019)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员：　杜少凤 电话号码：　86-(10)-53961593

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国际检索报告

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109788386A	21.05.2019	CN209358729U	06.09.2019
CN209120433U	16.07.2019	无	
CN109547905A	29.03.2019	CN209089198U	09.07.2019
CN109769167A	17.05.2019	CN209184800U	30.07.2019
CN109714687A	03.05.2019	CN209184798U	30.07.2019
CN109660901A	19.04.2019	CN209358760U	06.09.2019
CN209267804U	16.08.2019	无	
CN209184801U	30.07.2019	无	
CN103716739A	09.04.2014	WO2015101181A1	09.07.2015
		CN106470371A	01.03.2017
		JP2017502615A	19.01.2017
		CN106303861A	04.01.2017
		KR20170061184A	02.06.2017
		EP3094103A1	16.11.2016
		US2017374479A1	28.12.2017
		US2016329041A1	10.11.2016
		KR20170061188A	02.06.2017
		US2019132689A1	02.05.2019
		KR20160110365A	21.09.2016
		IN201617026062A	31.08.2016
		BR112016015742A2	08.08.2017
US2017318369A1	02.11.2017	GB2550132A	15.11.2017

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NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION, PRC

证　　明

本证明之附件是向本局提交的下列专利申请文件副本。

申　　请　　号：201910009927.4

申　请　类　型：发明专利

发明 创造 名称：骨传导扬声装置及其耳挂的制造方法

申　　请　　日：2019 年 01 月 05 日

申　　请　　人：深圳市韶音科技有限公司

发明人或设计人：李朝武、王旭东、李永坚

局长

申长雨

2020 年 08 月 07 日

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权 利 要 求 书

1. 一种骨传导扬声装置，其特征在于，所述骨传导扬声装置包括耳挂，所述耳挂包括：

弹性金属丝；

导线及固定套管、所述固定套管将所述导线固定于所述弹性金属丝上；

第一接插端和第二接插端，分别设置于所述弹性金属丝的两端；

保护套管，以注塑形成于所述弹性金属丝、所述导线、所述固定套管、所述第一接插端和第二接插端的外围。

2. 根据权利要求 1 所述的骨传导扬声装置，其特征在于，所述第一接插端和第二接插端分别以注塑方式形成于所述弹性金属丝的两端，所述第一接插端和第二接插端上分别设置有第一走线通道和第二走线通道，所述导线沿所述第一走线通道和第二走线通道延伸。

3. 根据权利要求 1 所述的骨传导扬声装置，其特征在于，所述导线以穿线方式穿入所述第一走线通道和所述第二走线通道。

4. 根据权利要求 2 所述的骨传导扬声装置，其特征在于，所述第一走线通道包括第一走线槽和连通所述第一走线槽和所述第一接插端的外端面的第一走线孔，所述导线沿所述第一走线槽和所述第一走线孔延伸并外露于所述第一接插端的外端面；所述第二走线通道包括第二走线槽和连通所述第二走线槽和所述第一接插端的外端面的第二走线孔，所述导线沿所述第二走线槽和所述第二走线孔延伸并外露于所述第二接插端的外端面。

5. 根据权利要求 1 所述的骨传导扬声装置，其特征在于，所述固定套管为至少两个，并沿所述弹性金属丝间隔设置。

6. 根据权利要求 1 所述的骨传导扬声装置，其特征在于，所述骨传导扬声装置进一步包括：

机芯壳体，用于容纳耳机芯，并与所述第一接插端接插固定；

电路壳体，用于容纳控制电路或电池，并与所述第二接插端接插固定。

7. 根据权利要求 6 所述的骨传导扬声装置，其特征在于，所述机芯壳体设置有与所述机芯壳体的外端面连通的第一接插孔，所述第一接插孔的内侧壁上设置有止挡块，所述第一接插端包括：

插入部，至少部分插入于所述第一接插孔内并抵接于所述止挡块的外侧面上；

两个弹性卡勾，设置于所述插入部朝向所述机芯壳体内部的一侧，两个弹性卡勾能够在外部推力和所述止挡块的作用下彼此并拢，并在经过所述止挡块后弹性回复成卡置于所述止挡块的内侧面上，进而实现所述机芯壳体与所述第一接插端的接插固定。

8. 根据权利要求 7 所述的骨传导扬声装置，其特征在于，所述插入部部分插入于所述第一接插孔内，且在所述插入部的外露部分呈阶梯状设置，进而形成与所述机芯壳体的外端面间隔设置的环形台面，所述保护套管进一步延伸至所述环形台面朝向所述机芯壳体的外端面的一侧，并在所述机芯壳体与所述第一接插端接插固定

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时与所述机芯壳体弹性抵接，进而实现密封。

9. 根据权利要求 6 所述的骨传导扬声装置，其特征在于，所述电路壳体设置有第二接插孔，所述第二接插端至少部分插入至所述第二接插孔内，其中在所述第二接插端的相对两侧分别设置有与所述第二接插端相对于所述第二接插孔的插入方向垂直设置的开槽，所述电路壳体的第一侧壁上设置有与两个所述开槽位置对应的两个通孔，所述骨传导扬声装置进一步包括固定件，所述固定件包括两条平行设置的插脚和用于连接所述插脚的连接部，其中所述插脚从所述电路壳体的外侧经所述通孔插入至所述开槽，进而实现所述电路壳体与所述第二接插端的接插固定。

10. 根据权利要求 6 所述的骨传导扬声装置，其特征在于，所述耳挂进一步包括与所述第二接插端外围的所述保护套管一体成型的壳体护套，所述壳体护套以套装方式包覆于所述电路壳体的外围。

11. 一种骨传导扬声装置的耳挂的制造方法，其特征在于，所述制造方法包括：

将固定套管套设于弹性金属丝上，其中在所述弹性金属丝的两端预留出注塑位；

在所述弹性金属丝的两端的注塑位上分别注塑第一接插端和第二接插端，其中所述第一接插端和第二接插端分别设置有第一走线通道和第二走线通道；

将导线设置成沿所述第一走线通道和第二走线通道延伸，其中，所述导线位于所述第一走线通道和所述第二走线通道之间的部分固定于所述弹性金属丝上；

在所述弹性金属丝、所述导线、所述固定套管、所述第一接插端和第二接插端的外围注塑形成保护套管。

12. 根据权利要求 11 所述的制造方法，其特征在于，将固定套管套设于弹性金属丝上的步骤，进一步包括：

利用所述固定套管将所述导线固定于所述弹性金属丝上。

13. 根据权利要求 11 所述的制造方法，其特征在于，将导线设置成沿所述第一走线通道和第二走线通道延伸，其中，所述导线位于所述第一走线通道和所述第二走线通道之间的部分由所述固定套管固定在所述弹性金属丝上的步骤进一步包括：

将导线穿设于所述固定套管的内部，以利用所述固定套管将所述导线固定于所述弹性金属丝上，并进一步将所述导线设置成沿所述第一走线通道和第二走线通道延伸。

14. 根据权利要求 11 所述的制造方法，其特征在于，所述在所述弹性金属丝、所述导线、所述保护套管、所述第一接插端和第二接插端的外围注塑形成保护套管的步骤进一步包括：

以注塑方式形成与所述第二接插端外围的所述保护套管一体成型的壳体护套，其中所述壳体护套以套装方式包覆于与所述第二接插端接插固定的电路壳体的外围。

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说　明　书

骨传导扬声装置及其耳挂的制造方法

技术领域

本申请涉及骨传导技术领域，特别是涉及一种骨传导扬声装置及其耳挂的制造方法。

背景技术

骨传导是一种声音传导方式，骨传导扬声装置利用骨传导技术接收声音，由于其能够开放双耳、不伤害鼓膜等优点而受到广大消费者的青睐。

骨传导扬声装置包括耳挂，在耳挂的生产过程中，可以将设置在外围保护套管可与内部结构分别成型，并进而将成型后的保护套管套设在内部结构的外围。然而这种方式往往使得耳挂的生产及装配的工序繁琐，且耳挂与内部结构之间可能会出现固定不牢靠的情况，从而降低骨传导扬声装置的质量。

发明内容

本申请主要解决的技术问题是提供一种骨传导扬声装置及其耳挂的制造方法，能够简化骨传导扬声装置的制作及装配工序，并使得骨传导扬声装置的耳挂中的保护套管固定得更加牢靠、稳定。

为解决上述技术问题，本申请采用的一个技术方案是：提供一种骨传导扬声装置，所述骨传导扬声装置包括耳挂，所述耳挂包括：弹性金属丝；导线及固定套管，所述固定套管将所述导线固定于所述弹性金属丝上；第一接插端和第二接插端，分别设置于所述弹性金属丝的两端；保护套管，以注塑形成于所述弹性金属丝、所述导线、所述固定套管、所述第一接插端和第二接插端的外围。

为解决上述技术问题，本申请采用的另一个技术方案是：提供一种骨传导扬声装置的耳挂的制造方法，所述制造方法包括：将固定套管套设于弹性金属丝上，其中在所述弹性金属丝的两端预留出注塑位；在所述弹性金属丝的两端的注塑位上分别注塑第一接插端和第二接插端，其中所述第一接插端和第二接插端分别设置有第一走线通道和第二走线通道；将导线设置成沿所述第一走线通道和第二走线通道延伸，其中，所述导线位于所述第一走线通道和所述第二走线通道之间的部分固定于所述弹性金属丝上；在所述弹性金属丝、所述导线、所述固定套管、所述第一接插端和第二接插端的外围注塑形成保护套管。

本申请的有益效果是：区别于现有技术的情况，本申请骨传导扬声装置中，保护套管可注塑形成于弹性金属丝、导线、固定套管、第一接插端和第二接插端的外围，从而将保护套管分别与弹性金属丝、导线、固定套管、第一接插端和第二接插端固定连接，而无需将保护套管单独注塑形成后再进一步套装在弹性金属丝以及第一接插端、第二接插端的外围，从而能够简化制作及装配工序，且通过这种方式，能够使保护套管的固定更加牢靠、稳定。

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附图说明

为了更清楚地说明本申请实施例中的技术方案，下面将对实施例描述中所需要使用的附图作简单地介绍，显而易见地，下面描述中的附图仅仅是本申请的一些实施例，对于本领域普通技术人员来讲，在不付出创造性劳动的前提下，还可以根据这些附图获得其他的附图。其中：

图1是本申请骨传导扬声装置一实施方式的爆炸结构示意图；

图2是本申请骨传导扬声装置一实施方式中耳挂的部分结构示意图；

图3是图 2 中 A 部分的局部放大图；

图4是本申请骨传导扬声装置一实施方式的局部截面图；

图5是图 4 中 B 部分的局部放大图；

图6是本申请骨传导扬声装置一实施方式的局部结构截面图；

图7是图 6 中 C 部分的局部放大图；

图8是本申请骨传导扬声装置一实施方式的机芯壳体的部分结构示意图；

图9是图 8 中 D 部分的局部放大图；

图10是本申请骨传导扬声装置一实施方式的机芯壳体的局部截面图；

图11是本申请骨传导扬声装置一实施方式中电路壳体与耳挂的部分爆炸图；

图12是本申请骨传导扬声装置一实施方式的部分结构的局部截面图；

图13是图 1 中 E 部分的局部放大图；

图14是本申请骨传导扬声装置一实施方式中电路壳体的截面图；

图15是图 14 中 F 部分的局部放大图；

图16是本申请骨传导扬声装置一实施方式中电路壳体与按键结构的爆炸图；

图17是图 6 中 G 部分的局部放大图；

图18是本申请骨传导扬声装置一实施方式中导电柱的结构示意图；

图19是本申请骨传导扬声装置一实施方式中电路壳体、导电柱及主控电路板的截面图；

图20是图 19 中 H 部分的局部放大图；

图21是本申请骨传导扬声装置一实施方式中电路壳体与辅助片的局部结构爆炸图；

图22是本申请骨传导扬声装置一实施方式中电路壳体与辅助片的局部结构示意图；

图23是本申请骨传导扬声装置一实施方式中电路壳体与后挂的局部结构爆炸图；

图24是本申请骨传导扬声装置一实施方式中电路壳体与后挂的局部结构截面图；

图25是本申请骨传导扬声装置一实施方式中后挂的局部结构示意图。

具体实施方式

下面将结合本申请实施例中的附图，对本申请实施例中的技术方案进行清楚、

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完整地描述，显然，所描述的实施例仅仅是本申请一部分实施例，而不是全部实施例。基于本申请中的实施例，本领域普通技术人员在没有做出创造性的劳动前提下所获得的所有其他实施例，都属于本申请保护的范围。

请一并参阅图 1 至图 25，图 1 至图 25 绘示了本申请骨传导扬声装置。本申请中的骨传导扬声装置可以为基于骨传导的耳机、MP3 或者其它具有扬声功能的装置。具体地，骨传导扬声装置可包括：耳挂 10、机芯壳体 20、电路壳体 30、后挂 40，以及耳机芯 50、控制电路 60、电池 70。其中，机芯壳体 20 与电路壳体 30 分别设置于耳挂 10 的两端，后挂 40 则进一步设置于电路壳体 30 远离耳挂 10 的一端。其中，机芯壳体 20 的数量为两个，分别用于容纳耳机芯 50，电路壳体 30 的数量也为两个，分别用来容纳控制电路 60 和电池 70，后挂 40 的两端分别连接对应的电路壳体 30。

其中，耳挂 10 是指在用户佩戴骨传导扬声装置时，用于环绕并支撑于用户的耳根部位，进而将机芯壳体 20 及耳机芯 50 悬挂并固定于用户耳朵预定位置的结构。

具体地，耳挂 10 包括弹性金属丝 11、导线 12、固定套管 13 以及设置于弹性金属丝 11 两端的接插端 14 和接插端 15，还进一步包括保护套管 16 以及与保护套管 16 一体成型的壳体护套 17。

其中，弹性金属丝 11 主要用于使耳挂 10 保持为与用户耳朵匹配的形状，并具有一定的弹性，从而能够在用户佩戴时根据用户的耳型以及头型产生一定的弹性形变以适配不同耳型以及头型的用户。本实施方式中，弹性金属丝 11 可以由记忆合金制成，具有良好的变形恢复能力，从而即便是耳挂 10 受到外力作用产生形变，在外力去除时，仍然能够恢复至原来的形状以能够继续为用户所使用，从而延长骨传导扬声装置的使用寿命。当然，在其它实施方式当中，弹性金属丝 11 也可以由非记忆合金制成。

导线 12 可用于与耳机芯 50 以及控制电路 60、电池 70 等进行电连接，以为耳机芯 50 的工作进行电量供应以及数据传输。

固定套管 13 用于将导线 12 固定于弹性金属丝 11 上。具体地，固定套管 13 的数量可以为一个或者多个，具体可根据实际需求而定。本实施方式中，固定套管 13 为至少两个，至少两个固定套管 13 可沿弹性金属丝 11 以及导线 12 的走向而间隔设置，并通过包裹设置在导线 12 以及弹性金属丝 11 的外围而将导线 12 固定于弹性金属丝 11 上。

接插端 14 和接插端 15 可由硬质材料，如塑胶等制成。本实施方式中，在制作该接插端 14 和接插端 15 时，可以分别以注塑的方式将二者形成于弹性金属丝 11 的两端。在其它实施方式中，也可以先对接插端 14 和接插端 15 分别进行注塑，并在注塑时分别预留与弹性金属丝 11 端部的连接孔，从而在注塑完成后，通过连接孔而将该接插端 14 和接插端 15 分别插接在弹性金属丝 11 的对应的端部，或者并通过粘接的方式进行固定均可。

需要指出的是，本实施方式中，接插端 14 和接插端 15 可以不直接注塑形成在导线 12 的外围，而是在注塑时避开导线 12。具体地，可以在注塑接插端 14 和接插端 15 时，对位于弹性金属丝 11 两端的导线 12 进行固定，以远离接插端 14 和接插

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端 15 的位置，并进一步在接插端 14 和接插端 15 上分别设置第一走线通道 141 和第二走线通道 151，以在注塑完成后，将导线 12 沿第一走线通道 141 和第二走线通道 151 延伸设置。具体地，在形成第一走线通道 141 和第二走线通道 151 后，可将导线 12 以穿线的方式穿入该第一走线通道 141 和第二走线通道 151。

当然，在其它实施方式中，也可以根据实际情况，将接插端 14 和接插端 15 直接注塑在导线 12 的外围，此处不做具体限定。

具体地，在一实施方式中，第一走线通道 141 可包括第一走线槽 1411 和连通第一走线槽 1411 的第一走线孔 1412。其中，第一走线槽 1411 连通接插端 14 的侧壁面设置，第一走线孔 1412 的一端与第一走线槽 1411 的一端连通，另一端与接插端 14 的外端面连通。接插端 14 处的导线 12 沿第一走线槽 1411 和第一走线孔 1412 延伸并外露于接插端 14 的外端面，以进一步与其它结构连接。

相应地，第二走线通道 151 可包括第二走线槽 1511 和连通第二走线槽 1511 的第二走线孔 1512。其中，第二走线槽 1511 连通接插端 15 的侧壁面设置，第二走线孔 1512 的一端与第二走线槽 1511 的一端连通，另一端与接插端 15 的外端面连通。接插端 15 处的导线 12 沿第二走线槽 1511 和第二走线孔 1512 延伸并外露于接插端 15 的外端面，以进一步与其它结构连接。

其中，接插端 14 的外端面是指接插端 14 远离接插端 15 的一端的端面；相应地，接插端 15 的外端面是指接插端 15 远离接插端 14 的一端的端面。

进一步地，保护套管 16 可注塑形成于弹性金属丝 11、导线 12、固定套管 13、接插端 14 和接插端 15 的外围，从而将保护套管 16 分别与弹性金属丝 11、导线 12、固定套管 13、接插端 14 和接插端 15 固定连接，而无需将保护套管 16 单独注塑形成后再进一步套装在弹性金属丝 11 以及接插端 14、接插端 15 的外围，从而能够简化制作及装配工序，且通过这种方式，能够使得保护套管 16 的固定更加牢靠、稳定。

进一步地，在成型保护套管 16 时，同时与该保护套管 16 一体成型有设置于靠近接插端 15 一侧的壳体护套 17。

其中，壳体护套 17 可与保护套管 16 一体成型而成为一整体，电路壳体 30 可通过与接插端 15 的接插固定而连接设置在耳挂 10 的一端，壳体护套 17 则可进一步以套装的方式包覆于在电路壳体 30 的外围。

其中，保护套管 16 和壳体护套 17 可以由具有一定弹性的软质材料制成，例如软质的硅胶、橡胶等。

具体地，在制造骨传导扬声装置的耳挂 10 时，可通过如下步骤实现：

步骤 S101：利用固定套管 13 将导线 12 固定于弹性金属丝 11 上，其中在弹性金属丝 11 的两端预留出注塑位；

具体地，可以先将弹性金属丝 11 与导线 12 按照预设的方式，如并排放置在一起，然后，将固定套管 13 进一步套设在导线 12 与弹性金属丝 11 的外围，从而将导线 12 固定在弹性金属丝 11 上。

其中，由于弹性金属丝 11 的两端还需要注塑接插端 14 和接插端 15，因此，在固定时，弹性金属丝 11 的两端不能被固定套管 13 完全包裹，而需预留出对应的注塑位，以供接插端 14 和接插端 15 注塑占用。

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步骤 S102: 在弹性金属丝 11 的两端的注塑位上分别注塑接插端 14 和接插端 15，其中接插端 14 和接插端 15 分别设置有第一走线通道 141 和第二走线通道 151；

步骤 S103：将导线 12 设置成沿第一走线通道 141 和第二走线通道 151 延伸；

具体地，此处可在接插端 14 和接插端 15 成型完成后，进一步通过手动或者通过机器将导线 12 的两端分别穿入第一走线通道 141 和第二走线通道 151。其中，导线 12 位于第一走线通道 141 和第二走线通道 151 之间的部分由固定套管 13 固定于弹性金属丝 11 上。

步骤 S104：在弹性金属丝 11、导线 12、固定套管 13、接插端 14 和接插端 15 的外围注塑形成保护套管 16。

在一实施方式中，在执行步骤 S104 时，进一步以注塑的方式形成与接插端 15 外围的保护套管 16 一体成型的壳体护套 17。

需要指出的是，在其它实施方式中，也可以在安装固定套管 13 时先不设置导线 12，而在接插端 14 和接插端 15 注塑之后，再进一步设置导线 12，具体步骤如下：

步骤 S201：将固定套管 13 套设于弹性金属丝 11 上，其中在弹性金属丝 11 的两端预留出注塑位；

步骤 S202: 在弹性金属丝 11 的两端的注塑位上分别注塑接插端 14 和接插端 15，其中接插端 14 和接插端 15 分别设置有第一走线通道 141 和第二走线通道 151；

步骤 S203：将导线 12 穿设于固定套管 13 的内部，以利用固定套管 13 将导线 12 固定于弹性金属丝 11 上，并进一步将导线 12 设置成沿第一走线通道 141 和第二走线通道 151 延伸。

需要指出的是，通过这种方式，能够避免在对接插端 14 和接插端 15 注塑时受到导线 12 的干扰，从而有利于成型的顺利进行。

其中，本实施方式，以及上述实施方式中方法所涉及到的弹性金属丝 11、导线 12、固定套管 13、接插端 14、接插端 15 与保护套管 16 的结构、作用以及形成方式等均与上述实施方式中的相同，相关详细内容请参见上述实施方式，此处不再赘述。

在一实施方式中，机芯壳体 20 可用于容纳耳机芯 50，并与接插端 14 接插固定。其中，耳机芯 50 和机芯壳体 20 的数量均为两个，分别对应用户的左耳和右耳。

具体地，机芯壳体 20 可以与接插端 14 通过插接、卡接等方式连接，以将机芯壳体 20 与耳挂 10 固定在一起。也就是说，本实施方式中，耳挂 10 与机芯壳体 20 可先分别成型，然后再进一步装配在一起，而不是将二者一体直接成型。

通过这种方式，可以采用各自对应的模具对耳挂 10 和机芯壳体 20 分别成型，而无需采用同一个较大尺寸的模具将二者一体成型，从而可减小模具的尺寸，以降低模具的加工难度，以及成型难度；另外，由于耳挂 10 和机芯壳体 20 分别采用不同的模具加工，在生产制造过程中，在需要对耳挂 10 或机芯壳体 20 中的某一个的形状或者构造进行调整时，仅调整该结构对应的模具即可，而无需对另外一个结构的模具进行调整，从而能够降低生产成本。

当然，在其它实施方式当中，也可以根据情况而使耳挂 10 与机芯壳体 20 通过一体成型得到。

在一实施方式中，机芯壳体 20 设置有与机芯壳体 20 的外端面 21 连通的接插孔

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22，接插孔 22 的内侧壁上设置有止挡块 23。

其中，机芯壳体 20 的外端面 21 是指机芯壳体 20 朝向耳挂 10 的端面。接插孔 22 用于为耳挂 10 的接插端 14 插入机芯壳体 20 提供容置空间，以便进一步实现接插端 14 与机芯壳体 20 的接插固定。

止挡块 23 可以由接插孔 22 的内侧壁沿垂直于该内侧壁的方向凸出形成。具体地，止挡块 23 可以为多个间隔设置的块状凸起，或者也可以为沿接插孔 22 内侧壁的环状凸起，此处不做具体限定。

其中，接插端 14 包括插入部 142 和两个弹性卡勾 143。

具体地，插入部 142 至少部分插入于接插孔 22 内并抵接于止挡块 23 的外侧面 231 上。其中，插入部 142 的外侧壁的形状与接插孔 22 的内侧壁的形状匹配，以使得插入部 142 至少部分插入于接插孔 22 内时，使得插入部 142 的外侧壁与接插孔 22 的内侧壁抵接。

止挡块 23 的外侧面 231 是指止挡块 23 朝向耳挂 10 设置的一侧面。插入部 142 可进一步包括一朝向机芯壳体 20 的端面 1421，该端面 1421 可与止挡块 23 的外侧面 231 匹配，从而在插入部 142 至少部分插入于接插孔 22 内时，插入部 142 的端面 1421 与止挡块 23 的外侧面 231 抵接。

具体地，机芯壳体 20 的接插孔 22 的沿垂直于接插端 14 相对于机芯壳体 20 的插入方向上的截面形状可为椭圆环形或近椭圆环形，对应地，插入部 142 的横截面可以为与接插孔 22 匹配的近椭圆形，当然，二者的形状还可以为其它，具体可根据实际需求进行设置。

进一步地，两个弹性卡勾 143 可沿垂直于插入方向并排并间隔且对称设置于插入部 142 朝向机芯壳体 20 内部的一侧。其中，每个弹性卡勾 143 可分别包括梁部 1431 和勾部 1432，梁部 1431 与插入部 142 朝向机芯壳体 20 的一侧连接，勾部 1432 设置在梁部 1431 远离插入部 142 的一端，并沿垂直于插入方向延伸。进一步地，每个勾部 1432 设置有连接平行于插入方向的侧面与远离插入部 142 的端面的过渡斜面 14321。

在耳挂 10 与机芯壳体 20 的安装过程当中，接插端 14 由接插孔 22 逐渐进入机芯壳体 20 内部，在到达止挡块 23 的位置时，两个弹性卡勾 143 的勾部 1432 会受到止挡块 23 的阻挡，在外部推力的作用下，止挡块 23 逐渐挤压勾部 1432 的过渡斜面 14321 而使得两个弹性卡勾 143 发生弹性形变而彼此并拢，在过渡斜面 14321 通过止挡块 23 而到达止挡块 23 靠近机芯壳体 20 内部的一侧时，弹性卡勾 143 因失去止挡块 23 的阻挡而弹性回复，并卡置于止挡块 23 朝向机芯壳体 20 内部的内侧面上，从而将止挡块 23 卡置于接插端 14 的插入部 142 和勾部 1432 之间，进而实现机芯壳体 20 与接插端 14 的接插固定。

其中，在一实施方式中，在机芯壳体 20 与接插端 14 接插固定后，插入部 142 部分插入于接插孔 22 内，且在插入部 142 的外露部分呈阶梯状设置，进而形成与机芯壳体 20 的外端面 21 间隔设置的环形台面 1422。

需要指出的是，插入部 142 的外露部分是指插入部 142 外露于机芯壳体 20 的部分，具体地，可以是指外露于机芯壳体 20 且靠近机芯壳体 20 外端面的部分。

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其中，环形台面 1422 可以与机芯壳体 20 的外端面 21 相对设置，且二者之间的间隔可以是指沿接插方向间隔以及沿垂直于接插方向的间隔。

进一步地，保护套管 16 延伸至环形台面 1422 朝向机芯壳体 20 的外端面 21 的一侧，并在机芯壳体 20 的接插孔 22 与接插端 14 接插固定时，填充于环形台面 1422 与机芯壳体 20 的外端面 21 之间的间隔内，并与机芯壳体 20 弹性抵接，从而使得外部液体难以从接插端 14 与机芯壳体 20 之间的接合处进入机芯壳体 20 内部，进而实现接插端 14 与接插孔 22 之间的密封，以保护机芯壳体 20 内部的耳机芯 50 等，从而能够提高对骨传导扬声装置的防水效果。

具体地，在一实施方式当中，保护套管 16 在环形台面 1422 朝向机芯壳体 20 的外端面的 21 一侧形成一环形抵接面 161。其中，该环形抵接面 161 为保护套管 16 朝向机芯壳体 20 一侧的端面。

进一步地，保护套管 16 还包括位于该环形抵接面 161 内部且相对于环形抵接面 161 凸出设置的环形凸台 162。具体地，该环形凸台 162 具体形成于环形抵接面 161 朝向接插端 14 的一侧，并相对于该环形抵接面 161 沿朝向机芯壳体 20 的方向凸出设置，进一步地，该环形凸台 162 还可直接形成于环形台面 1422 的外围，并覆盖该环形台面 1422。

进一步地，机芯壳体 20 包括用于连接机芯壳体 20 的外端面 21 和接插孔 22 的内侧壁的连接斜面 24。其中，该连接斜面 24 具体为机芯壳体 20 的外端面 21 与接插孔 22 的内侧壁之间的过渡面，该连接斜面 24 与机芯壳体 20 的外端面 21 和接插孔 22 的内侧壁均不在同一平面上。其中，该连接斜面 24 可以为平面，或者也可以根据实际需求而设置成曲面，或者其它形状，此处不做具体限定。

具体地，在机芯壳体 20 与接插端 14 接插固定时，环形抵接面 161 和环形凸台 162 分别与机芯壳体 20 的外端面和连接斜面 24 弹性抵接。

需要指出的是，由于机芯壳体 20 的外端面 21 和连接斜面 24 不在同一平面上，从而使得保护套管 16 与机芯壳体 20 之间的弹性抵接处不位于同一平面上，从而使得外部液体难以由保护套管 16 与机芯壳体 20 之间进入机芯壳体 20 以进一步进入耳机芯 50，从而能够提高骨传导扬声装置的防水效果，以对内部功能结构起到保护作用，进而延长骨传导扬声装置的使用寿命。

其中，在一实施方式中，插入部 142 在环形台面 1422 朝向机芯壳体 20 的外端面 21 的一侧进一步形成有与环形台面 1422 邻接的环形凹槽 1423，其中，环形凸台 162 可形成于环形凹槽 1423 内。

本实施方式中，环形凹槽 1423 可形成于环形台面 1422 朝向机芯壳体 20 的一侧。在一个应用场景中，环形台面 1422 为环形凹槽 1423 的朝向机芯壳体 20 一侧的侧壁面，此时，环形凸台 162 沿该侧壁面形成于环形凹槽 1423 内。

在一实施方式中，耳挂 10 的导线 12 的位于机芯壳体 20 的外部的一端可穿过第二走线通道 151 而进一步连接电路壳体 30 所容纳的控制电路 60、电池 70 等机芯壳体 20 外部的外部电路，另一端则沿第一走线通道 141 而露出于接插端 14 的外端面，并进一步随插入部 142 而通过接插孔 22 而进入机芯壳体 20 内部。

在一实施方式中，机芯壳体 20 可包括主壳体 25 以及隔板组件 26，其中，隔板

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组件 26 位于主壳体 25 内部，并与主壳体 25 连接，进而将主壳体 25 的内部空间 27 分隔成第一容置空间 271 和靠近接插孔 22 一侧的第二容置空间 272。

具体地，主壳体 25 包括周侧壁 251 以及与周侧壁 251 的一端面连接的底端壁 252，周侧壁 251 与底端壁 252 共同围绕形成一主壳体 25 的内部空间 27。

隔板组件 26 位于主壳体 25 的靠近接插孔 22 的一侧，并包括侧隔板 261 以及底隔板 262。其中，侧隔板 261 可沿垂直于底端壁 252 的方向设置，且侧隔板 261 的两端均与周侧壁 251 连接，从而对主壳体 25 的内部空间 27 进行分隔。底隔板 262 可与底端壁 252 平行或者接近平行且间隔设置，并进一步分别与周侧壁 251 和侧隔板 261 连接，从而将主壳体 25 所形成的内部空间 27 一分为二而形成由侧隔板 261、底隔板 262 和远离接插孔 22 的周侧壁 251、底端壁 252 共同围成的第一容置空间 271，以及由底隔板 262 与侧隔板 261 和靠近接插孔 22 的周侧壁 251 共同围成的第二容置空间 272。其中，第二容置空间 272 可小于第一容置空间 271。

当然，隔板组件 26 也可以通过其它的设置方式对主壳体 25 的内部空间 27 进行划分，此处不做具体限定。

进一步地，耳机芯 50 包括功能组件 51，该功能组件 51 设置于第一容置空间 271 内，可用于振动发声。骨传导扬声装置可进一步包括一端与功能组件 51 连接的导线 80，该导线 80 的另一端可由第一容置空间 271 而延伸至第二容置空间 272 内。

具体地，侧隔板 261 可在远离底端壁 252 的顶部边缘设置走线槽 2611，该走线槽 2611 可连通第一容置空间 271 和第二容置空间 272。进一步地，导线 12 的远离功能组件的一端经由该走线槽延伸至第二容置空间 272 内。

另外，耳挂 10 的导线 12 的远离电路壳体 30 的一端随插入部 142 进入机芯壳体 20 内部后，可进一步延伸入第二容置空间 272 内，并在第二容置空间 272 内与导线 80 电连接，以形成从第一容置空间 271 经由第二容置空间 272 而连接至外部电路的导线通路，从而通过该导线通路将功能组件 51 与位于机芯壳体 20 外部的外部电路电连接。

具体地，底隔板 262 上可设置有走线孔 2621，该走线孔 2621 将接插孔 22 与第二容置空间 272 连通，从而使得由接插孔 22 进入机芯壳体 20 的导线 12 能够经由该走线孔 2621 而延伸至第二容置空间 272。

其中，导线 12 与导线 80 在第二容置空间 272 内连接后，盘绕设置于第二容置空间 272 内。具体可通过焊接的方式将导线 12 与导线 80 连接于一起，进而将功能组件 51 与外部电路电连接，以通过外部电路为功能组件 51 的正常工作提供电量或者为耳机芯 50 传输数据。

需要指出的是，在对骨传导扬声装置装配时，导线往往会长于实际需求，以便于装配。然而耳机芯 50 处多余的导线若不能够进行合理的放置，则容易在功能组件 51 工作时产生振动而发出异响，从而降低骨传导扬声装置的声音质量，从而影响用户的听音感受。本实施方式中，在机芯壳体 20 的主壳体 25 所形成的内部空间 27 当中分离出第二容置空间 272 以用于容置多余的导线 12 和导线 80，从而避免或者减少多余的导线对因振动而对骨传导扬声装置所发出的声音的影响，以提高声音质量。

在一实施方式中，隔板组件 26 进一步包括内隔板 263，内隔板 263 进一步将第

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二容置空间 272 分隔成两个子容置空间 2721。具体地，该内隔板 263 垂直于主壳体 25 的底端壁 252 设置，分别与侧隔板 261 和周侧壁 251 连接，并进一步延伸至走线孔 2621 处，从而在将第二容置空间 272 分隔为两个子容置空间 2721 的同时，还进一步将走线孔 2621 划分为两个，两个走线孔 2621 可分别与对应的子容置空间 2721 连通。

本实施方式中，导线 12 和导线 80 可分别为两根，其中两根导线 12 分别沿对应的走线孔 2621 而分开延伸至各自的子容置空间 2721 内，而两根导线 80 则仍一起通过走线槽 2611 而进入第二容置空间 272，并在进入第二容置空间 272 后分开，并分别在对应的子容置空间 2721 内与对应的导线 12 焊接于一起，并进一步盘绕设置于对应的子容置空间 2721 内。

进一步地，在一实施方式中，第二容置空间 272 可进一步由密封胶进行填充。通过这种方式，能够将第二容置空间 272 内所容置的导线 12 和导线 80 进一步固定，以进一步降低由于导线振动而对声音质量造成的不良影响，从而提高骨传导扬声装置的声音质量，同时能够对导线 12 与导线 80 之间的焊接点起到保护作用，另外，将第二容置空间 272 密封设置还能够达到防水防尘的目的。

在一实施方式中，电路壳体 30 与接插端 15 接插固定，从而将电路壳体 30 固定在耳挂 10 远离机芯壳体 20 的一端。其中，在用户佩戴使用时，容纳电池 70 的电路壳体 30 和容纳控制电路 60 的电路壳体 30 可分别对应用户的左侧和右侧，二者在与对应的接插端 15 的接插方式上可以不同。

具体地，电路壳体 30 可以与接插端 15 通过插接、卡接等方式连接。也就是说，本实施方式中，耳挂 10 与电路壳体 30 可先分别独立成型，然后并在成型完成后再进一步装配在一起，而不是直接将二者一体成型。

通过这种方式，可以采用各自对应的模具对耳挂 10 和电路壳体 30 分别成型，而无需采用同一个较大尺寸的模具将二者一体成型，从而可减小成型模具的尺寸，以降低模具的加工难度，以及成型难度；另外，由于耳挂 10 和电路壳体 30 分别采用不同的模具加工，在生产制造过程中，在需要对耳挂 10 或电路壳体 30 中的某一个的形状或者构造进行调整时，仅调整该结构对应的模具即可，而无需对另外一个结构的模具进行调整，从而能够降低生产成本。

进一步地，在一实施方式中，电路壳体 30 设置有接插孔 31，该接插孔 31 的内表面的形状可与接插端 15 的至少部分外表面的形状匹配，从而使得接插端 15 能够至少部分插入至接插孔 31 内。

进一步地，在接插端 15 的相对两侧分别设置有与接插端 15 相对于接插孔 31 的插入方向垂直设置的开槽 152。具体地，两个开槽 152 对称且间隔设置于接插端 15 的相对两侧，且均在沿插入方向的垂直方向上连通接插端 15 的侧壁。

相应地，电路壳体 30 的第一侧壁 30a 上设置有与两个开槽 152 位置对应的贯穿该第一侧壁 30a 的两个通孔 32。

其中，电路壳体 30 可以呈扁平状设置，例如，电路壳体 30 于第二接插孔 31 处的横截面可以为椭圆形，或者能够形成扁平状设置的其它形状。本实施方式中，电路壳体 30 的面积较大的两个相对设置的侧壁为主侧壁 33，连接两个主侧壁 33 的面

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积较小的且相对设置的两对侧壁为辅侧壁 34。本实施方式中，电路壳体 30 的第一侧壁 30a 既可以为该电路壳体 30 的主侧壁 33 也可以为电路壳体 30 的辅侧壁 34，具体可以根据实际需求进行设定。

当然，在其它实施方式中，电路壳体 30 于接插孔 31 处的横截面还可以为圆形等其它形状，具体可根据实际需求进行设置。

进一步地，骨传导扬声装置还可以包括固定件 81，固定件 81 包括两条平行设置的插脚 811 和用于连接插脚 811 的连接部 812。具体地，连接部 812 可垂直连接设置于两条插脚 811 的朝向同一方向的一端，从而形成 U 型的固定件 81。

其中，两个插脚 811 远离连接部 812 的一端从电路壳体 30 的外侧经通孔 32 插入至开槽 152，而将连接部 812 阻挡于电路壳体 30 的外侧，进而实现电路壳体 30 与接插端 15 的接插固定。

进一步地，在一实施方式中，电路壳体 30 的第一侧壁 30a 上进一步形成有用于连接两个通孔 32 的条状凹槽 35，在利用固定件 81 接插固定时，连接部 812 能够进一步部分或者全部沉设于条状凹槽 35 内。从而一方面能够使得骨传导扬声装置整体更加统一，进而使得套装在电路壳体 30 外围的壳体护套 17 上无需专门成型设置与连接部 812 对应的凹槽，简化壳体护套 17 的模具；另一方面，还能够在一定程度上减小骨传导扬声装置整体所占用的空间。

其中，在一个应用场景中，可以在将连接部 812 部分或者全部沉设于条状凹槽 35 内后，进一步在条状凹槽 35 内施胶，通过这种方式，一方面能够将固定件 81 固定在电路壳体 30 上，从而使得接插端 15 与接插孔 31 之间的接插更加稳固；另一方面，在连接部 812 沉设于条状凹槽 35 后，进一步通过施胶将凹槽 35 填平，以与电路壳体 30 的第一侧壁 30a 保持一致，从而在套设壳体护套 17 后，使得该凹槽 35 与周边结构之间更加平整连贯。

其中，在一实施方式中，与电路壳体 30 的第一侧壁 30a 相对的电路壳体 30 的第二侧壁 30b 上进一步设置有与通孔 32 相对的通孔 36，插脚 811 进一步经开槽 152 插入至通孔 36 内。

具体地，电路壳体 30 的第一侧壁 30a 和电路壳体 30 的第二侧壁 30b 均可为电路壳体 30 的主侧壁 33 或者辅侧壁 34。在本实施方式中，电路壳体 30 的第一侧壁 30a 和第二侧壁 30b 分别为电路壳体 30 的两个相对设置的主侧壁 33。也就是说，两个通孔 32 以及两个通孔 36 分别设置于电路壳体 30 的面积较大的侧壁上，进而固定件 81 的两个插脚 811 之间可以设置较大的间隔，以增大固定件 81 的跨度，从而能够提高接插端 15 与接插孔 31 之间接插的稳定性。

本实施方式中，插脚 811 经通孔 32 插入至开槽 152 内，并进一步经开槽 152 插入至通孔 36 内，也就是说插脚 811 能够将电路壳体 30 的两相对主侧壁 33 以及接插端 15 完全贯穿并固定于一起，从而能够使得接插端 15 与电路壳体 30 之间接插更加牢固。

进一步地，如上述实施方式中所述，在保护套管 16 成型时，同时与该保护套管 16 一体成型有设置于靠近接插端 15 一侧的壳体护套 17。

其中，该壳体护套 17 与电路壳体 30 分别成型，并使得该壳体护套 17 的内侧壁

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的形状与电路壳体 30 的外侧壁匹配，进而在二者分别成型完成之后，将壳体护套 17 以套装的方式包覆于电路壳体 30 的外围。

需要指出的是，由于在壳体护套 17 成型时的环境温度较高，而高温环境可能会对电路壳体 30 所容纳的控制电路 60 或电池 70 造成一定的损伤，因此，在成型阶段，将电路壳体 30 和壳体护套 17 分别成型，然后再套装在一起，从而能够避免壳体护套 17 在成型时，高温对控制电路 60 或电池 70 所带来的损伤，从而降低成型对控制电路 60 或电池 70 所带来的不利影响。

进一步地，壳体护套 17 可以为一端开口的袋状结构，以使得电路壳体 30 经由壳体护套 17 的开口端进入壳体护套 17 的内部。

本实施方式中，壳体护套 17 在与保护套管 16 一体成型而形成之后，可以通过从开口端对壳体护套 17 进行翻卷而将其从模具上取下；在对壳体护套 17 进行外观检查以及丝印等表面处理时，可进一步将壳体护套 17 通过开口而套设在预设结构上进行操作，并在操作完成后，进一步通过从开口处对壳体护套 17 进行翻卷而将其从该预设结构上取下；在检查及处理等操作完成后，可进一步通过开口而将壳体护套 17 套装在电路壳体 30 的外围。上述操作中，在将壳体护套 17 取下并不限定于上述翻卷的方式，还可通过充气等方式，此处不做具体限定。

具体地，壳体护套 17 的开口端为壳体护套 17 背离保护套管 16 的一端，从而该电路壳体 30 从壳体护套 17 远离保护套管 16 的一端进入壳体护套 17 的内部，以为该壳体护套 17 所包覆。

在一实施方式中，壳体护套 17 的开口端设置有向内凸出的环状凸缘 171。进一步地，电路壳体 30 远离耳挂 10 的端部呈阶梯状设置，进而形成环形台面 37。当壳体护套 17 包覆于电路壳体 30 的外围时，环状凸缘 171 抵接于环形台面 37 上。

具体地，环状凸缘 171 由壳体护套 17 的开口端的内壁面朝向壳体护套 17 内部凸出一定的厚度形成，并包括一朝向耳挂 10 的凸缘面 172。

其中，环形台面 37 与凸缘面 172 相对，并朝向电路壳体 30 背离耳挂 10 的方向。

该环状凸缘 171 的凸缘面 172 的高度不大于环形台面 37 的高度，从而使得在环状凸缘 171 的凸缘面 172 与环形台面 37 相抵接时，壳体护套 17 的内壁面能够与电路壳体 30 的侧壁面充分抵接，从而使得壳体护套 17 能够紧密包覆于电路壳体 30 的外围。

进一步地，在一实施方式中，在环状凸缘 171 与环形台面 37 上的接合区域内可进一步施加有密封胶。具体地，在对壳体护套 17 进行套装时，可以在环形台面 37 上涂覆密封胶，从而将壳体护套 17 与电路壳体 30 进行密封连接。

其中，在一实施方式中，电路壳体 30 上还设置有定位块 38，该定位块 38 设置于环形台面 37 上，并沿电路壳体 30 背离耳挂 10 的方向延伸。具体地，该定位块 38 可设置于电路壳体 30 的辅侧壁 34 上，且该定位块 38 在辅侧壁 34 上凸出的厚度与环形台面 37 的高度一致。其中，定位块 38 的数量可以根据需求设置一个或者多个。

相应地，壳体护套 17 的环状凸缘 171 处设置有与定位块 38 对应的定位槽 173，从而在壳体护套 17 包覆于电路壳体 30 的外围时，该定位槽 173 覆盖在至少部分定

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位块 38 上。

通过这种方式，在对壳体护套 17 进行套装时，可以根据定位块 38 和定位槽 173 的位置对壳体护套 17 进行定位，以方便操作人员快速、准确得安装。当然，在其它实施方式中，也可以根据实际需求不设置定位块。

在一实施方式中，电路壳体 30 包括彼此扣合的两个子壳体，分别为第一子壳体 301 和第二子壳体 302。具体地，两个子壳体可以沿电路壳体 30 的中线而对称扣合，或者也可以根据实际需求通过其他方式进行扣合。另外，用于容纳控制电路 60 的电路壳体 30 的两个子壳体的扣合方式可以与用于容纳电池 70 的电路壳体 30 的两个子壳体的扣合方式可以相同，也可以不同。

在一个应用场景中，电路壳体 30 的环形台面 37 可形成于第一子壳体 301 上，两个子壳体在环形台面 37 朝向耳挂 10 的一侧接合，从而使得壳体护套 17 能够对两个子壳体的接合缝进行全覆盖，从而能够在一定程度上对电路壳体 30 的内部空间进行密封，以提高骨传导扬声装置的防水效果。

在另一应用场景中，电路壳体 30 的环形台面 37 还可以由两个子壳体共同形成，从而使得二者至少部分部位在环形台面 37 背离耳挂 10 的一侧结合。此时，壳体护套 17 不能够覆盖两个子壳体的位于环形台面 37 背离耳挂 10 一侧的接合缝。本应用场景中，可以进一步通过其它方式对该部分的接合缝进行覆盖。

进一步地，在一实施方式中，两个子壳体彼此对接的接合面为互相契合的阶梯形状。

具体地，第一子壳体 301 的朝向第二子壳体 302 的端面为阶梯状的第一阶梯面 3011，第二子壳体 302 的朝向第一子壳体 301 的端面为阶梯状的第二阶梯面 3021。第一阶梯面 3011 和第二阶梯面 3021 的形状及尺寸均一致，从而能够互相配合抵接在一起。

通过这种方式，电路壳体 30 的两个子壳体互相抵接的结合面成阶梯状而不在同一平面上，从而能够阻挡电路壳体 30 外部的液体由电路壳体 30 的外围进入电路壳体 30 的内部，进而进一步提高骨传导扬声装置的防水效果，以对电路壳体 30 内部的控制电路 60 或者电池 70 等进行保护。

进一步地，在第二子壳体 302 的第二阶梯面 3021 上设置有朝向第一子壳体 30a 的安装卡勾 3022，对应地，第一子壳体 301 的内部设置有与该安装卡勾 3022 匹配的安装勾槽 3012。在对第一子壳体 301 和第二子壳体 302 进行安装时，安装卡勾 3022 能够在外部推力越过安装勾槽 3012 的外侧壁而进入该安装勾槽 3012，并使得安装卡勾 3022 的勾部勾接安装勾槽 3012 的内侧壁，从而实现第一子壳体 301 与第二子壳体 302 的扣合。

在一实施方式中，骨传导扬声装置进一步设置有按键机构。

具体地，电路壳体 30 的辅侧壁 34 的外表面上设置有第一凹陷区 341，该第一凹陷区 341 内进一步设置有按键孔 342，该按键孔 342 连通辅侧壁 34 的外表面和内表面。

其中，电路壳体 30 的辅侧壁 34 可以包括，在用户佩戴该骨传导扬声装置时，朝向用户头部后侧的辅侧壁 34，也可以包括在用户佩戴时，朝向用户头部下侧的辅

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侧壁 34。

第一凹陷区 341 的数量可以为一个或者多个，且每个第一凹陷区 341 内可以设置一个或者多个按键孔 342，具体可以根据实际需求设置，此处不做具体限定。

本实施方式中，骨传导扬声装置还进一步包括弹性衬垫 82、按键 83，控制电路 60 包括按键电路板 61。

其中，弹性衬垫 82 设置于第一凹陷区 341，具体固定于第一凹陷区 341 对应的辅侧壁 34 的外表面上，以覆盖于按键孔 342 的外部从而避免外部液体通过按键孔 342 进入到电路壳体 30 的内部，以起到密封防水的作用。

进一步地，该弹性衬垫 82 上设置有与按键孔 342 对应的第二凹陷区 821，该第二凹陷区 821 延伸至按键孔 342 的内部。

具体地，该弹性衬垫 82 可以由软性材质制成，例如软性的硅胶、橡胶等。且该弹性衬垫 82 较薄，直接与辅侧壁 34 的外表面粘接时，难以粘接牢靠。

因此，在一实施方式中，可进一步在弹性衬垫 82 与电路壳体 30 之间设置刚性衬垫 84，该钢性衬垫 84 与弹性衬垫 82 彼此贴靠固定，具体可以通过贴合、粘接、注塑等的方式实现，并进一步将钢性衬垫 84 与辅侧壁 34 进行粘接，具体可以通过采用双面胶进行粘接，以在钢性衬垫 84 与辅侧壁 34 之间形成一粘胶层，从而使得弹性衬垫 82 能够牢靠地固定在辅侧壁 34 的外表面。而且，由于弹性衬垫 82 质软且薄，因此在用户按压按键的过程当中难以保持平整状态，而通过与钢性衬垫 84 的贴靠固定，能够使弹性衬垫 82 保持平整。

进一步地，钢性衬垫 84 上设置有允许第二凹陷区 821 通过的通孔 841，从而使得弹性衬垫 82 的第二凹陷区 821 能够进一步通过通孔 841 而延伸至按键孔 342 的内部。

具体地，钢性衬垫 84 可以由不锈钢制成，或者其它钢性材料，如塑胶等硬质材料。并可通过一体成型而与弹性衬垫 82 贴靠在一起。

另外，按键 83 包括按键本体 831，以及设置在按键本体 831 一侧凸出设置的按键触头 832。其中，按键本体 831 设置于弹性衬垫 82 远离电路壳体 30 的一侧，且按键触头 832 延伸至第二凹陷区 821 内，以随第二凹陷区 821 而延伸至按键孔 342 内部。

进一步地，由于本实施方式中骨传导扬声装置较为轻薄，按键 83 的按压行程较短，若采用软质的按键则会降低用户按压手感而带来不好的体验。本实施方式中，按键 83 可由硬质的塑胶材料制成，以使得用户按压时能够具有良好的手感。

进一步地，按键电路板 61 设置于电路壳体 30 的内部，其上设置有与按键孔 342 对应的按键开关 611。从而在用户按压按键时，按键触头 832 接触并触发按键开关 611，以进一步实现相应的功能。

本实施方式中，通过在弹性衬垫 82 上设置第二凹陷区 821，一方面，第二凹陷区 821 的设置能够覆盖整个按键孔 342，从而能够同时提高防水效果；另一方面，在自然状态下，按键触头 832 便能够通过第二凹陷区 821 而延伸入按键孔 342 内部，从而能够缩短按键按压的行程，以减小按键结构所占用的空间，进而使骨传导扬声装置既能够有好的防水性能，又占用较少的空间。

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在一实施方式中，按键 83 可包括按键单体 833，按键单体 833 的数量可以为一个或者多个。

在一个应用场景中，按键 83 可包括至少两个彼此间隔设置的按键单体 833 以及用于连接按键单体 833 的连接部 834。其中，多个按键单体 833 以及连接部 834 可一体成型。对应地，每个按键单体 833 对应设置有一个按键触头 832，并进而对应一个按键孔 342 以及一个按键开关 611。

也就是说，本实施方式中，对应于一个第一凹陷区 341 可以设置多个按键单体 833，用户可通过按压不同的按键单体 833 而触发不同的按键开关 611，并进而实现多种功能。

进一步地，弹性衬垫 82 上可设置用于支撑连接部 834 的弹性凸块 822。由于按键 83 包括连接设置的多个按键单体 833，弹性凸块 822 的设置使得用户在按压其中一个按键单体 833 时，能够使得该按键单体 833 受到单独的按压，而避免通过联动而将其它的按键单体 833 一并按压的情况发生，从而能够准确得触发对应的按键开关 611。需要指出的，该弹性凸块 822 并非是必要的，例如也可以是不具有弹性的凸出结构，或者也可以不设置凸出结构，具体可根据实际情况进行设置。

在一实施方式中，壳体护套 17 的内壁上设置有与按键对应的凹槽 174，从而能够以套装方式包覆于电路壳体 30 和按键的外围。

在一实施方式中，骨传导扬声装置还进一步包括有至少一个导电柱 85，容纳于电路壳体 30 内部的控制电路 60 还包括主控电路板 62，该导电柱 85 可用于连接电路壳体 30 内部的主控电路板 62 以及电路壳体 30 外部的充电电路和/或数据传输线路等，以对骨传导扬声装置进行充电和/或数据传输等。

相应地，电路壳体 30 的主侧壁 33 上设置至少一个安装孔 331，导电柱 85 可插置于对应的安装孔 331 内。其中，导电柱 85 和安装孔 331 可一一对应，本实施方式中，导电柱 85 和安装孔 331 的数量均为四个，四个导电柱 85 分别插置于对应的安装孔 331 内，并排呈一条直线而均匀间隔设置。其中，位于外侧的两个导电柱 85 可作为充电接口，而位于中间的两个导电柱 85 可作为数据传输接口。当然，导电柱 85 以及安装孔 331 也可以按照其它的排布方式进行设置，此处不做具体限定。

其中，导电柱 85 可包括插置于安装孔 331 内的柱状本体 851。其中柱状本体 851 的外周面上设置有定位凸台 852，该定位凸台 852 可用于与主侧壁 33 的内表面卡接，进而将导电柱 85 固定于安装孔 331。

具体地，定位凸台 852 可以绕柱状本体 851 的周向呈环形设置，进一步地，在环形的定位凸台 852 朝向电路壳体 30 内部的一侧设置有连接柱状本体 851 外周面以及定位凸台 852 的延伸斜面 853。在安装导电柱 85 时，将该导电柱 85 由电路壳体 30 的外部，沿延伸斜面 853 而逐渐插入安装孔 331 而进入电路壳体 30 的内部，并进而通过定位凸台 852，在定位凸台 852 完全通过安装孔 331 之后，该定位凸台 852 朝向电路壳体 30 外部的台面与主侧壁 33 的内表面卡接，进而将导电柱 85 固定于安装孔 331 内。

上述方式中，定位凸台 852 的设置使得在装配过程中，导电柱 85 能够从电路壳体 30 的主侧壁 33 的外表面插入安装孔 331 后，并可通过按压的方式即可将定位凸

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台 852 按压入安装孔 331 内，从而与电路壳体 30 的主侧壁 33 的内表面卡接固定，而无需从电路壳体 30 的内部进行安装，从而使得骨传导扬声装置的装配更加便捷，提高生产装配效率.进一步地，延伸斜面 853 的设置使得在装配过程中，定位凸台 852 能够更加顺利地通过安装孔 331。定位凸台 852 的设置则能够使得导电柱 85 进入安装孔 331 内时与主侧壁 33 的内表面卡接而不易从导电孔内划出，从而能够将导电柱 85 牢靠地固定于安装孔 331 内。

具体地，在一实施方式中，柱状本体 851 沿柱状本体 851 相对于安装孔 331 的插入方向划分为第一柱状本体 8511 和第二柱状本体 8512，二者可由导电的金属材质，如铜、银或者合金等一体成型而为一整体结构。其中，在垂直于导电柱 85 插入安装孔 331 的插入方向上，第一柱状本体 8511 的横截面可大于第二柱状本体 8512 的横截面。其中，定位凸台 852 可设置于第二柱状本体 8512 上。

相应地，安装孔 331 沿插入方向划分为横截面与第一柱状本体 851 和第二柱状本体 851 对应的第一孔段 3311 和第二孔段 3312，进而在第一孔段 3311 和第二孔段 3312 的连接处形成一环形台面 3313，其中，该环形台面 3313 与主侧壁 33 的外表面连通。

进一步地，当柱状本体 851 插置于安装孔 331 内时，第一柱状本体 8511 朝向第二柱状本体 8512 的一侧支撑于环形台面 3313 上，同时，位于第二柱状本体 8512 外周面上的定位凸台 852 朝向第一柱状本体 8511 的一侧卡接于主侧壁 33 的内表面上，进而将导电柱 85 从安装孔 331 周围的主侧壁 33 的内外两侧面同时卡接，从而将导电柱 85 固定于安装孔 331 内。

在一实施方式中，柱状本体 851 沿轴向设置有容置腔 8513，容置腔 8513 的开口端于第二柱状本体 8512 朝向电路壳体 30 内部的端面上。具体地，该容置腔 8513 可沿平行于插入方向而贯通至第二柱状本体 8512 的位于电路壳体 30 内部一侧的部分，并在到达定位凸台 852 之前终止。当然，在其它实施方式当中，可以根据需求设置容置腔 8513 的具体位置，此处不做限定。

进一步地，导电柱 85 包括设置于容置腔 8513 内的弹簧 854 以及导电触头 855，导电触头 855 的一端可于容置腔 8513 内部与弹簧 854 抵接，另一端从容置腔 8513 的开口端外露于电路壳体 30 的内部。其中，导电触头 855 的材质可与柱状本体 851 的材质相同，弹簧 854 可以通过一定的手段如粘接、焊接等方式与第二柱状本体 851 以及导电触头 855 连接，或者还可以直接放置于容置腔 8513 内，并通过柱状本体 851 与电路壳体 30 的主侧壁 33 的卡接以及导电触头 855 与主控电路板 62 的抵接而弹性夹持于容置腔 8513 内部。

进一步地，电路壳体 30 内部的主控电路板 62 上设置有与导电柱 85 位置对应的触点 621，具体如图 7 所示。具体地，主控电路板 62 包括面积较大的主表面 622 以及连接主表面 622 的面积较小的侧表面 623，其中，主控电路板 62 的主表面 622 可平行或者近似平行于电路壳体 30 的主侧壁 33，其中，触点 621 对应设置于主控电路板 62 的主表面 622 上。

其中，导电柱 85 插入安装孔 331 的插入方向与导电柱 85 的轴向平行，并垂直于主侧壁 33，进而垂直于主控电路板 62 的主表面 622。在将导电柱 85 安装于安装

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孔 331 内后，弹簧 854 受到导电触头 855 以及柱状本体 851 的夹持而产生弹性形变，以将导电触头 855 弹性压持于对应的触点 621 上，从而实现导电柱 85 与主控电路板 62 的电连接。

在一实施方式中，骨传导扬声装置还进一步包括一位于电路壳体 30 内部的辅助片 86。

该辅助片 86 包括一板体 861，该板体 861 上设置有镂空区 8611，该板体 861 可通过热熔或者热压、粘接等方式设置于主侧壁 33 的内表面上，并使得设置于主侧壁 33 上的安装孔 331 位于镂空区 8611 内部。具体地，板体 861 的板面可平行贴靠于主侧壁 33 的内表面上。

其中，该辅助片 86 具有一定的厚度，在其设置于主侧壁 33 的内表面上后，与该辅助片 86 的镂空区 8611 的内侧壁与主侧壁 33 共同构成一位于插置于安装孔 331 内的导电柱 85 外围的胶槽 87。

进一步地，可在胶槽 87 内施加密封胶，从而从电路壳体 30 的内部对安装孔 331 进行密封，以提高电路壳体 30 的密闭性，进而提高骨传导扬声装置的防水性能。

其中，该辅助片 86 的材质可与电路壳体 30 的材质相同，并与电路壳体 30 分别成型。需要指出的是，在电路壳体 30 成型阶段，安装孔 331 附近往往还具有其它结构，例如需要成型按键孔 342 等，这些结构在成型时所对应的模具可能需要从电路壳体 30 的内部退出，而此时若直接在电路壳体 30 内部一体成型对应于安装孔 331 的胶槽 87，则胶槽 87 的凸起可能会干涉这些结构的模具的顺利退出，从而为生产带来不便。本实施方式中，辅助片 86 与电路壳体 30 分别为独立的结构，在二者分别成型后，可通过将辅助片 86 安装于电路壳体 30 的内部而与电路壳体 30 的主侧壁 33 共同构成胶槽 87，从而在电路壳体 30 的成型阶段不会阻挡部分结构的模具从电路壳体 30 的内部退出，从而有利于生产的顺利进行。

在一实施方式中，在对电路壳体 30 进行成型时，模具的退出仅占用胶槽 87 所占据的空间的部分空间，从而，可以在不影响退模的情况下，在主侧壁 33 的内表面上一体成型胶槽 87 的一部分，而胶槽 87 的另一部分仍可由辅助片 86 辅助构成。

具体地，主侧壁 33 的内表面上一体成型有第一条状凸肋 332，该第一条状凸肋 332 所在的位置不影响电路壳体 30 的模具退模。辅助片 86 的镂空区 8611 设置有一缺口 8612。其中，第一条状凸肋 332 与该缺口 8612 对应。在电路壳体 30 和辅助片 86 分别成型之后，可将该辅助片 86 于主侧壁 33 的内表面，以使得第一条状凸肋 332 至少部分嵌合于缺口 8612 处，进而利用第一条状凸肋 332 和辅助片 86 配合使得胶槽 87 呈闭合设置。

本实施方式中，由于第一条状凸肋 332 不会对模具的退出产生阻挡，因此，胶槽 87 的侧壁可由一体成型于主侧壁 33 内表面的第一条状凸肋 332 与辅助片 86 共同构成。

进一步地，在一实施方式中，第一条状凸肋 332 还进一步延伸成与板体 861 的侧边缘 8613 抵接，进而对板体 861 进行定位。

具体地，该第一条状凸肋 332 包括凸肋主体 3321 和定位臂 3322，其中，凸肋主体 3321 用于与镂空区 8611 的缺口 8612 匹配并与其嵌合，从而共同形成胶槽 87

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的侧壁；而定位臂 3322 则由凸肋主体 3321 的一端进一步延伸而成，并延伸至板体 861 的一侧边缘 8613 处与该侧边缘 8613 抵接，从而对该板体 861 于该侧边缘 8613 处进行定位。

其中，第一条状凸肋 332 在主侧壁 33 的内表面上凸出的高度可大于辅助片 86 的厚度，当然，也可以小于或者等于，只要能够与辅助片 86 共同构成胶槽 87，以及能够对辅助片 86 的板体 861 起到定位作用即可，此处不做具体限定。

在一实施方式中，板体 861 上进一步设置有定位孔 8614，其中，定位孔 8614 贯通板体 861 的主板面设置。进一步地，主侧壁 33 的内表面上一体成型有与定位孔 8614 对应的定位柱 333，在将辅助片 86 设置在主侧壁 33 的内表面后，该定位柱 333 插置于定位孔 8614 内，从而进一步对辅助片进行定位。

其中，定位孔 8614 和定位柱 333 的数量一致，本实施方式中，二者的数量均为两个。

在一个应用场景中，板体 861 的侧边缘 8613 形成有至少两个凸耳 8615，两个定位孔 8614 可分别设置于对应的凸耳 8615 上。

进一步地，主侧壁 33 的内表面上一体成型有一第二条状凸肋 334，该第二条状凸肋 334 可沿朝向辅侧壁 34 的方向延伸设置，并可与第一条状凸肋 332 的定位臂 3322 的延伸方向互相垂直。

对应地，板体 861 上还设置有与第二条状凸肋 334 对应的条状定位槽 8616，该定位槽 8616 沿远离该主侧壁 33 的方向凹陷设置，且其一端与板体 861 的侧边缘 8613 连接并可与该侧边缘 8613 垂直设置。

在一个应用场景中，定位槽 8616 可以仅由板体 861 的贴合主侧壁 33 的表面凹陷形成，定位槽 8616 的深度小于板体 861 的厚度，此时，板体 861 的与凹陷的表面相背设置的面不受定位槽 8616 的影响；在另一个应用场景中，定位槽 8616 的深度大于板体 861 的深度，从而使得在板体 861 的靠近主侧壁 33 的表面凹陷时，另一相对表面朝向凹陷的方向凸出，从而配合形成定位槽 8616。

具体地，在将辅助片 86 设置在主侧壁 33 的内表面后，第二条状凸肋 334 嵌入于条状定位槽 8616 内，以进一步对板体 861 进行定位。

在一实施方式中，按键电路板 61 垂直于主控电路板 62 而与电路壳体 30 的辅侧壁 34 平行间隔设置。具体地，如上所述，按键机构所对应的辅侧壁 34 可包括两种，一种是在用户佩戴该骨传导扬声装置时，朝向用户头部后侧的辅侧壁 34，另一种是在用户佩戴时朝向用户头部下侧的辅侧壁 34。本实施方式中，按键电路板 61 可以为两个，并分别与对应的两种辅侧壁 34 平行间隔设置。

其中，按键电路板 61 可设置于辅助片 86 的板体 861 的朝向辅侧壁 34 的一侧。进一步地，辅助片 86 包括相对于板体 861 凸出设置的压持脚 862。具体地，压持脚 862 沿垂直于板体 861 的主表面的方向凸出设置于板体 861 的朝向辅侧壁 34 的侧边缘处，且压持脚 862 的数量可以为一个或者多个。本实施方式中，压持脚 862 可通过其朝向辅侧壁 34 的侧面而将按键电路板 61 压持于辅侧壁 34 的内表面上，从而对按键电路板 61 起到固定的作用。

在一实施方式中，主控电路板 62 与主侧壁 33 间隔设置，而辅助片 86 的板体

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861 的主表面与主侧壁 33 平行而进一步与主控电路板 62 间隔设置。

其中，压持脚 862 具体由板体 861 沿背离辅助片 86 所靠近的电路壳体 30 的主侧壁 33 且朝向主控电路板 62 的方向凸出，并延伸至主控电路板 62 的板面处以对主控电路板 62 起到压持作用，从而使得主控电路板 62 支撑于至少部分压持脚 862 上。

在一实施方式中，壳体护套 17 上设置有与所述导电柱 85 对应的外露孔 175，在将壳体护套 17 套装在电路壳体 30 外围后，导电柱 85 位于电路壳体 30 外部的一端进一步通过该外露孔 175 外露，进而与骨传导扬声装置外部的电路连接，以使得该骨传导扬声装置通过导电柱进行电量供应或者数据传输。

进一步地，电路壳体 30 的外表面凹陷设置有环绕多个安装孔 331 的胶槽 39。具体地，胶槽 39 可为椭圆环形，多个安装孔 331 分别设置于椭圆环形的胶槽 39 所环绕的电路壳体 30 上。

本实施方式中，该胶槽 39 内施加有密封胶，进而壳体护套 17 与电路壳体 30 装配完成后，壳体护套 17 能够通过该密封胶在安装孔 331 的外围与电路壳体 30 密封连接，从而避免外部液体通过外露孔 175 而进入壳体护套 17 内部时，壳体护套 17 在电路壳体 30 外围产生滑动，且能够进一步从电路壳体 30 的外部对安装孔 331 进行密封，以进一步提高电路壳体 30 的密闭性，进而进一步提高骨传导扬声装置的防水性能。

在一实施方式中，电路壳体 30 在远离耳挂 10 的一端进一步设置有接插端 3a，后挂 40 包括弹性金属丝 41 以及设置于弹性金属丝 41 的两端的接插端 42，其中接插端 3a 与接插端 42 彼此接插固定。

其中，由于骨传导扬声装置的耳机芯 50 分别为左右两个，对应的机芯壳体 20、耳挂 10 以及电路壳体 30 也设置为左右两个，后挂 40 通过分别与两个电路壳体 30 接插固定的方式将位于两侧的机芯壳体 20、耳挂 10 以及电路壳体 30 连接在一起，并在用户佩戴时悬挂设置于用户头部后侧。

具体地，弹性金属丝 41 的材质与性能等可以与弹性金属丝 11 相同，相关详细内容请参见前述对弹性金属丝 11 的相关描述，此处不再赘述。

接插端 42 可以通过注塑的方式形成在弹性金属丝 41 的两端。具体地，接插端 42 可以由塑胶等材料制成。

在一实施方式中，接插端 42 设置有接插孔 421，该接插端 3a 至少部分插入至接插孔 421 内，本实施方式中，接插端 3a 可具体设置在环形台面 37 背离耳挂 10 的一侧。接插端 3a 与接插孔 421 之间的接插方式和接插端 15 与接插孔 31 之间的接插方式可以相同，也可以不同。

其中，在接插端 3a 的相对两侧分别设置有与接插端 3a 相对于接插孔 421 的插入方向垂直设置的开槽 3a1。两个开槽 3a1 可间隔且对称设置于接插端 3a 的两侧。进一步地，该两个开槽 3a1 可均在垂直于插入方向上与接插端 3a 的对应的侧壁连通。

相应地，接插端 42 的第一侧壁 422 上设置有与两个开槽 3a1 位置对应的通孔 423。其中，接插端 42 包括用于定义接插孔 421 的环绕设置的侧壁，接插端 42 的第一侧壁 422 可以是在接插端 3a 与接插端 42 接插固定时，接插端 42 的能够与开槽 3a1 的延伸方向相交的侧壁。

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其中，骨传导扬声装置进一步包括固定件 88，固定件 88 包括两条平行设置的插脚 881 和用于连接插脚 881 的连接部 882。本实施方式中，两条插脚 881 平行设置，连接部 882 可垂直连接设置于两条插脚 881 的同一侧，从而形成与固定件 81 形状相似的 U 型的固定件 88。

需要指出的是，固定件 88 可与固定件 81 的形状相似，但是具体的尺寸参数可以适应于周边结构而不同，本实施方式中，插脚 881 的长度大于插脚 811 的长度，连接部 812 长度小于连接部 882 的长度等，此处不做具体限定。

进一步地，插脚 881 可从接插端 42 的外侧经通孔 423 插入至开槽 3a1，而将连接部 882 阻挡于接插端 3a 的外侧，进而实现接插端 42 与接插端 3a 的接插固定。

通过上述方式，骨传导扬声装置的固定件 88 包括两条平行设置的插脚 881 和用于连接插脚 881 的连接部 882，以使得固定件 88 在一定跨度上对接插端 3a 和接插端 42 进行接插固定，从而使得电路壳体 30 与后挂 40 之间的固定更加稳定、牢靠；而且固定件 88 结构简单，插入和取出方便，从而使得接插端 3a 与接插端 42 之间的接插固定为可拆卸，且能够使得骨传导扬声装置的装配更加方便。

进一步地，在一实施方式中，接插端 42 的与第一侧壁 422 相对的第二侧壁 424 上进一步设置有与通孔 423 相对的通孔 425，插脚 881 进一步经开槽 3a1 插入至通孔 425 内。

在本实施方式中，插脚 881 经通孔 423 插入至开槽 3a1 内，并进一步经开槽 3a1 插入至通孔 425 内，也就是说插脚 881 能够将后挂 40 的接插端 42 的相对两侧壁以及接插端 3a 完全贯穿并连接于一起，从而能够使得电路壳体 30 与后挂 40 之间接插更加牢固。

具体地，在一实施方式中，接插端 3a 沿接插端 3a 相对于接插孔 421 的插入方向进一步划分为第一接插段 3a2 和第二接插段 3a3。

其中，接插端 3a 可设置在电路壳体 30 的端部的靠近一辅侧壁 34 一侧，该辅侧壁 34 具体可以是与上述实施方式中的定位块 38 所在的辅侧壁 34 相对的另一辅侧壁 34。

进一步地，第一接插段 3a2 和第二接插段 3a3 可在靠近定位块 38 的一侧沿接插端 3a 相对于接插孔 421 的插入方向而呈阶梯状设置，从而使得在垂直于插入方向的截面方向上，第一接插段 3a2 的截面大于第二接插段 3a3 的截面。

相应地，接插孔 421 沿接插端 3a 相对于接插孔 421 的插入方向进一步划分为形状分别与第一接插段 3a2 和第二接插段 3a3 相匹配的第一孔段 4211 和第二孔段 4212，从而使得在接插端 3a 插入至接插孔 421 内时，第一接插段 3a2 和第二接插段 3a3 分别插置于第一孔段 4211 和第二孔段内 4212。

进一步地，开槽 3a1 可设置于第一接插段 3a2 上，具体地，开槽 3a1 可沿接插端 3a 到定位块 38 的方向，即电路壳体 30 的两个辅侧壁 34 相对的方向而延伸设置，从而贯通第一接插段 3a2 的与电路壳体 30 的主侧壁 33 垂直的两侧壁，且进一步沿垂直插入方向贯穿第一接插段 3a2 的平行于电路壳体 30 的主侧壁 33 的两侧壁。

其中，接插端 42 上设置的通孔 423 可与开槽 3a1 的朝向定位块 38 的一侧对应，而通孔 425 则可与开槽 3a1 的远离定位块 38 的一侧对应。

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进一步地，在一实施方式中，第一接插段 3a2 和第二接插段 3a3 的顶侧彼此共面设置。其中，第一接插段 3a2 和第二接插段 3a3 的顶侧是指在用户正常佩戴骨传导扬声装置时，第一接插段 3a2 和第二接插段 3a3 的朝向头部顶侧的一侧，也即与第一接插段 3a2 和第二接插段 3a3 所形成的阶梯状相背的一侧。

进一步地，第一接插段 3a2 和第二接插段 3a3 的顶侧共面且形成有用于容纳导线的走线槽 3a4。该走线槽 3a4 可沿接插端 3a 与接插孔 421 的接插方向延伸，可用于容纳经过后挂 40 而连通控制电路 60 和电池 70 的导线。

本实施方式中，可先将接插端 3a 插置于接插孔 421 内，然后从第一接插段 3a2 的朝向定位块 38 的一侧插入开槽 3a1。具体地，本实施方式中，接插端 3a 设置于电路壳体 30 的朝向后挂 40 的端面的远离定位块 38 的一侧，因此，在接插端 3a 朝向定位块 38 的一侧还具有一定的空间，从而在对电路壳体 30 以及后挂 40 进行插接安装时，可以将固定件 88 从接插端 3a2 的底侧，即第一接插段 3a2 朝向定位块 38 的一侧由通孔 423 插入至开槽 3a1 并进而插入至通孔 425 内，以实现电路壳体 30 与后挂 40 的插接固定。通过这种方式，能够将固定件 88 完全隐藏于电路壳体 30 与后挂 40 所形成的内部空间当中而不外露，从而无需占用额外的空间。

进一步地，在一实施方式中，后挂 40 还包括注塑于弹性金属丝 41 以及接插端 42 外围的第二保护套管 43 以及与第二保护套管 43 一体成型的端部保护盖 44。

其中，第二保护套管 43 以及端部保护盖 44 的材质均可以与保护套管 16 及壳体护套 17 的材质相同，例如均可以为具有一定弹性的软质材料，例如软质的硅胶、橡胶等。

端部保护盖 44 具体可形成于弹性金属丝 41 的两端，可以与位于弹性金属丝 41 的两端的接插端 42 一体成型于该接插端 42 的外围。

需要指出的是，壳体护套 17 仅由电路壳体 30 的朝向耳挂 10 的一端包裹至电路壳体 30 的环形台面 37 处，因此，电路壳体 30 的环形台面 37 的朝向后挂 40 的部分则外露于壳体护套 17 的外围。进一步地，本实施方式中，端部保护盖 44 以及接插端 42 共同形成的内侧壁的形状与该电路壳体 30 所外露的端部的形状匹配，以进一步覆盖于该外露的电路壳体 30 的端部的外围，且该端部保护盖 44 的朝向电路壳体 30 的端面与壳体护套 17 的朝向后挂 40 的端面弹性抵接，以进一步提供密封。

进一步地，在一实施方式中，壳体护套 17 所外露的电路壳体 30 的端部还设置有按键孔 342，对应地，按键孔 342 内设置有按键 83，端部保护盖 44 覆盖该按键 83，并设置有用于容纳按键 83 的按键容置槽 441。

具体地，该按键孔 342 可间隔设置于接插端 3a 朝向定位块 38 的一侧，且按键孔 342 的数量可以为一个或者多个，具体可根据电路壳体 30 内部的控制电路 60 的具体结构以及电路壳体 30 本身的结构来确定，此处不做具体限定。

以上所述仅为本申请的实施方式，并非因此限制本申请的专利范围，凡是利用本申请说明书及附图内容所作的等效结构或等效流程变换，或直接或间接运用在其他相关的技术领域，均同理包括在本申请的专利保护范围内。

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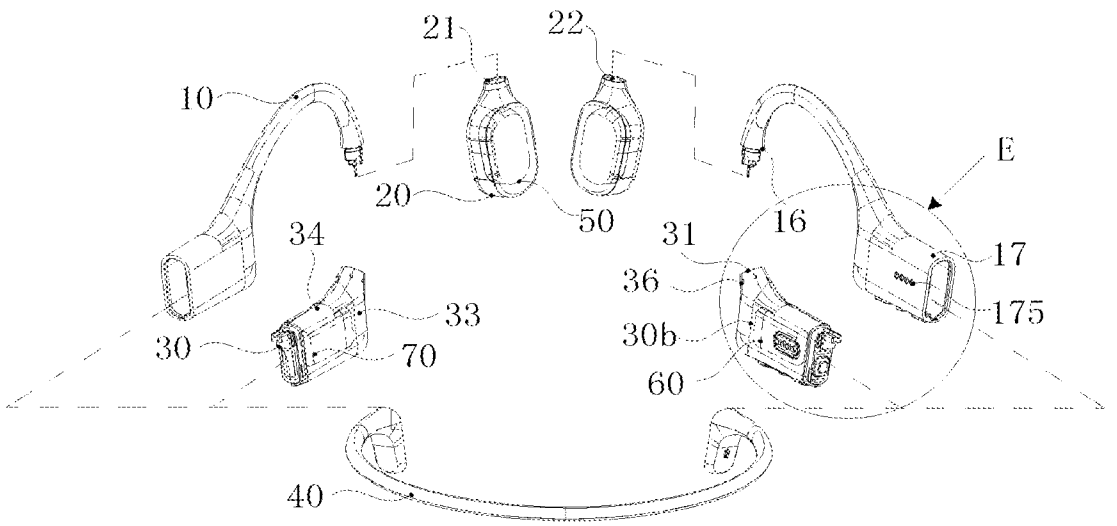
说 明 书 附 图



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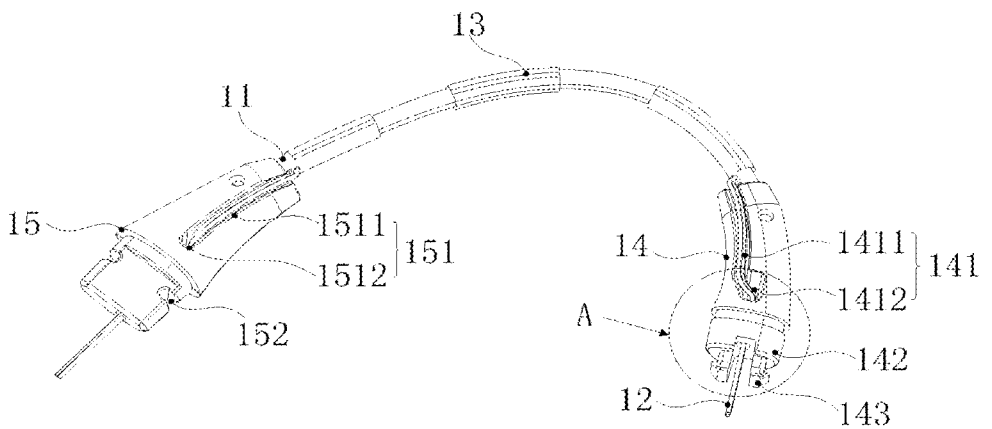

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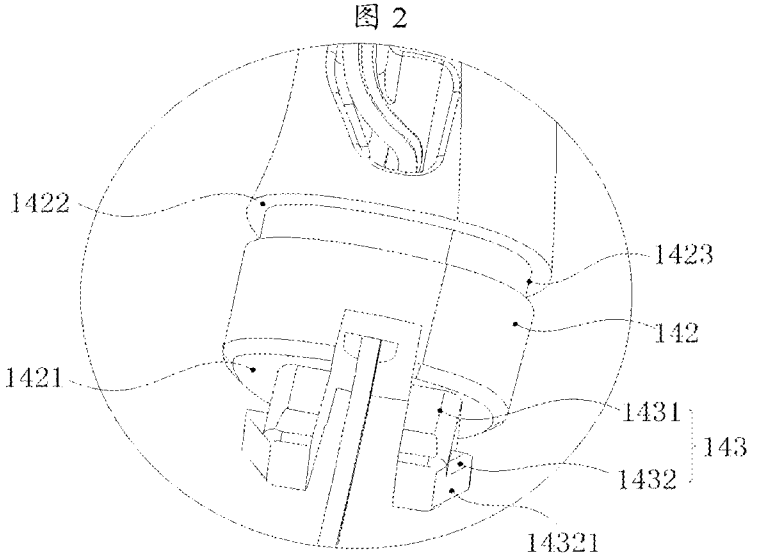

图 3

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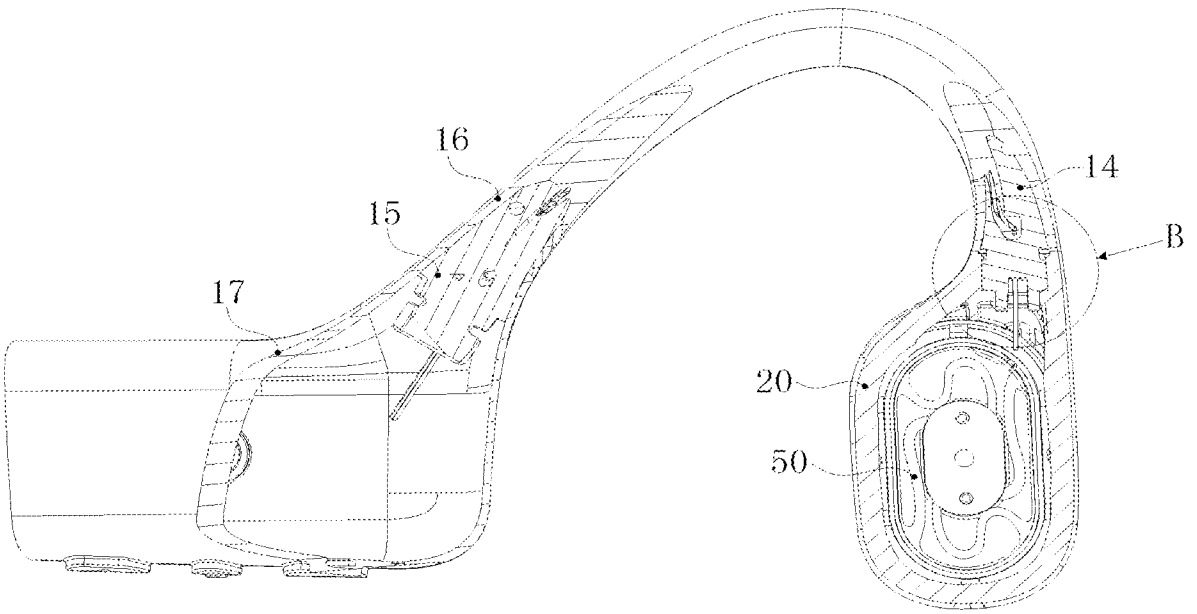

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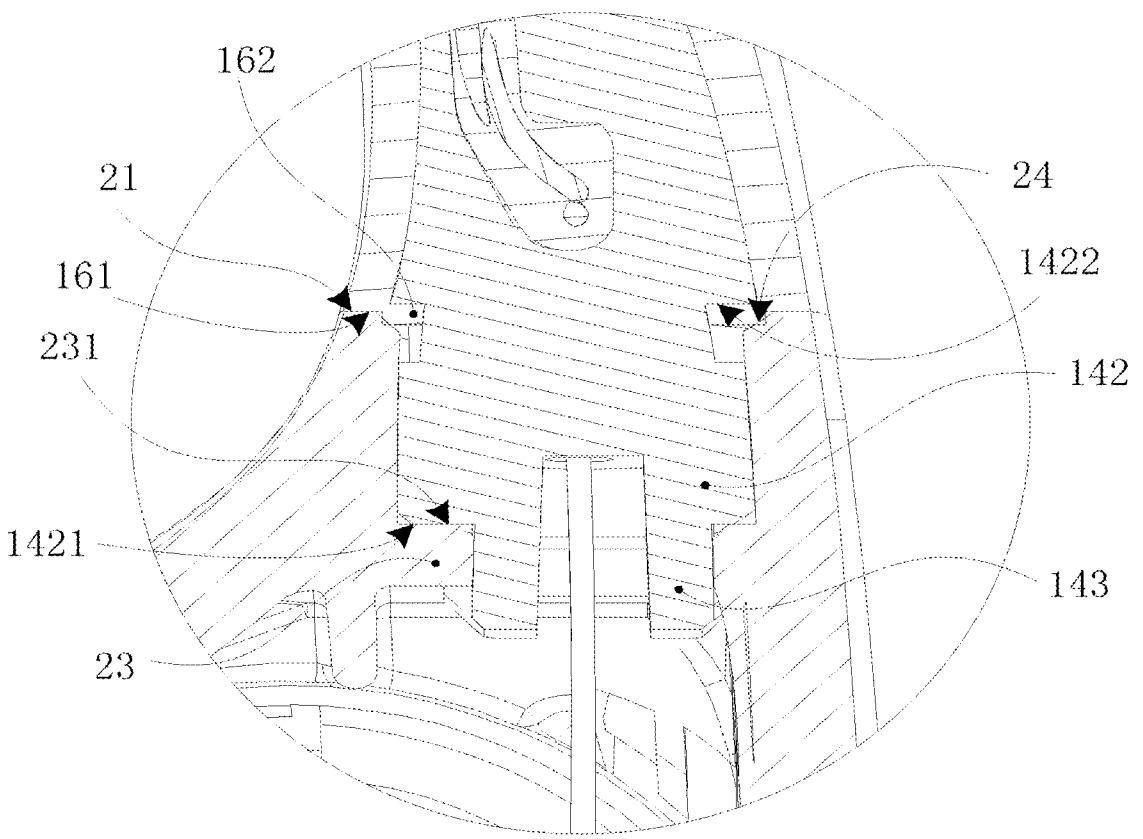

图 5

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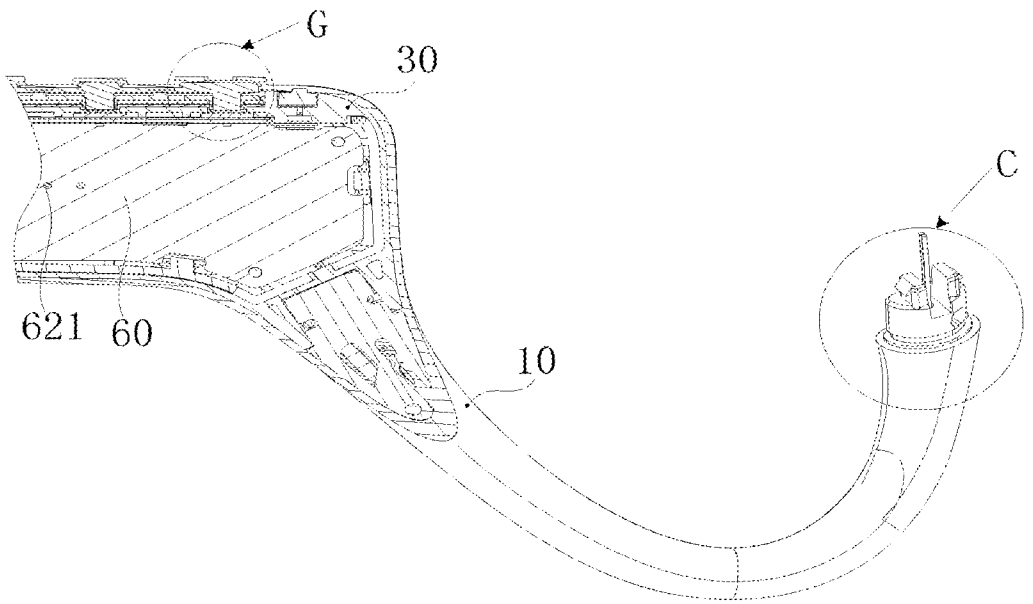

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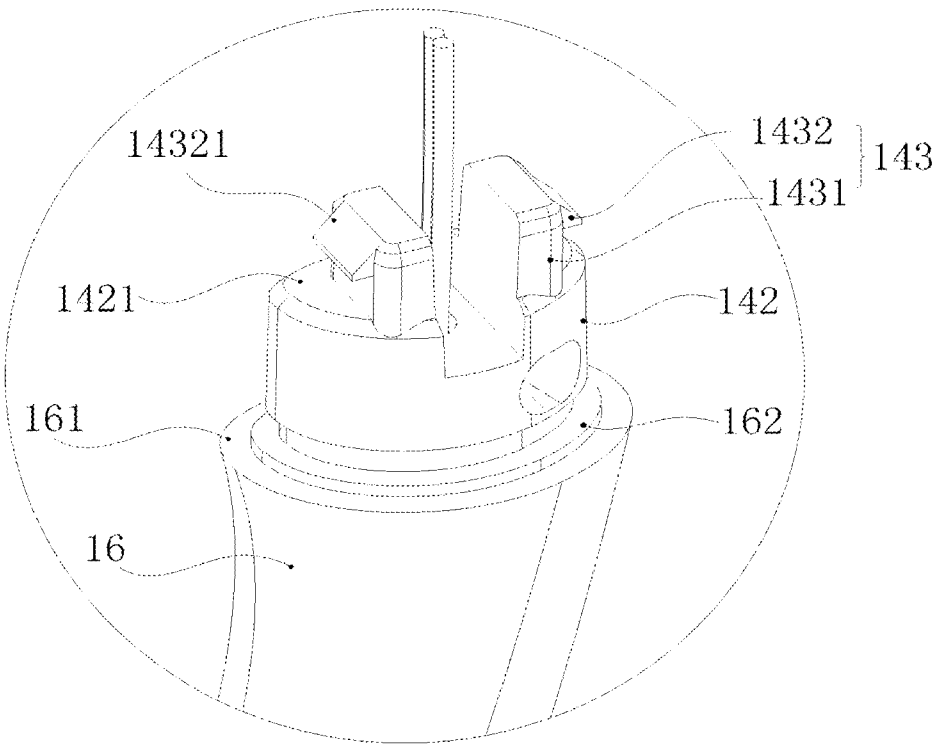

图 7

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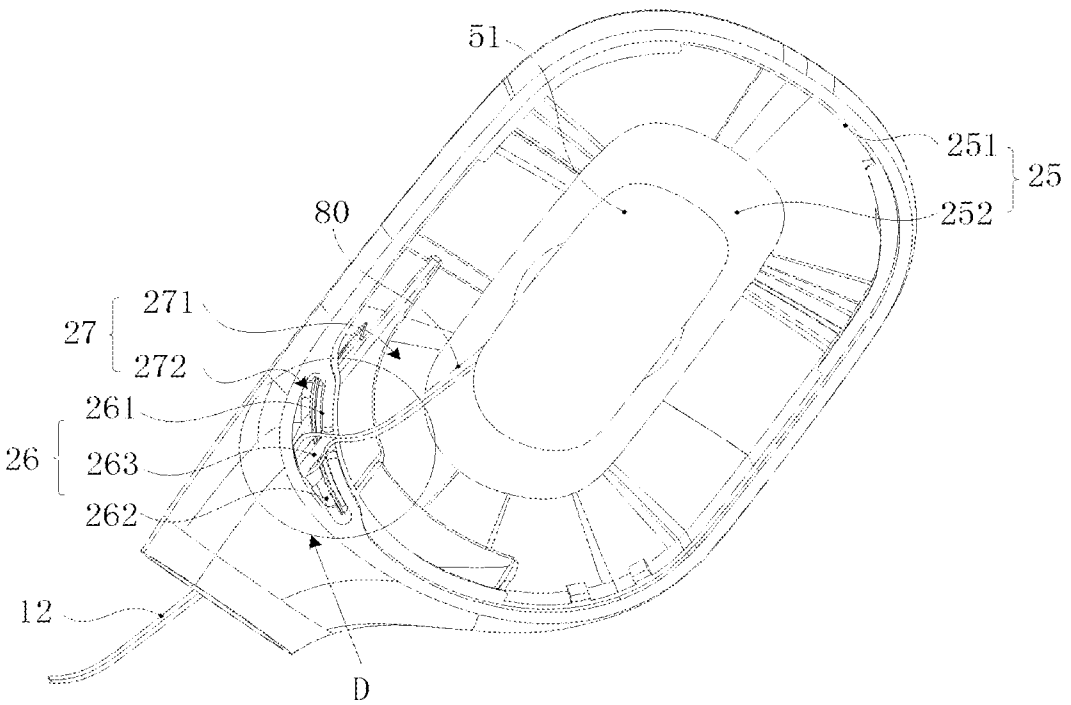

图 8

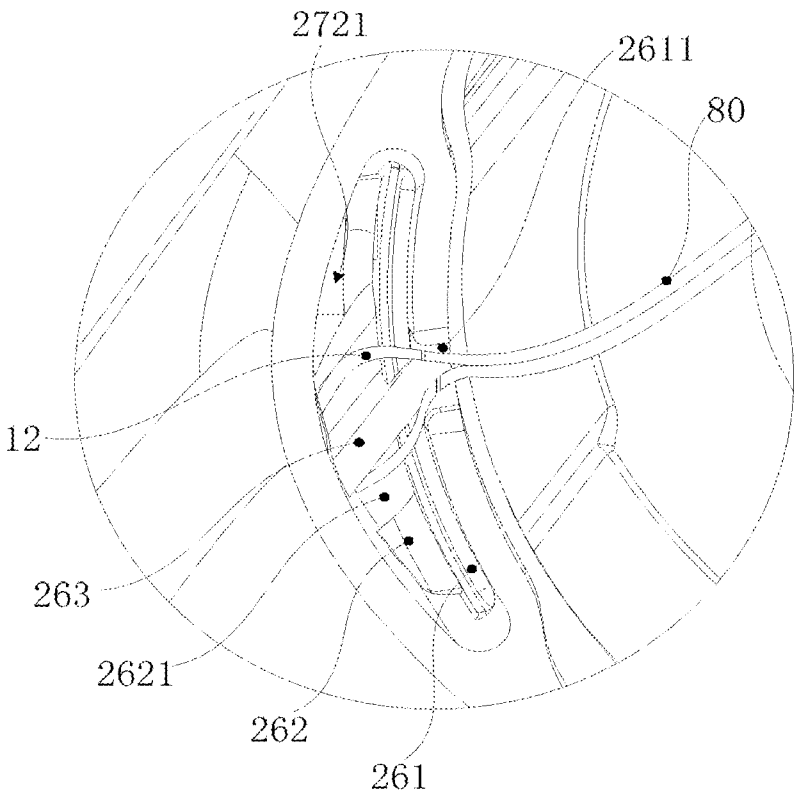

图 9

5

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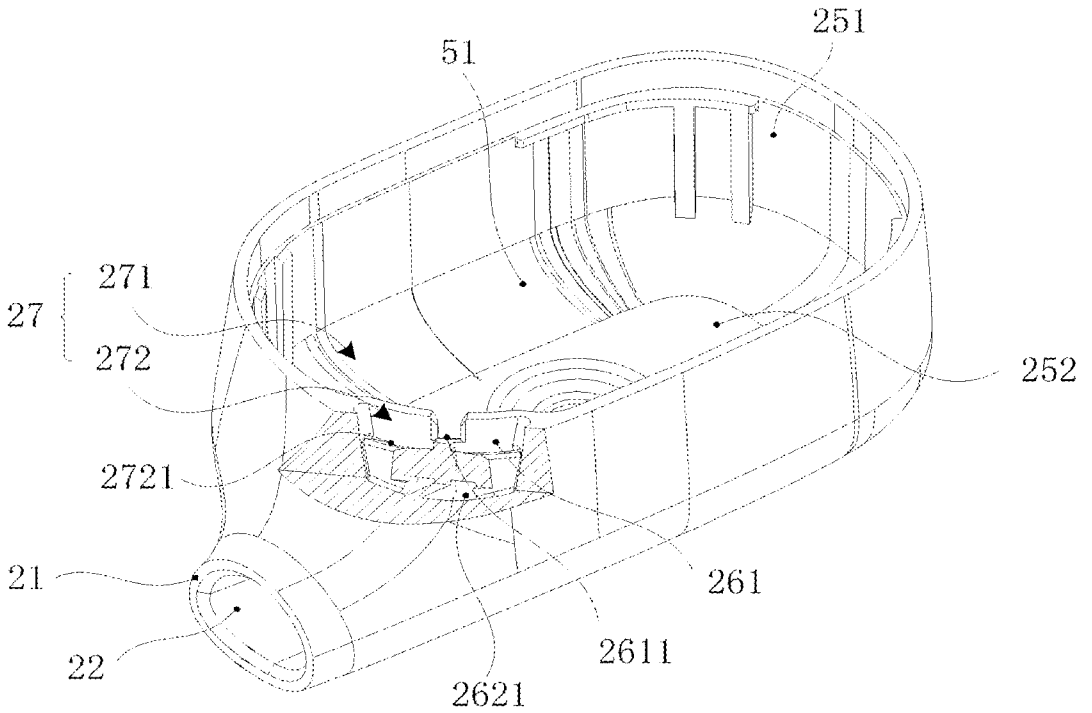

图 10

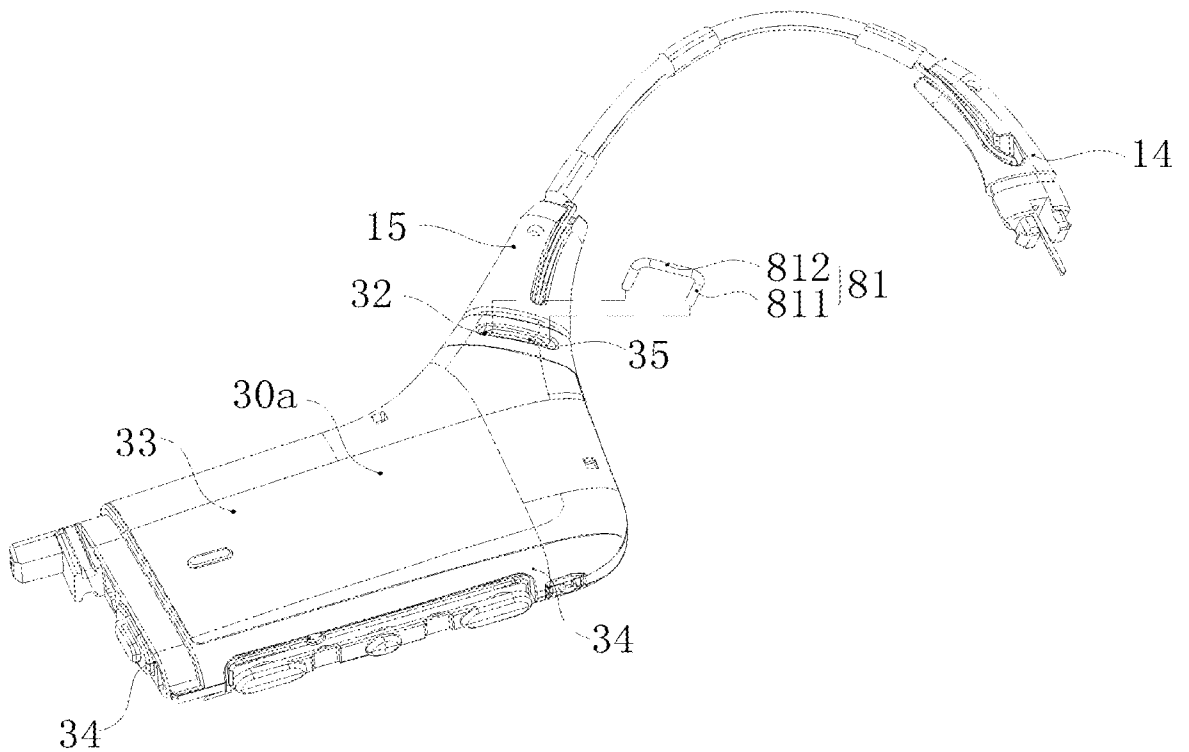

图 11

5

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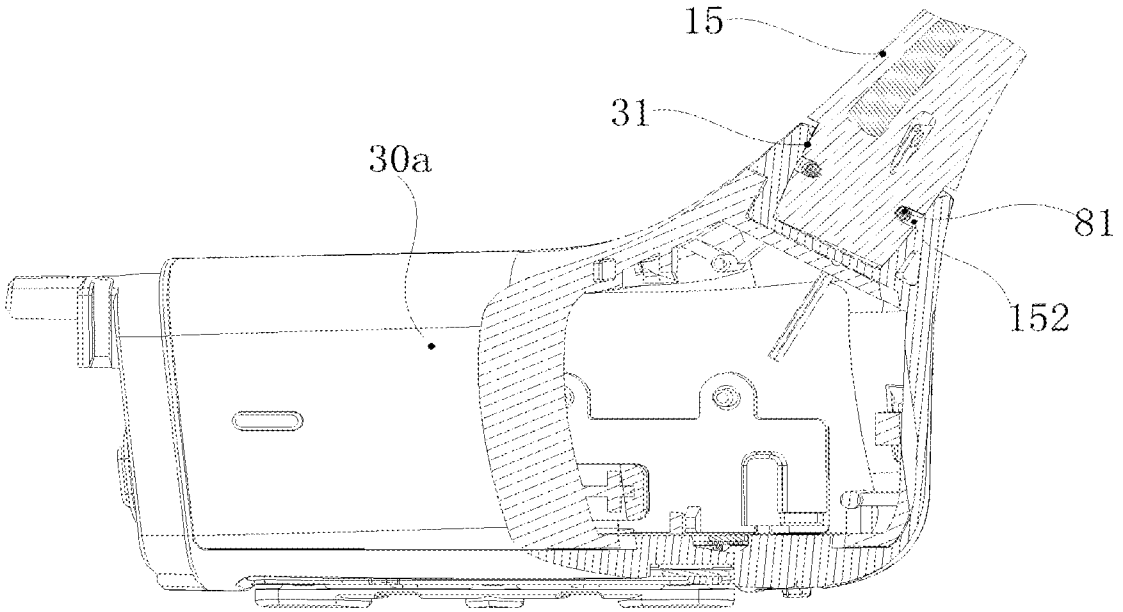

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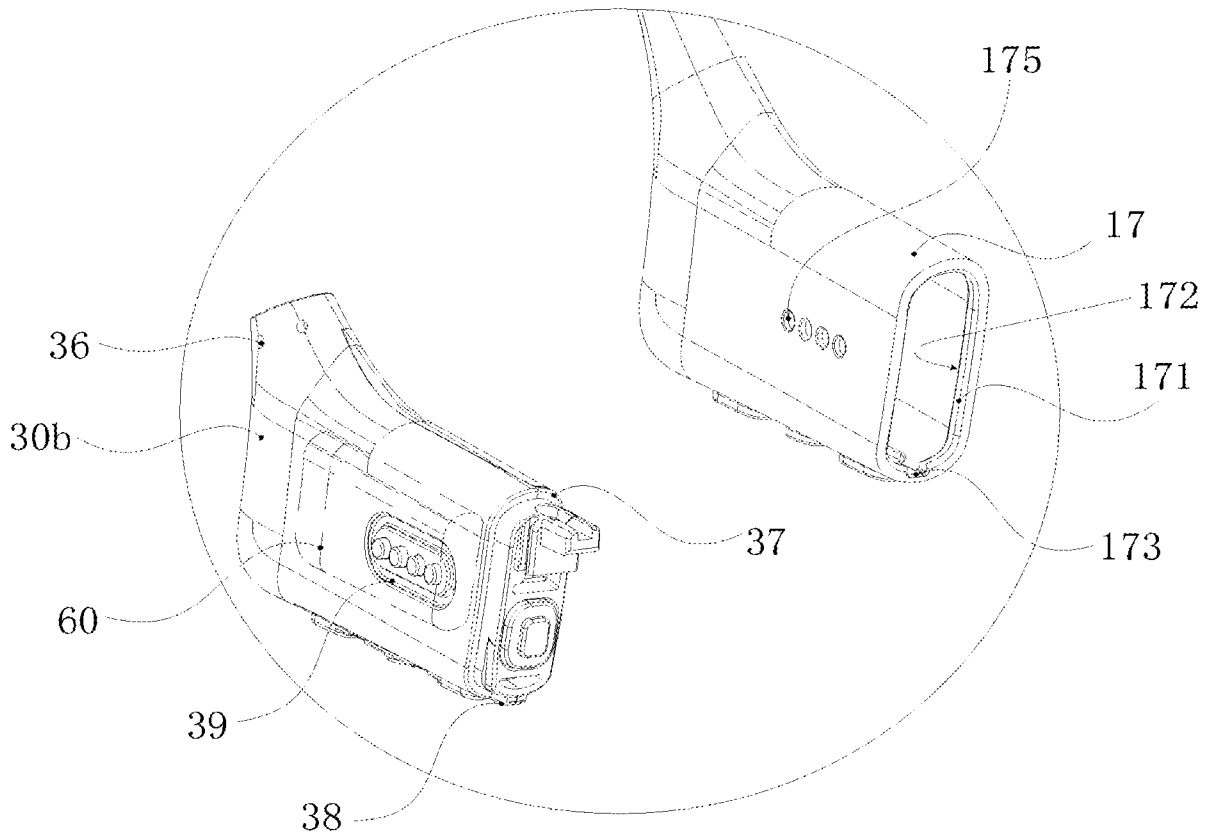

图 13

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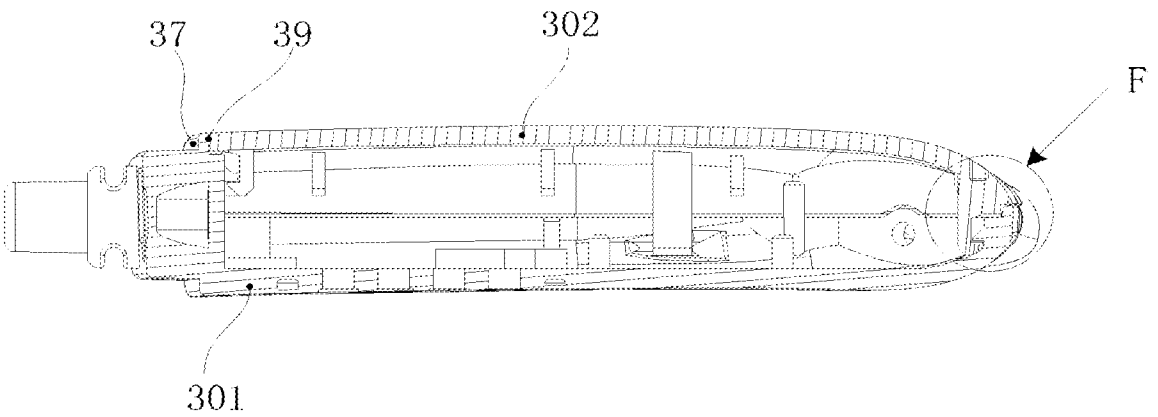

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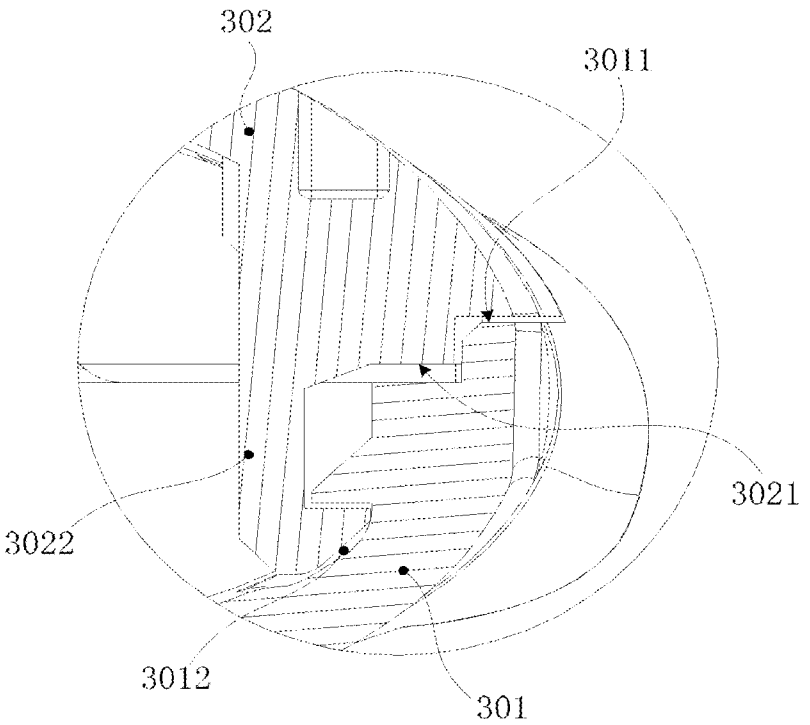

图 15

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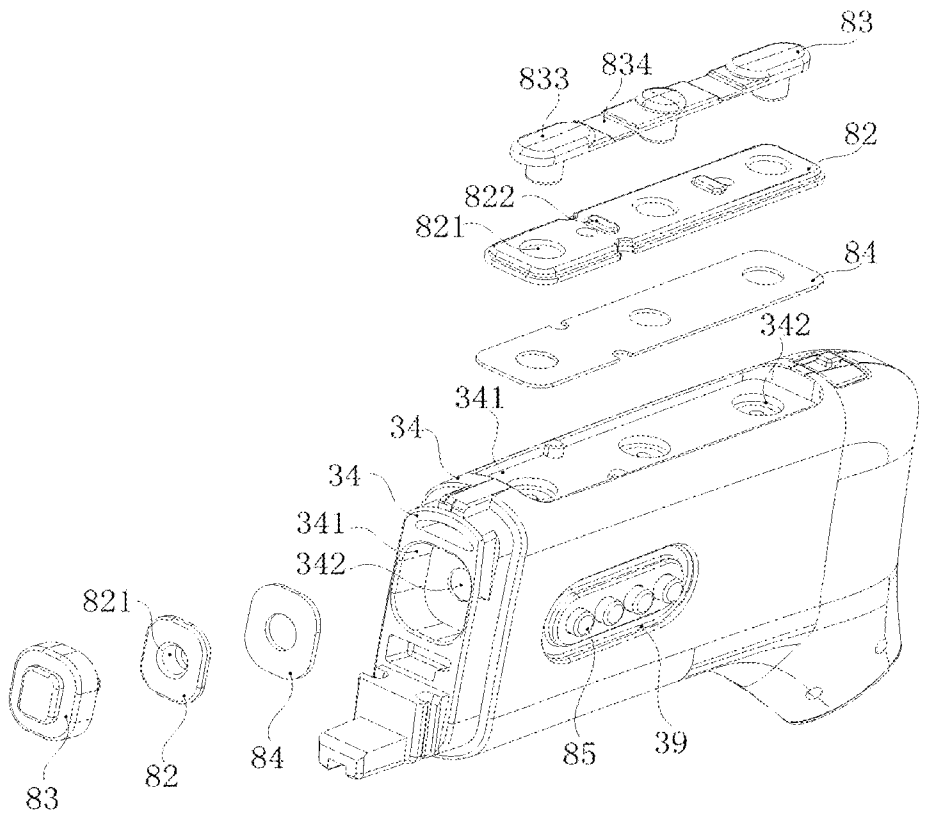

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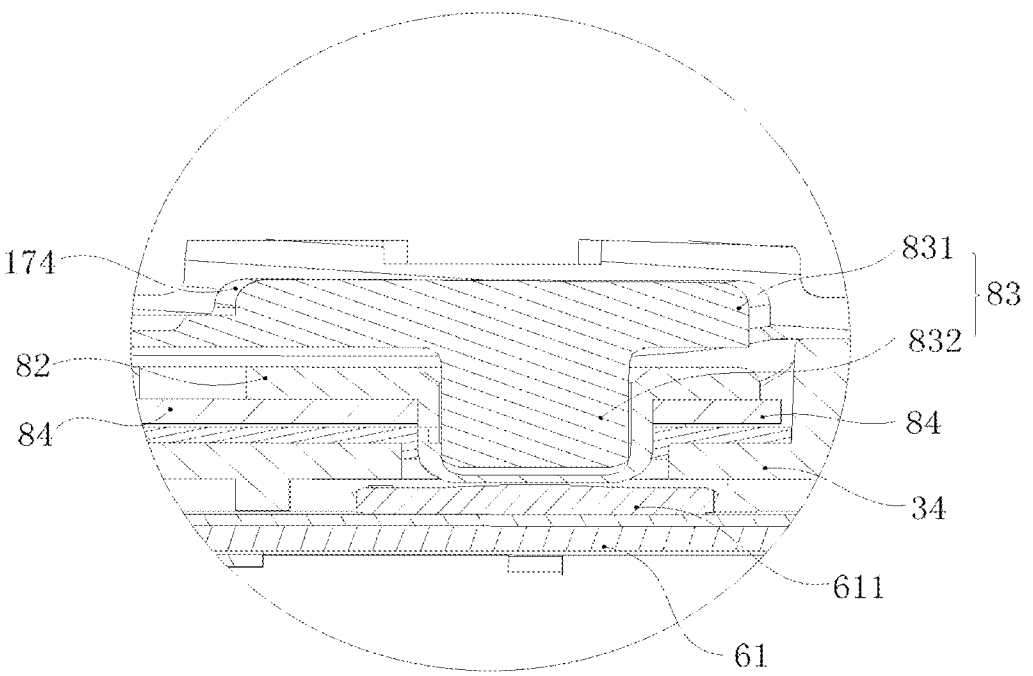

图 17

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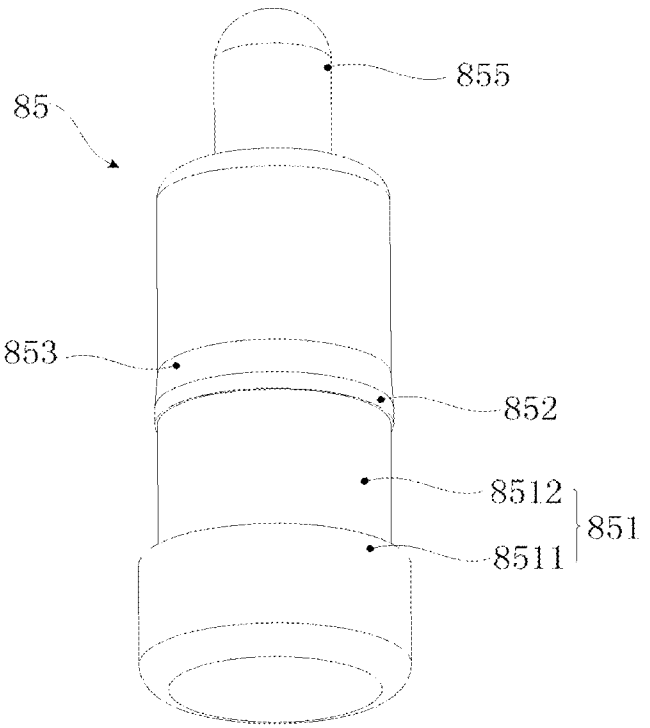

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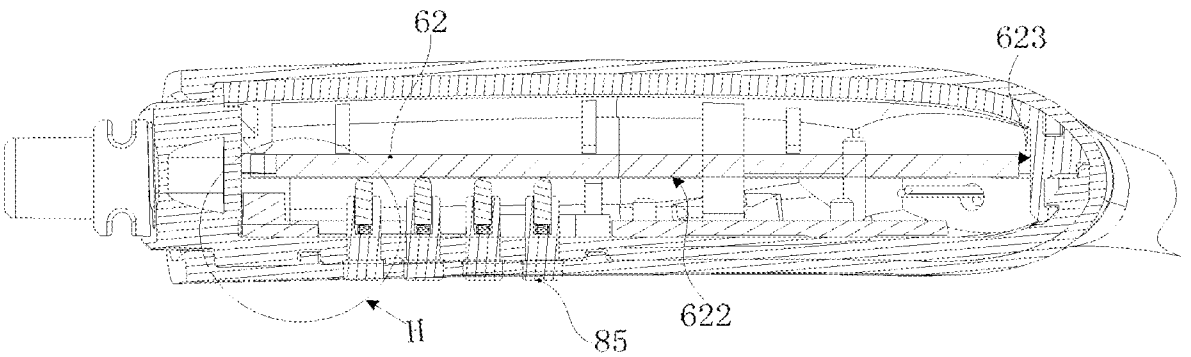

图 19

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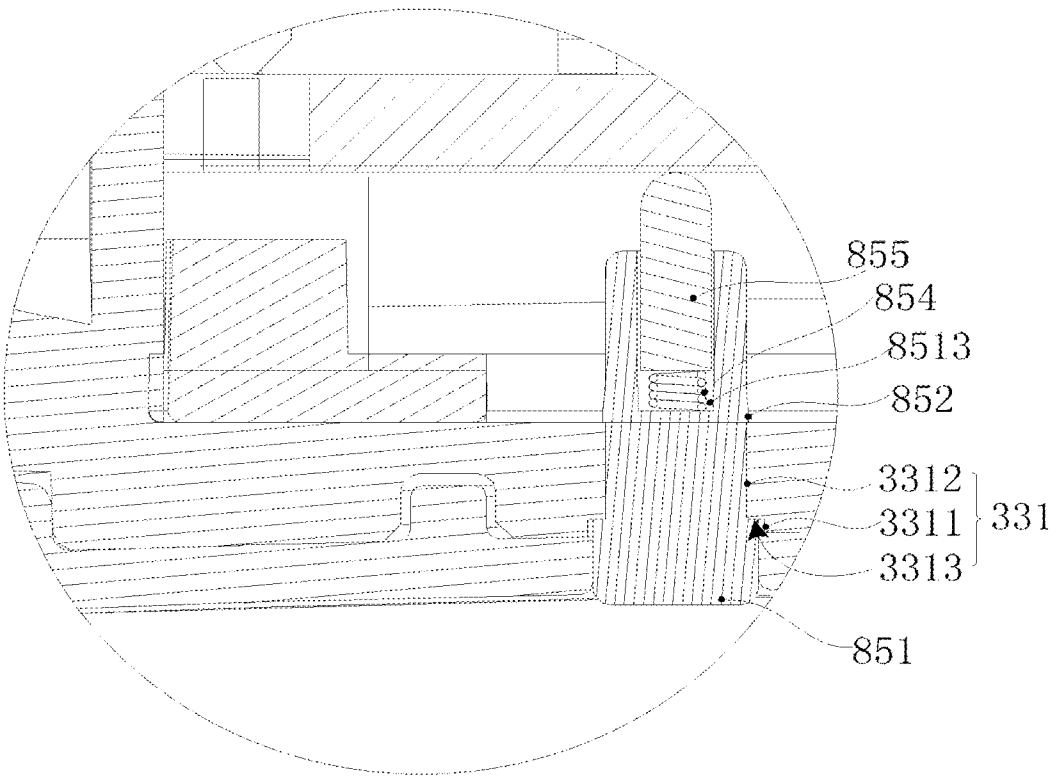

图 20

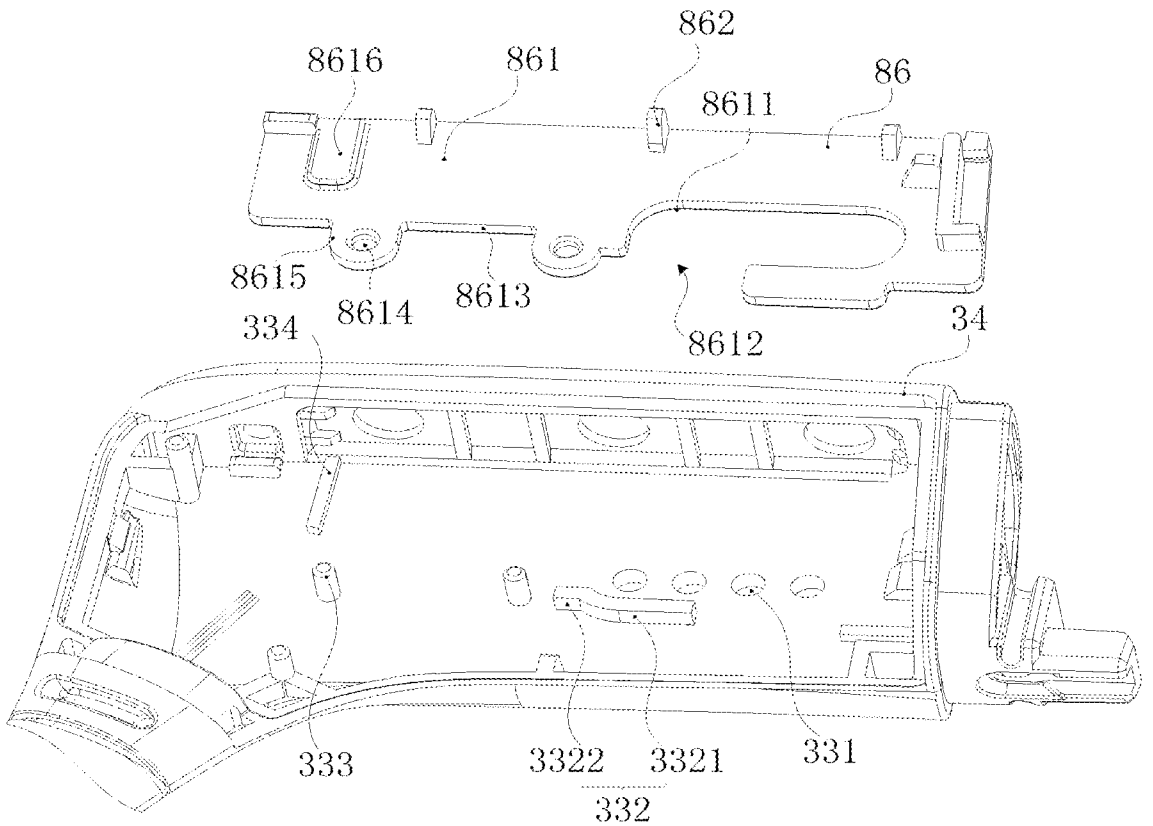

图 21

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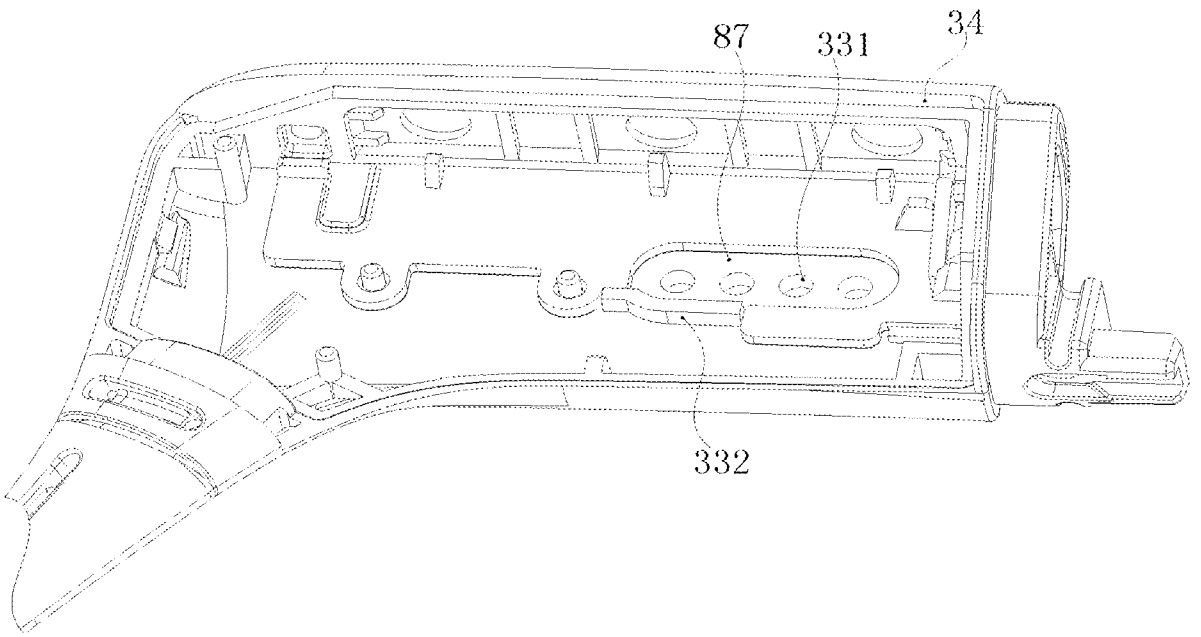

图 22

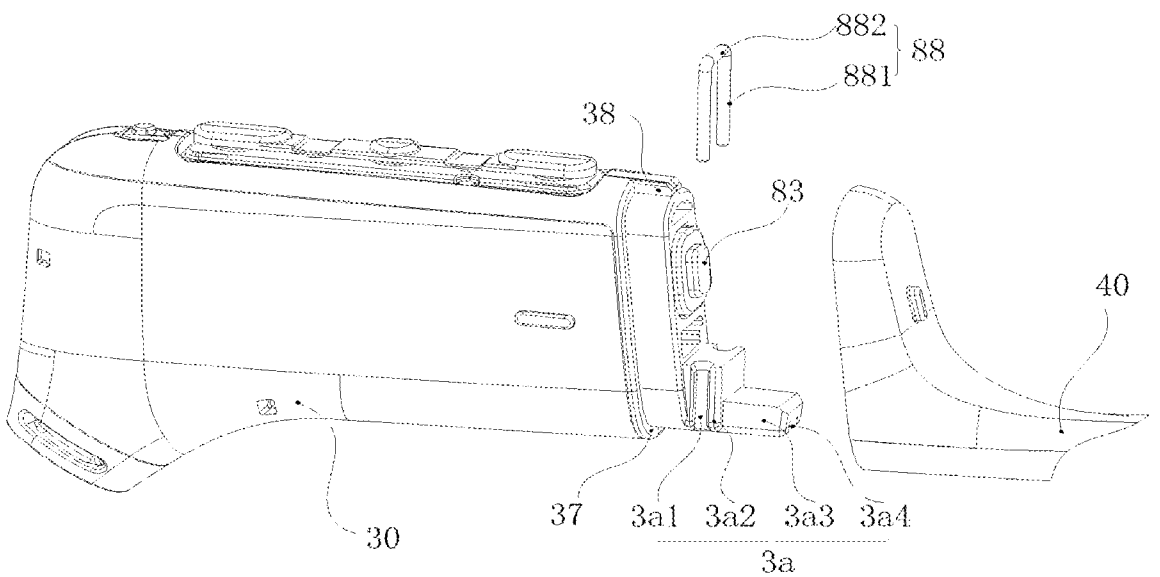

图 23

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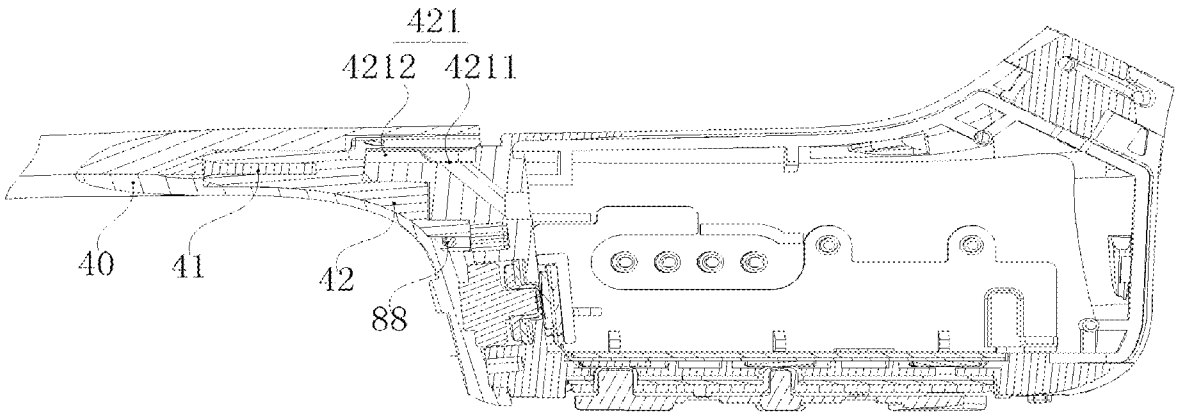

图 24

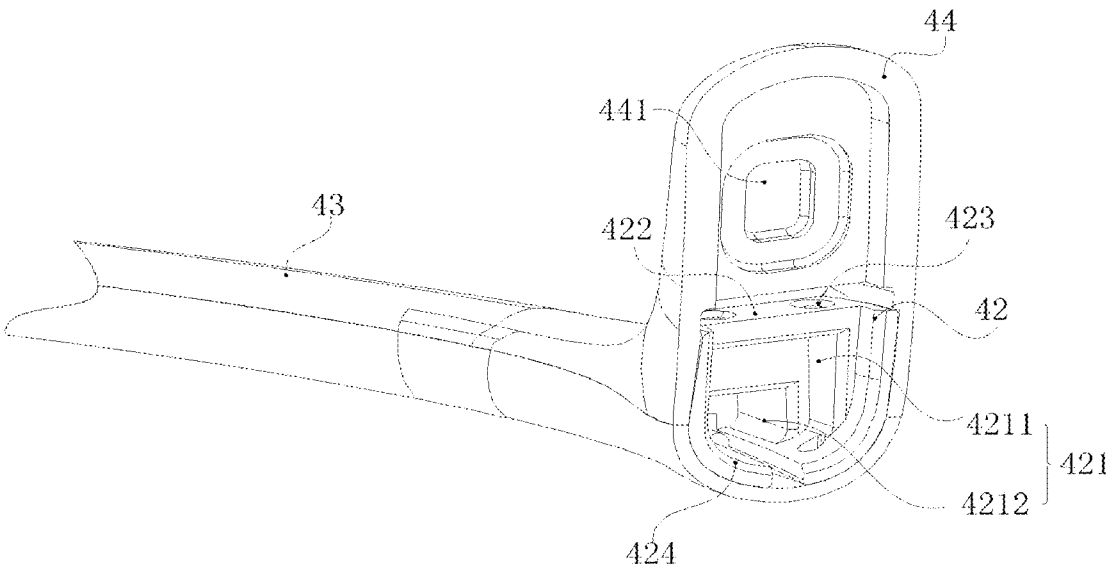

图 25

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/137,389	12/30/2020	2833	1820	20608-0081US00	20	1

CONFIRMATION NO. 1993

131839
Metis IP LLC
PO Box 423
McLean, VA 22101

FILING RECEIPT

OC000000122662097

Date Mailed: 01/15/2021

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Inventor(s)

Chaowu LI, Shenzhen, CHINA;
Yongjian LI, Shenzhen, CHINA;

Applicant(s)

SHENZHEN VOXTECH CO., LTD., Shenzhen, CHINA;

Assignment For Published Patent Application

SHENZHEN VOXTECH CO., LTD., Shenzhen, CHINA

Power of Attorney: The patent practitioners associated with Customer Number 131839

Domestic Priority data as claimed by applicant

This application is a CON of PCT/CN2019/102397 08/24/2019

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Projected Publication Date: 04/22/2021
Non-Publication Request: No
Early Publication Request: No
Title

LOUDSPEAKER APPARATUS

Preliminary Class

439

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/137,389

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Application Number	
Filing Date	
First Named Inventor	LI, Chaowu
Title	LOUDSPEAKER APPARATUS
Art Unit	
Examiner Name	
Attorney Docket Number	20608-0081US00

SIGNATURE of Applicant or Patent Practitioner

Signature	/Yangzhou Du/	Date (Optional)	
Name	Yangzhou Du	Registration Number	65310
Title (if Applicant is a juristic entity)	Patent Attorney		
Applicant Name (if Applicant is a juristic entity)	SHENZHEN VOXTECH CO., LTD.		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

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I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

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☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 131839

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

SHENZHEN VOXTECH CO., LTD.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Chen Hao	Date (Optional)	2017.6.26
Name	Chen Hao		
Title	General Manager		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
LI, Chaowu et al.

Application No.: *To Be Assigned*
(Continuation of International Application No. PCT/CN2019/102397)

Filed: On even date herewith

For: LOUDSPEAKER APPARATUS

Group Art Unit: *To Be Assigned*

Examiner: *To Be Assigned*

Confirmation No.: *To Be Assigned*

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

PRELIMINARY AMENDMENT UNDER 37 C.F.R. § 1.115

Prior to the examination of the above application, please amend this application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks begin after the Amendments Section.

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated below. This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) A loudspeaker apparatus, comprising:

an ear hook including a first plug end and a second plug end, the ear hook being surrounded by a protective sleeve, the protective sleeve being made of an elastic waterproof material;

a core housing for accommodating an earphone core, the core housing being fixed to the first plug end and elastically abutted against the protective sleeve; and

a circuit housing for accommodating a control circuit or a battery, the circuit housing being fixed to the second plug end, the control circuit or the battery driving the earphone core to vibrate, the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a normal line of the housing panel.

2. (Original) The loudspeaker apparatus of claim 1, wherein the ear hook further includes:

an elastic metal wire;

a wire; and

a fixed sleeve, the fixed sleeve fixing the wire on the elastic metal wire, the protective sleeve being formed, by injection molding, on periphery of the elastic metal wire, the wire, the fixed sleeve, the first plug end, and the second plug end.

3. (Original) The loudspeaker apparatus of claim 2, wherein

the first plug end and the second plug end are formed, by injection molding, at both ends of the elastic metal wire respectively,

the first plug end and the second plug end are arranged with a first wiring channel and a second wiring channel respectively, and

the wire extends along the first wiring channel and the second wiring channel.

4. (Original) The loudspeaker apparatus of claim 3, wherein the wire passes through the first wiring channel and the second wiring channel.

5. (Original) The loudspeaker apparatus of claim 3, wherein

the first wiring channel includes a first wiring groove and a first wiring hole connecting the first wiring groove and an outer end surface of the first plug end,

the wire extends along the first wiring groove and the first wiring hole and is exposed on the outer end surface of the first plug end,

the second wiring channel includes a second wiring groove and a second wiring hole connecting the second wiring groove and the outer end surface of the first plug end, and

the wire extends along the second wiring groove and the second wiring hole and is exposed on the outer end surface of the second plug end.

6. (Original) The loudspeaker apparatus of claim 2, wherein the ear hook includes at least two fixed sleeves spaced apart along the elastic metal wire.

7. (Original) The loudspeaker apparatus of claim 1, wherein

the core housing is arranged with a first socket connecting with an outer end surface of the core housing,

a stopping block is arranged on an inner sidewall of the first socket, and

the first socket is connected to the first plug end.

8. (Original) The loudspeaker apparatus of claim 7, wherein the first plug end includes:

an inserting portion being at least partially inserted into the first socket and abutting against an outer side surface of the stopping block; and

two elastic hooks being arranged on a side of the inserting portion facing inside of the core housing, wherein:

the two elastic hooks are brought together under action of external thrust and the stopping block, and

after passing through the stopping block, the two elastic hooks are elastically restored to be stuck on an inner surface of the stopping block to realize the fixation of the core housing and the first plug end.

9. (Original) The loudspeaker apparatus of claim 8, wherein

the inserting portion is partially inserted into the first socket, and

an exposed part of the inserting portion is arranged in a stepped manner to form an annular table surface spaced apart from the outer end surface of the core housing.

10. (Original) The loudspeaker apparatus of claim 9, wherein

the protective sleeve further extends to a side of the annular table surface facing the outer end surface of the core housing, and

when the core housing and the first plug end are fixed, the protective sleeve elastically abuts against the core housing to realize sealing.

11-12. (Cancelled)

13. (Original) The loudspeaker apparatus of claim 1, wherein the ear hook further includes a housing sheath integrally formed with the protective sleeve, the housing sheath being wrapped around periphery of the circuit housing.

14. (Original) The loudspeaker apparatus of claim 1, wherein

the housing panel and the earphone core are in a transmission connection, and

all or part of the housing panel is used to contact or abut a user's body to conduct a sound generated by the vibration of the earphone core.

15. (Original) The loudspeaker apparatus of claim 14, wherein when a straight line of the driving force has a positive direction pointing to outside of the loudspeaker apparatus from the housing panel and the normal line has a positive direction pointing to the outside of the loudspeaker apparatus, an angle between the two lines in their positive direction is an acute angle.

16. (Original) The loudspeaker apparatus of claim 14, wherein

the earphone core includes a coil and a magnetic circuit system, and

an axis of the coil or the magnetic circuit system is not parallel to the normal line, the axis being perpendicular to a radial plane of the coil or the magnetic circuit system.

17. (Original) The loudspeaker apparatus of claim 14, wherein

the driving force has a component in a first quadrant or a third quadrant of an XOY plane coordinate system, wherein

an origin O of the XOY plane coordinate system is on a contact surface between the loudspeaker apparatus and a human body, an X-axis of the XOY plane coordinate system is parallel to a coronal axis of the human body, a Y-axis of the XOY plane coordinate system is parallel to a sagittal axis of the human body, a positive direction of the X-axis faces outside of the human body, and a positive direction of the Y-axis faces front of the human body.

18. (Cancelled)

19. (Original) The loudspeaker apparatus of claim 1, wherein the earphone core further includes a magnetic circuit component generating a first magnetic field, the magnetic circuit component including:

a first magnetic unit configured to generate a second magnetic field;

a first magnetically conductive unit; and

at least one second magnetic unit, the at least one second magnetic unit surrounding the first magnetic unit and forming a magnetic gap with the first magnetic unit, a magnetic field strength of the first magnetic field in the magnetic gap being greater than a magnetic field strength of the second magnetic field in the magnetic gap.

20. (Original) The loudspeaker apparatus of claim 19, wherein the magnetic circuit component further includes:

a second magnetically conductive unit; and

at least one third magnetic unit being connected to the second magnetically conductive unit and the at least one second magnetic unit.

21. (Original) The loudspeaker apparatus of claim 20, wherein the magnetic circuit component further includes:

at least one fourth magnetic unit being located below the magnetic gap and connected to the first magnetic unit and the second magnetically conductive unit.

22-23. (Cancelled)

24. (Original) The loudspeaker apparatus of claim 20, wherein

the first magnetically conductive unit is connected to the upper surface of the first magnetic unit,

the second magnetically conductive unit includes a bottom plate and a sidewall; and

the first magnetic unit is connected to the bottom plate of the second magnetically conductive unit.

25. (Original) The loudspeaker apparatus of claim 20, further comprising:

at least one electrically conductive unit being connected to at least one unit of the first magnetic unit, the first magnetically conductive unit, or the second magnetically conductive unit.

REMARKS

By the above Amendment, Applicant cancels claims 11-12, 18, and 22-23 without prejudice or disclaimer of the subject matter thereof. No new matter has been introduced. The entry of the amendments is respectfully requested.

Applicant submits that the present Application is in condition for examination and respectfully requests the same. The Examiner is cordially invited to contact Applicant's representative at the number provided below in order to resolve any issues promptly.

Respectfully submitted,

Metis IP LLC

Dated: December 30, 2020

By: /Yangzhou Du/
Yangzhou Du
Registration No. 65,310
Tel.: 202.580.8894 ext. 105

LOUDSPEAKER APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Continuation of International Application No. PCT/CN2019/102397 filed on August 24, 2019, which claims priority of Chinese Patent Application No. 201910009927.4, filed on January 5, 2019, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a loudspeaker apparatus, and in particular, to a loudspeaker apparatus with a waterproof function.

BACKGROUND

[0003] Generally, people can hear the sound because air transmits vibration to the eardrum through the external ear canal, and the vibration formed by the eardrum drives the human auditory nerve, thereby perceiving the sound. At present, earphones are widely used in people's lives. For example, users can use earphones to play music, answer calls, etc. Earphones have become an important item in people's daily life. Ordinary earphones can no longer meet the normal use of users in some special scenes (e.g., swimming, rainy days, etc.). Thus, earphones with waterproof function and better sound quality are more popular with consumers. Therefore, it may be necessary to provide a loudspeaker apparatus with waterproof function and easy to produce and assemble.

SUMMARY

[0004] The embodiments of the present disclosure provide a loudspeaker apparatus. The loudspeaker apparatus may include an ear hook, a core housing, and a circuit housing. The ear hook may include a first plug end and a second plug end. The ear hook may be surrounded by a protective sleeve. The protective sleeve may be made of an elastic waterproof material. The core housing may be used for accommodating an earphone core. The core housing may be fixed to the first plug end and elastically abutted against the protective sleeve. The circuit housing may be used for accommodating a

control circuit or a battery. The circuit housing may be fixed to the second plug end. The control circuit or the battery may drive the earphone core to vibrate. The vibration of the earphone core may generate a driving force to drive a housing panel of the core housing to vibrate. The driving force may be not parallel to a normal line of the housing panel.

[0005] In some embodiments, the ear hook may further include an elastic metal wire, a wire, and a fixed sleeve. The fixed sleeve may fix the wire on the elastic metal wire. The protective sleeve may be formed, by injection molding, on periphery of the elastic metal wire, the wire, the fixed sleeve, the first plug end, and the second plug end.

[0006] In some embodiments, the first plug end and the second plug end may be formed, by injection molding, at both ends of the elastic metal wire respectively. The first plug end and the second plug end may be arranged with a first wiring channel and a second wiring channel respectively. The wire may extend along the first wiring channel and the second wiring channel.

[0007] In some embodiments, the wire may pass through the first wiring channel and the second wiring channel.

[0008] In some embodiments, the first wiring channel may include a first wiring groove and a first wiring hole connecting the first wiring groove and an outer end surface of the first plug end. The wire may extend along the first wiring groove and the first wiring hole and be exposed on the outer end surface of the first plug end. The second wiring channel may include a second wiring groove and a second wiring hole connecting the second wiring groove and the outer end surface of the first plug end. The wire may extend along the second wiring groove and the second wiring hole and be exposed on the outer end surface of the second plug end.

[0009] In some embodiments, the ear hook may include at least two fixed sleeves spaced apart along the elastic metal wire.

[0010] In some embodiments, the core housing may be arranged with a first socket connecting with an outer end surface of the core housing. A stopping block may be

arranged on an inner sidewall of the first socket. The first socket may be connected to the first plug end.

[0011] In some embodiments, the first plug end may include an inserting portion and two elastic hooks.

[0012] In some embodiments, the inserting portion may be at least partially inserted into the first socket and abut against an outer side surface of the stopping block. The two elastic hooks may be arranged on a side of the inserting portion facing inside of the core housing. The two elastic hooks may be brought together under action of external thrust and the stopping block. After passing through the stopping block, the two elastic hooks may be elastically restored to be stuck on an inner surface of the stopping block to realize the fixation of the core housing and the first plug end.

[0013] In some embodiments, the inserting portion may be partially inserted into the first socket. An exposed part of the inserting portion may be arranged in a stepped manner to form an annular table surface spaced apart from the outer end surface of the core housing.

[0014] In some embodiments, the protective sleeve may further extend to a side of the annular table surface facing the outer end surface of the core housing. When the core housing and the first plug end are fixed, the protective sleeve may elastically abut against the core housing to realize sealing.

[0015] In some embodiments, the loudspeaker apparatus may further include a fastener. The circuit housing may be arranged with a second socket and the second plug end may be at least partially inserted into the second socket and connected to the second socket by the fastener.

[0016] In some embodiments, the second plug end may be arranged with a slot perpendicular to an inserting direction of the second socket. A through hole corresponding to a position of the slot may be arranged on a first sidewall of the circuit housing. The fastener may include two parallel pins and a connecting portion for connecting the pins. The pins may be inserted into the slot from outside of the circuit

housing through the through hole to realize the plug and fixation of the circuit housing and the second plug end.

[0017] In some embodiments, the ear hook may further include a housing sheath integrally formed with the protective sleeve. The housing sheath may be wrapped around periphery of the circuit housing.

[0018] In some embodiments, the housing panel and the earphone core may be in a transmission connection. All or part of the housing panel may be used to contact or abut a user's body to conduct a sound generated by the vibration of the earphone core.

[0019] In some embodiments, when a straight line of the driving force has a positive direction pointing to outside of the loudspeaker apparatus from the housing panel and the normal line has a positive direction pointing to the outside of the loudspeaker apparatus, an angle between the two lines in their positive direction may be an acute angle.

[0020] In some embodiments, the earphone core may include a coil and a magnetic circuit system. An axis of the coil or the magnetic circuit system may be not parallel to the normal line. The axis may be perpendicular to a radial plane of the coil or the magnetic circuit system.

[0021] In some embodiments, the driving force may have a component in a first quadrant or a third quadrant of an XOY plane coordinate system. An origin O of the XOY plane coordinate system may be on a contact surface between the loudspeaker apparatus and a human body. An X-axis of the XOY plane coordinate system may be parallel to a coronal axis of the human body. A Y-axis of the XOY plane coordinate system may be parallel to a sagittal axis of the human body. A positive direction of the X-axis may face outside of the human body. A positive direction of the Y-axis may face front of the human body.

[0022] In some embodiments, a region of the housing panel used to contact or abut the user's body may include a flat surface or a quasi-flat surface.

[0023] In some embodiments, the earphone core may further include a magnetic circuit component generating a first magnetic field. The magnetic circuit component may include

a first magnetic unit configured to generate a second magnetic field, a first magnetically conductive unit, and at least one second magnetic unit. The at least one second magnetic unit may surround the first magnetic unit and form a magnetic gap with the first magnetic unit. A magnetic field strength of the first magnetic field in the magnetic gap may be greater than a magnetic field strength of the second magnetic field in the magnetic gap.

[0024] In some embodiments, the magnetic circuit component may further include a second magnetically conductive unit and at least one third magnetic unit being connected to the second magnetically conductive unit and the at least one second magnetic unit.

[0025] In some embodiments, the magnetic circuit component may further include at least one fourth magnetic unit being located below the magnetic gap and connected to the first magnetic unit and the second magnetically conductive unit.

[0026] In some embodiments, the magnetic circuit component may further include at least one fifth magnetic unit being connected to an upper surface of the first magnetically conductive unit.

[0027] In some embodiments, the magnetic circuit component may further include a third magnetically conductive unit being connected to an upper surface of the fifth magnetic unit. The third magnetically conductive unit may be configured to suppress a leakage of a field strength of the first magnetic field.

[0028] In some embodiments, the first magnetically conductive unit may be connected to the upper surface of the first magnetic unit. The second magnetically conductive unit may include a bottom plate and a sidewall. The first magnetic unit may be connected to the bottom plate of the second magnetically conductive unit.

[0029] In some embodiments, the magnetic circuit component may further include at least one electrically conductive unit connected to the first magnetic unit, the first magnetically conductive unit, and/or the second magnetically conductive unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The present disclosure is further described in terms of exemplary embodiments. These exemplary embodiments are described in detail with reference to the drawings. These embodiments are non-limiting exemplary embodiments, in which like reference numerals represent similar structures, and wherein:

[0031] FIG. 1 is a flowchart illustrating an exemplary process for generating auditory sense through a loudspeaker apparatus according to some embodiments of the present disclosure;

[0032] FIG. 2 is an exploded structural diagram of an MP3 player according to some embodiments of the present disclosure;

[0033] FIG. 3 is a partial structural diagram of an ear hook of an MP3 player according to some embodiments of the present disclosure;

[0034] FIG. 4 is a partial enlarged view of part A in FIG.3;

[0035] FIG. 5 is a partial sectional view of an MP3 player according to some embodiments of the present disclosure;

[0036] FIG. 6 is a partial enlarged view of part B in FIG.5;

[0037] FIG. 7 is a partial structural diagram of a core housing according to some embodiments of the present disclosure;

[0038] FIG. 8 is a partial enlarged view of part D in FIG. 7;

[0039] FIG. 9 is a partial sectional view of a core housing according to some embodiments of the present disclosure;

[0040] FIG. 10 is a structural diagram and an application scenario of a bone conductive loudspeaker apparatus according to some embodiments of the present disclosure;

[0041] FIG. 11 is a schematic diagram illustrating a direction of an included angle according to some embodiments of the present disclosure;

[0042] FIG. 12 is a structural diagram of a bone conductive loudspeaker apparatus acting on human skin and bones according to the present disclosure;

[0043] FIG. 13 is a diagram illustrating an angle-relative displacement relationship of a bone conductive loudspeaker apparatus according to some embodiments of the present disclosure;

[0044] FIG. 14 is a schematic diagram illustrating frequency response curves of a bone conductive loudspeaker apparatus in a low-frequency part correspond to different angles θ according to some embodiments in the present disclosure;

[0045] FIG. 15 is a longitudinal section view illustrating a bone conductive loudspeaker apparatus according to some embodiments of the present disclosure;

[0046] FIG. 16 is a longitudinal sectional view illustrating a magnetic circuit component 2100 according to some embodiments of the present disclosure;

[0047] FIG. 17 is a longitudinal sectional view illustrating a magnetic circuit component 2600 according to some embodiments of the present disclosure;

[0048] FIG. 18 is a longitudinal sectional view illustrating a magnetic circuit component 2700 according to some embodiments of the present disclosure;

[0049] FIG. 19 is a longitudinal sectional view illustrating a magnetic circuit component 2900 according to some embodiments of the present disclosure;

[0050] FIG. 20 is a longitudinal sectional view illustrating a magnetic circuit component 3000 according to some embodiments of the present disclosure;

[0051] FIG. 21 is a longitudinal sectional schematic diagram illustrating a magnetic circuit component 3100 according to some embodiments of the present disclosure; and

[0052] FIG. 22 is a schematic diagram illustrating transmitting a sound through air conduction according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

[0053] In the following detailed description, numerous specific details are set forth by way of examples in order to provide a thorough understanding of the relevant disclosure. Obviously, drawings described below are only some examples or embodiments of the present disclosure. Those skilled in the art, without further creative efforts, may apply the

present disclosure to other similar scenarios according to these drawings. It should be understood that the purposes of these illustrated embodiments are only provided to those skilled in the art to practice the application, and not intended to limit the scope of the present disclosure. Unless obviously obtained from the context or the context illustrates otherwise, the same numeral in the drawings refers to the same structure or operation.

[0054] As used in the disclosure and the appended claims, the singular forms “a,” “an,” and “the” may include plural referents unless the content clearly dictates otherwise. In general, the terms “comprise” and “include” merely prompt to include steps and elements that have been clearly identified, and these steps and elements do not constitute an exclusive listing. The methods or devices may also include other steps or elements. The term “based on” is “based at least in part on.” The term “one embodiment” means “at least one embodiment;” the term “another embodiment” means “at least one other embodiment.” Related definitions of other terms will be given in the description below. In the following, without loss of generality, the description of "player", "loud speaking component", "loudspeaker device" or "loudspeaker component" may be used when describing a related technology of sound conduction in the present disclosure. This description is only a form of sound conduction application. For those skilled in the art, "player", "playing device", "loud speaking component", "loudspeaker device" or "hearing aid" may also be replaced with other similar words. In fact, various implementations in the present disclosure may be easily applied to other non-speaker component hearing devices. For example, for those skilled in the art, after understanding the basic principle of the loud speaking component, it may be possible to make various modifications and changes in the form and details of the specific methods and operations of implementing the loud speaking component without departing from the principles. In particular, an environmental sound collection and processing function may be added to the loud speaking component to implement the function of a hearing aid. For example, in the case of using a bone conduction loud speaking component, adding a microphone that may pick up the sound of

a user/wearer's surrounding environment, processing the sound using a certain algorithm and transmit the processed sound (or generated electrical signal) to a loud speaking component of eyeglasses. That is, the bone conduction loud speaking component may be modified to include the function of collecting the environmental sound, and after a certain signal processing, the sound may be transmitted to the user/wearer via the bone conduction loud speaking component, thereby implementing the function of the bone conductive hearing aid. As an example, the algorithm mentioned herein may include noise cancellation, automatic gain control, acoustic feedback suppression, wide dynamic range compression, active environment recognition, active noise reduction, directional processing, tinnitus processing, multi-channel wide dynamic range compression, active howling suppression, volume control, or the like, or any combination thereof.

[0055] FIG.1 is a flowchart illustrating an exemplary process for generating auditory sense through a loudspeaker apparatus according to some embodiments of the present disclosure. The loudspeaker apparatus may transfer sound to an auditory system through bone conduction or air conduction by a built-in loudspeaker, thereby generating an auditory sense. As shown in FIG.1, the process for generating the auditory sense through the loudspeaker apparatus may include operations 101-104.

[0056] In 101, the loudspeaker apparatus may acquire or generate a signal (also referred to as a “sound signal”) containing sound information. In some embodiments, the sound information may refer to a video file or an audio file with a specific data format. The sound information may refer to data or files that may be converted to be sound through specific approaches. In some embodiments, the signal containing the sound information may be obtained from a storage unit of a loudspeaker apparatus itself. In some embodiments, the signal containing the sound information may be obtained from an information generation system, a storage system, or a delivery system other than the loudspeaker apparatus. The signal containing the sound information may be not limited to an electrical signal, and may also include other forms of signals other than the electrical signal, such as an optical

signal, a magnetic signal, and a mechanical signal, or the like. In principle, as long as the signal includes information that may be used to generate sounds by loudspeaker apparatus, the signal may be processed as the sound signal. In some embodiments, the sound signal may not be limited to one signal source, and it may come from a plurality of signal sources. The plurality of signal sources may be independent of or dependent on each other. In some embodiments, manners of generating or transmitting the sound signal may be wired or wireless and may be real-time or time-delayed. For example, the loudspeaker apparatus may receive an electrical signal containing sound information via a wired or wireless connection or may obtain data directly from a storage medium and generate a sound signal. Taking bone conduction technology as an example, components with sound collection function may be added to a bone conductive loudspeaker. The bone conductive loudspeaker may pick up sound from ambient environment and convert mechanical vibration of the sound into an electrical signal. Further, the electrical signal may be processed through an amplifier to meet special requirements. The wired connection may be realized by using including but not limited to metal cables, optical cables, or hybrid cables of metal and optical, such as coaxial cables, communication cables, flexible cables, spiral cables, non-metal sheathed cables, metal sheathed cables, multi-core cables, twisted pair cables, ribbon cables, shielded cables, telecommunications cables, double-stranded cables, parallel twin-core wires, and twisted pairs. Examples described above are only used for illustration purposes. The wired connection may also be realized by using other types of transmission carriers, such as transmission carriers for electrical or optical signal.

[0057] The storage device or storage unit mentioned herein may include a direct attached storage, a network attached storage, a storage area network, and other storage systems. The storage device may include but is not limited to common types of storage devices such as a solid-state storage device (a solid-state drive, a solid-state hybrid hard drive, etc.), a mechanical hard drive, a USB flash drive, a memory stick, a storage card (e.g., CF, SD,

etc.), and other drives (e.g., CD, DVD, HD DVD, Blu-ray, etc.), a random access memory (RAM), a read-only memory (ROM), etc. The RAM may include but is not limited to a decimal counter, a selection tube, a delay line memory, a Williams tube, a dynamic random access memory (DRAM), a static random access memory (SRAM), a thyristor random access memory (T-RAM), a zero capacitive random access memory (Z-RAM), etc. The ROM may include but is not limited to a magnetic bubble memory, a magnetic button line memory, a thin film memory, a magnetic plating line memory, a magnetic core memory, a drum memory, an optical disk driver, a hard disk, a magnetic tape, an early non-volatile memory(NVRAM), a phase change memory, a magneto-resistive random access memory, a ferroelectric random access memory, a non-volatile SRAM, a flash memory, an electronically erasable rewritable read-only memory, an erasable programmable read-only memory, a programmable read-only memory, a shielded heap read memory, a floating connection gate random access memory, a nano random access memory, a racetrack memory, a variable resistance memory, a programmable metallization unit, etc. The storage device/storage unit mentioned above are only used for illustration purposes. The storage medium used in the storage device/storage is not limited.

[0058] In 102, the loudspeaker apparatus may convert the signal containing sound information into vibrations to generate a sound. The loudspeaker apparatus may use a specific transducer to convert the signal into mechanical vibrations accompanying with energy conversion. The conversion process may include multiple types of energy coexistence and conversion. For example, the electrical signal may be directly converted into mechanical vibrations by the transducers to generate a sound. As another example, the sound information may be included in an optical signal, which may be converted into mechanical vibrations by a specific transducer. Other types of energy that may be coexisted and converted when the transducer works may include thermal energy, magnetic field energy, or the like. In some embodiments, an energy conversion manner of the transducer may include but is not limited to, a moving coil type, an electrostatic type, a

piezoelectric type, a moving iron type, a pneumatic type, an electromagnetic type, or the like. A frequency response range and sound quality of the loudspeaker apparatus may be affected by the energy conversion manner and a property of each physical component of the transducer. For example, in a transducer with the moving coil type, a wound cylindrical coil is connected to a vibration plate, the coil driven by a signal current drives the vibration plate to vibrate in the magnetic field, and generate a sound. Factors, such as material expansion and contraction, folds deformation, size, shape, and fixed manner of the vibration plate, the magnetic density of the permanent magnet, etc., may have a large impact on the sound quality of the loudspeaker apparatus.

[0059] The term "sound quality" used herein may indicate the quality of sound, which refers to an audio fidelity after post-processing, transmission, or the like. In an audio device, the sound quality may include audio intensity and magnitude, audio frequency, audio overtone, or harmonic components, or the like. When the sound quality is evaluated, measuring manner and the evaluation criteria for objectively evaluating the sound quality may be used, other manners that combine different elements of sound and subjective feelings for evaluating various properties of the sound quality may also be used. Thus, the sound quality may be affected during the processes of generating the sound, transmitting the sound, and receiving the sound.

[0060] In 103, the sound is delivered by a delivery system. In some embodiments, the delivery system refers to a substance that can deliver vibration signals containing sound information, such as the skull, bony labyrinth, inner ear lymph, and spiral organs of humans or/and animals with auditory systems. As another example, the delivery system also refers to a medium that may transmit sound (e.g., air and liquid). To illustrate the process of transmitting sound information by the delivery system, a bone conductive loudspeaker may be taken as an example. The bone conductive loudspeaker may directly transmit sound waves (vibration signals) converted from electrical signals to an auditory center through bones. In addition, the sound waves may be transmitted to the auditory center

through air conduction. For the content of air conduction, please refer to the description elsewhere in the specification.

[0061] In 104, the sound information is transferred to a sensing terminal. Specifically, the sound information is transmitted to the sensing terminal through the delivery system. In a working scenario, the loudspeaker apparatus picks up or generates a signal containing sound information, converts the sound information into a sound vibration by the transducer. The loudspeaker apparatus transmits the sound to the sensing terminal through the delivery system, and finally a user can hear the sound. Generally, the subject of the sensing terminal, the auditory system, the sensory organ, etc. described above may be a human or an animal with an auditory system. It should be noted that the following description of the loudspeaker apparatus used by a human does not constitute a restriction on the use scene of the loudspeaker apparatus, and similar descriptions may also be applied to other animals.

[0062] The above description of the process of the loudspeaker apparatus is only a specific example and should not be regarded as the only feasible implementation. Obviously, for persons having ordinary skills in the art, after understanding the basic principle of the loudspeaker apparatus, various modifications and changes may be made in the form and details to the specific ways and steps of implementing the loudspeaker apparatus without departing from the principle. However, those modifications and changes are still within the scope of the present disclosure. For example, between acquiring a signal containing sound information in operation 101 and generating sound in operation 102, a signal correction or enhancement step may be additionally added, which may enhance or modify the signal acquired in operation 101 according to a specific algorithm or parameter. Furthermore, between generating sound in operation 102 and transmitting sound in operation 103, an enhancement or a correction step of the vibration may be additionally added.

[0063] The loudspeaker apparatus in the specification of the present disclosure may include, but is not limited to, an earphone, an MP3 player, and a hearing aid. In the following specific embodiments of the present disclosure, an MP3 player is taken as an example to describe the loudspeaker apparatus in detail. FIG. 2 is an exploded structural diagram of an MP3 player according to some embodiments of the present disclosure. FIG. 3 is a partial structural diagram of an ear hook in an MP3 player according to some embodiments of the present disclosure. FIG. 4 is an enlarged view of part A in FIG. 3. As shown in FIG. 1, in some embodiments, an MP3 player may include an ear hook 10, a core housing 20, a circuit housing 30, a rear hook 40, an earphone core 50, a control circuit 60, and a battery 70. The core housing 20 and the circuit housing 30 are arranged at two ends of the ear hook 10 respectively, and the rear hook 40 is further arranged at an end of the circuit housing 30 away from the ear hook 10. The number of the core housings 20 is two, which are used to accommodate two earphone cores 50 respectively. The number of the circuit housings 30 is also two, which are used to accommodate the control circuit 60 and the battery 70 respectively. The two ends of the rear hook 40 are connected to the corresponding circuit housings 30 respectively. The ear hook 10 refers to a structure surrounding and supporting a user's ear when the user wears a bone conductive MP3 player, and then suspending and fixing the core housing 20 and the earphone core 50 at a predetermined position of the user's ear.

[0064] Combining FIG. 2, FIG. 3, and FIG. 4, in some embodiments, the ear hook 10 may include an elastic metal wire 11, a wire 12, a fixed sleeve 13, a plug end 14, and a plug end 15. The plug end 14 and the plug end 15 may be arranged at both ends of the elastic metal wire 11. In some embodiments, the ear hook 10 may further include a protective sleeve 16 and a housing sheath 17 integrally formed with the protective sleeve 16. The elastic metal wire 11 is mainly used to keep the ear hook 10 in a shape that matches the user's ear. The elastic metal wire 11 has a certain elasticity, so as to generate a certain elastic deformation according to the user's ear shape and head shape to adapt to users

with different ear shapes and head shapes. In some embodiments, the elastic metal wire 11 may be made of a memory alloy, which has good deformation recovery ability. Thus, even if the ear hook 10 is deformed by an external force, it may still be restored to its original shape when the external force is removed, and continue to be used by users, thereby extending the life of the MP3 player. In other embodiments, the elastic metal wire 11 may also be made of a non-memory alloy. The wire 12 may be used for electrical connection with the earphone core 50, the control circuit 60, the battery 70, etc. for power supply and data transmission for the operation of the earphone core 50.

[0065] The fixed sleeve 13 may be used to fix the wire 12 on the elastic metal wire 11. In this embodiment, there are at least two fixed sleeves 13. The at least two fixed sleeves 13 may be spaced apart along the elastic metal wire 11 and the wire 12, and arranged on the outer periphery of the wire 12 and the elastic metal wire 11 by wrapping to fix the wire 12 on the elastic metal wire 11.

[0066] In some embodiments, the plug end 14 and the plug end 15 may be made of hard materials, such as plastic. In some embodiments, the plug end 14 and the plug end 15 may be formed respectively on both ends of the elastic metal wire 11 by injection molding. In some embodiments, the plug end 14 and the plug end 15 may be formed by injection molding separately. Connection holes to connect with the end of the elastic metal wire 11 are respectively reserved during the injection molding of the plug end 14 and the plug end 15. After the injection molding is completed, the plug end 14 and the plug end 15 may be inserted into the corresponding ends of the elastic metal wire 11 respectively by the connection holes or fixed by bonding.

[0067] It should be noted that, in this embodiment, the plug end 14 and the plug end 15 may not be directly formed by injection molding on the periphery of the wire 12, which avoids the wire 12 during injection molding. Specifically, when the plug end 14 and the plug end 15 are injection molded, the wire 12 located at both ends of the elastic metal wire 11 may be fixed to be far away from the position of the plug end 14 and the plug end 15.

Further, a first wiring channel 141 and a second wiring channel 151 may be arranged respectively on the plug 14 and the plug end 15 to extend the wire 12 along the first wiring channel 141 and the second wiring channel 151 after the injection molding. Specifically, the wire 12 may be threaded into the first wiring channel 141 and the second wiring channel 151 in a threading way after the first wiring channel 141 and the second wiring channel 151 are formed. In some embodiments, the plug end 14 and the plug end 15 may be directly injection molded on the periphery of the wire 12 according to actual conditions, which is not specifically limited herein.

[0068] In some embodiments, the first wiring channel 141 may include a first wiring groove 1411 and a first wiring hole 1412 connecting with the first wiring groove 1411. The first wiring groove 1411 may be connected with the sidewall of the plug end 14. One end of the first wiring hole 1412 may be connected with one end of the first wiring groove 1411 and another end of the first wiring hole 1412 may be connected with the outer end surface of the plug end 14. The wire 12 at the plug end 14 may extend along the first wiring groove 1411 and the first wiring hole 1412 and be exposed on the outer end surface of the plug end 14 to further connect with other structures.

[0069] In some embodiments, the second wiring channel 151 may include a second wiring groove 1511 and a second wiring hole 1512 connecting with the second wiring groove 1511. The second wiring groove 1511 may be connected with the sidewall of the plug end 15, one end of the second wiring hole 1512 may be connected with one end of the second wiring groove 1511, and another end of the second wiring hole 1512 may be connected with the outer end surface of the plug end 15. The wire 12 at the plug end 15 may extend along the second wiring groove 1511 and the second wiring hole 1512 and be exposed on the outer end surface of the plug end 15 to further connect to other structures.

[0070] In some embodiments, the outer end surface of the plug end 14 refers to the surface of the end of the plug end 14 away from the plug end 15. The outer end surface

of the plug end 15 refers to the surface of the end of the plug end 15 away from the plug end 14.

[0071] In some embodiments, the protective sleeve 16 may be injection molded around periphery of the elastic metal wire 11, the wire 12, the fixed sleeve 13, the plug end 14, and the plug end 15. Thus, the protective sleeve 16 may be fixedly connected with the elastic metal wire 11, the wire 12, the fixed sleeve 13, the plug end 14, and the plug end 15 respectively. There is no need to form the protective sleeve 16 separately by injection molding and then further wrap protective sleeve 16 around the periphery of the elastic metal wire 11, the plug end 14, and the plug end 15. It may simplify the manufacturing and assembly processes and make the fixation of the protective sleeve 16 more reliable and stable.

[0072] In some embodiments, when the protective sleeve 16 is formed, a housing sheath 17 disposed on the side close to the plug end 15 may be integrally formed with the protective sleeve 16. In some embodiments, the housing sheath 17 may be integrally formed with the protective sleeve 16 to form a whole structure. The circuit housing 30 may be connected to one end of the ear hook 10 by being fixedly connected to the plug end 15. The housing sheath 17 may be further wrapped around the periphery of the circuit housing 30 in a sleeved manner.

[0073] Specifically, when manufacturing the ear hook 10 of the MP3 player, the following steps may be implemented.

[0074] Step S101, the fixed sleeve 13 may be used to fix the wire 12 on the elastic metal wire 11. An injection position is reserved at both ends of the elastic metal wire 11. Specifically, the elastic metal wire 11 and the wire 12 may be placed side by side in a preset way, and then the fixed sleeve 13 is further sleeved around the wire 12 and the elastic metal wire 11, so as to fix the wire 12 on the elastic metal wire 11. Since the two ends of the elastic metal wire 11 still need the injection molded plug end 14 and the plug end 15, the two ends of the elastic metal wire 11 may not be completely wrapped by the

fixed sleeve 13. A corresponding injection position needs to be reserved for injection molding of the plug end 14 and the plug end 15.

[0075] Step S102, the plug end 14 and the plug end 15 may be injection molded at the injection positions of the two ends of the elastic metal wire 11, respectively. The first wiring channel 141 and the second wiring channel 151 are arranged on the plug end 14 and the plug end 15, respectively.

[0076] Step S103, the wire 12 may be arranged to extend along the first wiring channel 141 and the second wiring channel 151. Specifically, after the forming of the plug end 14 and the plug end 15 is completed, the two ends of the wire 12 may be further threaded into the first wiring channel 141 and the second wiring channel 151 manually or by a machine. The part of the wire 12 located between the first wiring channel 141 and the second wiring channel 151 may be fixed on the elastic metal wire 11 by the fixed sleeve 13.

[0077] Step S104, the protective sleeve 16 may be formed by injection molding on the periphery of the elastic metal wire 11, the wire 12, the fixed sleeve 13, the plug end 14, and the plug end 15.

[0078] In some embodiments, when step S104 is performed, the housing sheath 17 may be integrally formed with the protective sleeve 16 on the periphery of the plug end 15 by injection molding.

[0079] In some embodiments, it should be noted that the wire 12 may not be arranged when the fixed sleeve 13 is installed. The wire 12 may be further arranged after the plug end 14 and the plug end 15 are injection molded. The specific steps are as follows.

[0080] Step S201, the fixed sleeve 13 may be sleeved on the elastic metal wire 11. The injection molding positions may be reserved at both ends of the elastic metal wire 11.

[0081] Step S202, the plug end 14 and the plug end 15 may be injection molded at the injection positions of the two ends of the elastic metal wire 11, respectively. The first wiring channel 141 and the second wiring channel 151 may be arranged on the plug end 14 and the plug end 15, respectively.

[0082] Step S203, the wire 12 may be threaded inside the fixed sleeve 13, so as to use the fixed sleeve 13 to fix the wire 12 on the elastic metal wire 11. Further, the wire 12 may be arranged to extend along the first wiring channel 141 and the second wiring channel 151.

[0083] It should be noted that, in this way, interference of the wire 12 may be avoided during injection molding of the plug end 14 and the plug end 15, so as to facilitate the smooth progress of molding.

[0084] It should be noted that the structure, function, and formation of the elastic metal wire 11, the wire 12, the fixed sleeve 13, the plug end 14, the plug end 15, and the protective sleeve 16 involved in the embodiment set forth above are the same as those in the foregoing embodiment, and for related details, please refer to the foregoing embodiment, which are not repeated herein.

[0085] In some embodiments, the core housing 20 may be used to accommodate the earphone core 50 and may be plugged and fixed with the plug end 14. The number of the earphone cores 50 and the core housings 20 are both two, corresponding to the left ear and the right ear of the user, respectively.

[0086] In some embodiments, the core housing 20 and the plug end 14 may be connected by plugging, clamping, etc., so as to fix the core housing 20 and the ear hook 10 together. That is, in this embodiment, the ear hook 10 and the core housing 20 may be formed separately first, and then be assembled together, instead of directly forming the two together.

[0087] In this way, the ear hook 10 and the core housing 20 may be molded separately with corresponding molds instead of using the same larger-sized mold to form the two integrally, which may reduce the size of the mold and the difficulty of mold process. In addition, since the ear hook 10 and the core housing 20 are processed by different molds, when the shape or structure of the ear hook 10 or the core housing 20 needs to be adjusted in the manufacturing process, it is sufficient to adjust the mold corresponding to

the structure instead of adjusting the mold of another structure, so as to reduce the cost of production. In other embodiments, the ear hook 10 and the core housing 20 may be integrally formed according to the situation.

[0088] In some embodiments, the core housing 20 may be arranged with a socket 22 connecting with the outer end surface 21 of the core housing 20. The outer end surface 21 of the core housing 20 refers to the end surface of the core housing 20 facing the ear hook 10. The socket 22 provides an accommodating space for the plug end 14 of the ear hook 10 to be inserted into the core housing 20, so as to further realize the plug and fixation between the plug end 14 and the core housing 20.

[0089] FIG. 5 is a partial sectional view of an MP3 player according to some embodiments of the present disclosure. FIG. 6 is a partial enlarged view of part B in FIG. 5.

[0090] Combining FIG. 2, FIG. 5, and FIG. 6, in some embodiments, the plug end 14 may include an inserting portion 142 and two elastic hooks 143. Specifically, the inserting portion 142 may be at least partially inserted into the socket 22 and abut against the outer side surface 231 of a stopping block 23. The shape of the outer sidewall of the inserting portion 142 matches the shape of the inner sidewall of the socket 22, so that the outer sidewall of the inserting portion 142 may abut against the inner sidewall of the socket 22 when the inserting portion 142 is at least partially inserted into the socket 22.

[0091] The outer side surface 231 of the stopping block 23 refers to a side of the stopping block 23 facing the ear hook 10. The inserting portion 142 may further include an end surface 1421 facing the core housing 20. The end surface 1421 may match the outer side surface 231 of the stopping block 23, so that the end surface 1421 of the inserting portion 142 may abut against the outer side surface 231 of the stopping block 23 when the inserting portion 142 is at least partially inserted into the socket 22.

[0092] In some embodiments, the two elastic hooks 143 may be arranged side by side and spaced apart symmetrically on the side of the inserting portion 142 facing the inside of the core housing 20 along the direction of insertion. The two elastic hooks 143 may be

brought together under action of external thrust and the stopping block 23. After passing through the stopping block 23, the two elastic hooks 143 may be elastically restored to be stuck on an inner surface of the stopping block 23 to realize the fixation of the core housing 20 and the plug end 14. Each elastic hook 143 may include a beam portion 1431 and a hook portion 1432. The beam portion 1431 may be connected to the side of the inserting portion 142 facing the core housing 20. The hook portion 1432 may be arranged on the beam portion 1431 away from the inserting portion 142 and extend perpendicular to the inserted direction. Each hook portion 1432 may be arranged with a side parallel to the inserted direction and a transitional slope 14321 away from the inserting portion 142.

[0093] In some embodiments, after the core housing 20 and the plug end 14 are plugged and fixed, the inserting portion 142 may be partially inserted into the socket 22. The exposed portion of the inserting portion 142 may be arranged in a stepped manner, so as to form an annular table surfaces 1422 spaced apart from the outer end surface 21 of the core housing 20. The exposed portion of the inserting portion 142 refers to the portion of the inserting portion 142 exposed to the core housing 20. Specifically, the exposed portion of the inserting portion 142 refers to the portion exposed to the core housing 20 and close to the outer end surface of the core housing 20.

[0094] In some embodiments, the annular table surface 1422 may be arranged opposite to the outer end surface 21 of the core housing 20. The spacing between the two may refer to the spacing along the direction of insertion and the spacing perpendicular to the direction of insertion.

[0095] In some embodiments, the protective sleeve 16 may extend to the side of the annular table surface 1422 facing the outer end surface 21 of the core housing 20. When the socket 22 and the plug end 14 of the core housing 20 is plugged and fixed, the protective sleeve 16 may be at least partially filled in the space between the annular table surface 1422 and the outer end surface 21 of the core housing 20, and elastically abut against the core housing 20. Thus, it is difficult for external liquid to enter the inside of the

core housing 20 from the junction between the plug end 14 and the core housing 20, thereby realizing the sealing between the plug end 14 and the socket 22, protecting the earphone core 50, etc. inside the core housing 20, and improving the waterproof effect of the bone conductive MP3 player.

[0096] Specifically, in some embodiments, the protective sleeve 16 forms an annular abutting surface 161 on the outer end surface 21 of the annular table surface 1422 facing the outer end surface of the core housing 20. The annular abutting surface 161 may be the end surface of the protective sleeve 16 facing the core housing 20.

[0097] In some embodiments, the protective sleeve 16 may further include an annular boss 162 locating inside the annular abutting surface 161 and protruding from the annular abutting surface 161. Specifically, the annular boss 162 may be formed on the side of the annular abutting surface 161 facing the plug end 14, and be protrudingly arranged toward the core housing 20 relative to the annular abutting surface 161. Further, the annular boss 162 may also be directly formed on the periphery of the annular table surface 1422 and cover the annular table surface 1422.

[0098] In some embodiments, the core housing 20 may include a connecting slope 24 for connecting the outer end surface 21 of the core housing 20 and the inner sidewall of the socket 22. The connecting slope 24 may be the transitional surface between the outer end surface 21 of the core housing 20 and the inner sidewall of the socket 22. The connecting slope 24 may be not on the same plane as the outer end surface 21 of the core housing 20 and the inner sidewall of the socket 22. In some embodiments, the connecting slope 24 may be a flat surface, or may also be a curved surface or other shapes according to actual requirements, there is no specific limitation herein.

[0099] Specifically, when the core housing 20 and the plug end 14 are plugged and fixed, the annular abutting surface 161 and the annular boss 162 may elastically abut against the outer end surface of the core housing 20 and the connecting slope 24, respectively. It should be noted that since the outer end surface 21 of the core housing 20 and the

connecting slope 24 are not on the same plane, the elastic abutment between the protective sleeve 16 and the core housing 20 may be not on the same plane. Thus, it is difficult for external liquid to enter the core housing 20 from the junction of the protective sleeve 16 and the core housing 20, and further enter the earphone core 50, so as to improve the waterproof effect of the MP3 player, protect the inner functional structure, and extend the lifetime of the MP3 player.

[0100] In some embodiments, the inserting portion 142 may be further formed with an annular groove 1423 adjacent to the annular table surface 1422 on the side of the annular table surface 1422 facing the outer end surface 21 of the core housing 20. The annular boss 162 may be formed in the annular groove 1423.

[0101] In some embodiments, an end of the wire 12 of the ear hook 10 arranged outside the core housing 20 may pass through the second wiring channel 151 to connect the circuits outside the core housing 20, such as the control circuit 60, the battery 70, etc. included in the circuit housing 30. Another end of the wire 12 may be exposed to the outer end surface of the plug end 14 along the first wiring channel 141, and further enter the core housing 20 through the socket 22 along with the inserting portion 142.

[0102] FIG. 7 is a partial structural diagram of the core housing according to some embodiments of the present disclosure. FIG. 8 is a partial enlarged view of part D in FIG. 7. FIG. 9 is a partial sectional view of a core housing according to some embodiments of the present disclosure.

[0103] Combing FIG. 2, FIG. 7, FIG. 8, and FIG. 9, in some embodiments, the core housing 20 may include a main housing 25 and a partition component 26. The partition component 26 may be arranged inside the main housing 25 and connected to the main housing 25, so as to divide the inner space 27 of the main housing 25 into a first accommodating space 271 and a second accommodating space 272 on the side close to the socket 22. In some embodiments, the main housing 25 may include a peripheral sidewall 251 and a bottom wall 252 connected to one end surface of the peripheral sidewall

251. The peripheral sidewall 251 and the bottom wall 252 jointly form the inner space 27 of the main housing.

[0104] The partition component 26 may be arranged on the side of the main housing 25 close to the socket 22 and include a side partition 261 and a bottom partition 262. The side partition 261 may be arranged in a direction perpendicular to the bottom wall 252 and both ends of the side partition 261 may be connected with the peripheral sidewall 251, thereby separating the inner space 27 of the main housing 25. The bottom partition 262 and the bottom wall 252 may be parallel or nearly parallel and spaced apart. Further, the bottom partition 262 and the bottom wall 252 may be connected to the peripheral side wall 251 and the side partition 261, respectively. Thus, the inner space 27 formed by the main housing 25 may be divided into two to form the first accommodating space 271 surrounded by the side partition 261, the bottom partition 262, the peripheral sidewall 251 away from the socket 22, and the bottom wall 252, and the second accommodating space 272 surrounded by the bottom partition 262, the side partition 261, and the peripheral sidewall 251 close to the socket 22. The second accommodating space 272 may be smaller than the first accommodating space 271. The partition component 26 may also divide the inner space 27 of the main housing 25 by other arrangements, which are not specifically limited herein.

[0105] In some embodiments, the earphone core may include a functional component 51 that may be arranged in the first accommodating space 271 and used for vibrating and generating sound. In some embodiments, the MP3 player may further include a wire 80 connected to the functional component 51. An end of the wire 80 may be extended from the first accommodating space 271 to the second accommodating space 272.

[0106] In some embodiments, the side partition 261 may be arranged with a wiring groove 2611 at the top edge away from the bottom wall 252. The wiring groove 2611 may connect the first accommodation space 271 and the second accommodation space 272.

Further, an end of the wire 12 away from the functional component may extend into the second accommodating space 272 through the wire groove 2611.

[0107] After the end of the wire 12 away from the circuit housing 30 entering the core housing 20 with the inserting portion 142, the end of the wire 12 may further extend into the second accommodating space 272 and be electrically connected to the wire 80 in the second accommodating space 272, so that a wire path connecting the first accommodating space 271 to an external circuit through the second accommodating space 272 may be formed. Thus, the functional component 51 may be electrically connected to the external circuit arranged outside the core housing 20 through the wire path.

[0108] In some embodiments, the bottom partition 262 may also be arranged with a wiring hole 2621, which connects the socket 22 with the second accommodating space 272, so that the wire 12 entering the core housing from the socket 22 may extend to the second accommodating space 272 through the wiring hole 2621.

[0109] The wire 12 and the wire 80 may be coiled and arranged in the second accommodating space 272 after being connected in the second accommodating space 272. Specifically, the wire 12 and the wire 80 may be connected together by welding. Further, the functional component 51 may be electrically connected to the external circuit, so as to provide power for the normal operation of the functional component 51 through the external circuit or transmit data to the earphone core 50.

[0110] It should be noted that when assembling the bone conductive MP3 player, the wire is often longer than the actual requirement to facilitate assembly. However, if the extra wires of the earphone core 50 may not be placed reasonably, it is easy to vibrate and make abnormal noises when the functional component 51 is working, thereby reducing the sound quality of the bone conductive MP3 player and affecting the user's experience of listening. In this embodiment, the second accommodating space 272 may be separated from the inner space 27 formed by the main housing 25 of the core housing 20 and used for accommodating extra wires 12 and wires 80, so as to avoid or reduce the influence of the

extra wires on the sound generated by the bone conductive MP3 player due to vibration, thereby improving the sound quality.

[0111] In some embodiments, the partition component 26 may further include an inner partition 263. The inner partition 263 may further divide the second accommodating space 272 into two sub-accommodating spaces 2721. Specifically, the inner partition 263 may be arranged perpendicular to the bottom wall 252 of the main housing 25 and connected to the side partition 261 and the peripheral sidewall 251 respectively, and further extend to the wiring hole 2621, so as to divide the wiring hole 2621 into two, while dividing the second accommodating space 272 into two sub-accommodating spaces 2721. Each of the two wiring holes 2621 may be connected with a corresponding sub-accommodating space 2721 respectively.

[0112] In this embodiment, there are two wires 12 and two wires 80. The two wires 12 may extend into respective sub-accommodating spaces 2721 along the corresponding wiring holes 2621 respectively. The two wires 80 may enter the second accommodating space 272 through the wiring groove 2611 together, separate after entering the second accommodating space 272, be welded with the corresponding wires 12 in the corresponding sub-accommodating spaces 2721 respectively, and further be coiled and arranged in the corresponding sub-accommodating space 2721.

[0113] In some embodiments, the second accommodating space 272 may be further filled with sealant. In this way, the wire 12 and the wire 80 included in the second accommodating space 272 may be further fixed, which may reduce the adverse effect on the sound quality caused by the vibration of the wire, improve the sound quality of the bone conductive MP3 player, and protect the welding point between the wire 12 and the wire 80. In addition, the purpose of waterproof and dustproof may also be achieved by sealing the second accommodating space 272.

[0114] Referring to FIG. 2 and FIG. 3, in some embodiments, the circuit housing 30 and the plug end 15 may be plugged and fixed, so that the circuit housing 30 may be fixed to

the end of the ear hook 10 away from the core housing 20. When worn by the user, the circuit housing 30 including the battery 70 and the circuit housing 30 including the control circuit 60 may correspond to the left and right side of the user, respectively. The way of plug and connection of the circuit housing 30 and the control circuit 60 may be different from the corresponding plug end 15.

[0115] Specifically, the circuit housing 30 may be connected to the plug end 15 through plug and connection, snap connection, or the like. In other words, in this embodiment, the ear hook 10 and the circuit housing 30 may be formed separately, and then be assembled after the form is completed, instead of directly forming the two together.

[0116] In this way, the ear hook 10 and the circuit housing 30 may be molded separately with respective corresponding molds, instead of using the same larger-sized mold to form the two integrally, which may reduce the size of the molding mold and the difficulty of mold process. In addition, since the ear hook 10 and the circuit housing 30 are processed by different molds, when the shape or structure of the ear hook 10 or the circuit housing 30 needs to be adjusted in the manufacturing process, it is sufficient to adjust the mold corresponding to the structure. There is no need to adjust the mold corresponding to another structure, so as to reduce the cost of production.

[0117] In some embodiments, the circuit housing 30 may be arranged with a socket 31. The shape of the inner surface of the socket 31 may match the shape of at least part of the outer end surface of the plug end 15, so that the plug end 15 may be at least partially inserted into the socket 31.

[0118] Further, a slot 152 perpendicular to the inserted direction of the plug end 15 with respect to the socket 31 may be arranged on opposite sides of the plug end 15, respectively. Specifically, the two slots 152 may be symmetric and spaced apart on opposite sides of the plug end 15, and both are connected to the sidewall of the plug end 15 in the vertical direction along the inserted direction.

[0119] Referring to FIG. 2, the circuit housing 30 may be flat. For example, the cross-section of the circuit housing 30 at the second socket 31 may be elliptical or other shapes that may be flattened. In this embodiment, the two opposite sidewalls of the circuit housing 30 with a larger area are main sidewalls 33 and the two opposite sidewalls with a smaller area connecting the two main sidewalls 33 are auxiliary sidewalls 34.

[0120] It should be noted that the above description of the MP3 player is only a specific example and should not be regarded as the only feasible implementation solution. Obviously, for those skilled in the art, after understanding the basic principles of the MP3 player, various modifications and changes in forms and details of the specific methods and steps for implementing the MP3 player may be made without departing from the principles. However, those modifications and changes are still within the scope described above. For example, the number of the fixed sleeves 13 is not limited to the at least two described in the embodiments set forth above. The number of the fixed sleeves 13 may also be one, which may be specifically determined according to actual requirements. As another example, the shape of the cross-section of the circuit housing 30 at the socket 31 is not limited to be elliptical. The shape of the cross-section may also be other shapes, such as a triangle, a quadrilateral, a pentagon, and other polygons. Such modifications are all within the protection scope of the present disclosure.

[0121] FIG. 10 is a structural diagram and an application scenario of a bone conductive loudspeaker according to some embodiments of the present disclosure. Please refer to FIG.10 and FIG.2. The housing 1004 in FIG.10 may be equivalent to the core housing 20 in FIG.2 and the driving device 1001 in FIG.10 may be equivalent to the earphone core 50 in FIG.2. In the following, the bone conductive loudspeaker only is used as an example to describe the application scenario and structure of the loudspeaker apparatus. In some embodiments, as shown in FIG.10, the bone conductive loudspeaker may include a driving device 1001, a transmission component 1002, a panel 1003 (the panel 1003 may also be referred to as a housing panel, which is the side of the core housing 20 facing the human

body), and a housing 1004, etc. In some embodiments, the housing 1004 may include a housing back and a housing side. The panel 1003 may be connected with the housing back and the housing side. The driving device 1001 may transmit the vibrating signal to the panel 1003 and/or the housing 1004 through the transmission component 1002, and further transmit the sound to the human body by contacting with the panel 1003 or the housing 1004 and human skin. In some embodiments, the panel 1003 and/or the housing 1004 of the bone conductive loudspeaker may be in contact with human skin at the tragus, so as to transmit sound to the human body. In some embodiments, the panel 1003 and/or the housing 1004 may also be in contact with human skin on the backside of the auricle.

[0122] In some embodiments, a straight line B (or a vibrating direction of a driving device) of a driving force generated by the driving component 1001 and a normal line A of the panel 1003 may form an angle θ. In other words, the straight line B is not parallel to the normal line A.

[0123] The panel has an area that contacts or abuts the user's body, such as human skin. It should be understood that when the panel is covered with other materials (such as silicone and other soft materials) to enhance the user's wearing comfortability, the panel and the user's body are not in direct contact, but abut against each other. In some embodiments, when the bone conductive loudspeaker is worn on the user's body, the whole area of the panel contacts or abuts the user's body. In some embodiments, when the bone conductive loudspeaker is worn on the user's body, a part of the panel contacts or abuts the user's body. In some embodiments, the area of the panel contacting or abutting the user's body may account for more than 50% of the entire area of the panel. More preferably, it may account for more than 60% of the entire area of the panel. In general, the area of the panel contacting or abutting the user's body may be flat or curved.

[0124] In some embodiments, when the area of the panel contacting or abutting the user's body is a flat surface, its normal line meets the general definition, that is, a dashed line perpendicular to the flat surface. In some embodiments, when the area contacting or

abutting the user's body of the panel is a curved surface, its normal line is the average normal line of the area, wherein, the average normal line is defined as follows:

$$\hat{r}_0 = \frac{\oiint_S \hat{r}\, ds}{\left|\oiint_S \hat{r}\, ds\right|} \quad (1),$$

where, $\hat{r}_0$ refers to the average normal line; $\hat{r}$ refers to the normal line of any point on the curved surface; ds refers to a surface unit.

[0125] Further, the curved surface is a quasi-flat surface that is close to the flat surface. That is, the curved surface is a surface that an angle between a normal line of any point of at least 50% of the area on the curved surface and the average normal line is less than a set threshold. In some embodiments, the set threshold may be less than 10°. In some embodiments, the set threshold may be less than 5°.

[0126] In some embodiments, the straight line B of the driving force and the normal line A' of the area of the panel 1003 for contacting or abutting the user's body may form the angle θ. A value range of the angle θ may be $0<\theta<180°$. Further, the value range may be $0<\theta<180°$ and not equal to 90°. In some embodiments, it is assumed that the straight line B has a positive direction pointing to the outside of the bone conductive loudspeaker, and the normal line A of the panel 1003 (or the normal line A' of a contact surface of the panel 1003 and the human skin) also has a positive direction pointing to the outside of the bone conductive loudspeaker. Thus, the angle θ formed by the normal line A or A' and the straight line B in the positive direction is an acute angle, that is, $0<\theta<90°$. More descriptions about the normal line A and A' may be found in FIG. 12 and the descriptions thereof.

[0127] FIG. 11 is a schematic diagram illustrating a direction of an included angle according to some embodiments of the present disclosure. As shown in FIG. 11, in some embodiments, a driving force generated by a driving device has a component in a first quadrant and/or a third quadrant of a XOY plane coordinate system. As used herein, the XOY plane coordinate system is a reference coordinate system whose origin O is located on a contact surface between the panel and/or the housing and the human body after the

bone conductive loudspeaker is worn on the human body. The X axis is parallel to the coronal axis of the human body, the Y axis is parallel to the sagittal axis of the human body, and the positive direction of the X axis faces the outside of the human body, the positive direction of the Y axis faces the front of the human body. Quadrants should be understood as four regions divided by the horizontal axis (such as X axis) and the vertical axis (such as Y axis) in a rectangular coordinate system. Each region is a quadrant. The quadrant is centered at the origin, and the X axis and Y axis are the dividing lines. The upper right region (the region enclosed by the positive half axis of the X axis and the positive half axis of the Y axis) is the first quadrant, the upper left region (the region enclosed by the negative half axis of the X axis and the positive half axis of the Y axis) is the second quadrant, the lower left region (the region enclosed by the positive half axis of the X axis and the negative half axis of the Y axis) is the third quadrant, and the lower right region (the region enclosed by the positive half axis of the X axis and the negative half axis of the Y axis) is the fourth quadrant. The points on the X axis and the Y axis do not belong to any quadrant. It should be understood that the driving force in the embodiment may be directly located in the first quadrant and/or the third quadrant of the XOY plane coordinate system, or the driving force may point to other directions, but the projection or component in the first quadrant and/or the third quadrant is not equal to 0 in the XOY plane coordinate system, and the projection or component in a direction of a Z axis may be equal to 0 or not equal to 0. As used herein, the Z axis is perpendicular to the XOY plane and passes through the origin O. In some embodiments, the angle θ between the straight line of the driving force and the normal line of the area contacting or abutting the user's body of the panel may be any acute angle, for example, the range of the angle θ is 5°~80°. More preferably, the range is 15°~70°. More preferably, the range is 25°~60°. More preferably, the range is 25°~50°. More preferably, the range is 28°~50°. More preferably, the range is 30°~39°. More preferably, the range is 31°~38°. More preferably, the range is 32°~37°. More preferably, the range is 33°~36°. More

preferably, the range is 33°~35.8°. More preferably, the range is 33.5°~35°. Specifically, the angle θ may be 26°, 27°, 28°, 29°, 30°, 31°, 32°, 33°, 34°, 34.2°, 35°, 35.8°, 36°, 37°, 38°, etc., wherein the error is controlled within 0.2°. It should be noted that the illustrations of the driving force direction described above should not be interpreted as a limitation of the driving force in the present disclosure. In other embodiments, the driving force may also have component in the second and fourth quadrants of the XOY plane coordinate system, even the driving force may be located on the Y axis, or the like.

[0128] FIG. 12 is a structural diagram of a bone conductive loudspeaker acting on human skin and bones according to the present disclosure.

[0129] In some embodiments, the straight line of the driving force is collinear or parallel to the straight line of the vibration of the driving device. For example, in a driving device based on the moving-coil principle, the direction of the driving force may be the same as or opposite to the vibrating direction of the coil and/or the magnetic circuit component. The panel may have a flat surface or curved surface, or there are a plurality of protrusions or grooves on the panel. In some embodiments, when the bone conductive loudspeaker is worn on the user's body, the normal line of the area contacting or abutting the user's body of the panel is not parallel to the straight line of the driving force. In general, the area contacting or abutting the user's body of the panel is flat relatively. Specifically, it may have a flat surface or a quasi-flat plane with little curvature. When the area contacting or abutting the user's body of the panel has a flat surface, the normal line of any point on it may be the normal line of the area. At this time, the normal line A of the panel 1003 may be parallel or coincident to the normal line A' of the contact surface between the panel 1003 and human skin. When the panel used to contact the user's body is non-planar, the normal line of the area may be the average normal line. More detailed definitions of the average normal line may be found in FIG. 10 and the descriptions thereof. In some other embodiments, when the panel used to contact the user's body is non-planar, the normal line of the area may also be determined as follows: selecting a certain point in an area

when the panel is in contact with human skin, determining a tangent plane of the panel at the selected point, determining a straight line that passes through the point and is perpendicular to the tangent plane, and designating the straight line as the normal line of the panel. When the panel used to contact the user's body is non-planar, different points correspond to different tangent planes of the panel, and the determined normal line may also be different. At this time, the normal line A' is not parallel to the normal line A of the panel. According to a specific embodiment of the present disclosure, the straight line of the driving force (or the straight line of the vibration of the driving device) and the normal line of the area may form an angle θ, where $0<\theta<180°$. In some embodiments, when the straight line of the driving force has a positive direction pointing to the outside of the bone conductive loudspeaker from the panel (or the contact surface between the panel and/or the housing and human skin), and the normal line of the designated panel (or the contact surface between the panel and/or the housing and human skin) has a positive direction pointing to the outside of the bone conductive loudspeaker, the angle formed by the two straight lines in the positive direction is an acute angle.

[0130] As shown in FIG. 12, the bone conductive loudspeaker may include a driving device (also referred to as a transducer in other embodiments), a transmission component 1803, a panel 1801, and a housing 1802. In some embodiments, a coil 1804 and a magnetic circuit component 1807 are both ring-shaped. In some embodiments, the driving device adopts a moving-coil driving mode, and includes the coil 1804 and the magnetic circuit component 1807.

[0131] In some embodiments, the coil 1804 and the magnetic circuit component 1807 have axes parallel to each other. The axis of the coil 1804 or the magnetic circuit component 1807 is perpendicular to the radial plane of the coil 1804 and/ or the magnetic circuit component 1807. In some embodiments, the coil 1804 and the magnetic circuit component 1807 have the same central axis. The central axis of the coil 1804 is perpendicular to the radial plane of the coil 1804 and passes through the geometric center

of the coil 1804. The central axis of the magnetic circuit component 1807 is perpendicular to the radial plane of the magnetic circuit component 1807 and passes through the geometric center of the magnetic circuit component 1807. The axis of the coil 1804 or the magnetic circuit component 1807 and the normal line of the panel 1801 may form the angle θ described above.

[0132] Merely by way of example, the relationship between the driving force *F* and the deformation *S* of the skin will be illustrated below combined with FIG. 12. When the straight line of the driving force generated by the driving device is parallel to the normal line of the panel 1801 (i.e., the angle θ is zero), the relationship between the driving force and the total deformation of the skin is:

$$F_{\perp} = S_{\perp} \times E \times A/h \quad (2),$$

where, $F_{\perp}$ refers to the driving force, $S_{\perp}$ refers to the total deformation of the skin in the direction perpendicular to the skin, *E* refers to the elastic modulus of the skin, *A* refers to the contact area between the panel and the skin, *h* refers to a total thickness of the skin (i.e., the distance between the panel and the bone).

[0133] When the straight line of the driving force generated by the driving device is parallel to the normal line of the area contacting or abutting the user's body of the panel (i.e., the angle θ is 90°), the relationship between the driving force in the vertical direction and the total deformation of the skin may be shown in Equation (3):

$$F_{//} = S_{//} \times G \times A/h \quad (3),$$

where, $F_{//}$ refers to the driving force, $S_{//}$ refers to the total deformation of the skin in the direction parallel to the skin, *G* refers to the shear modulus of the skin, *A* refers to the contact area between the panel and the skin, *h* refers to total thickness of the skin (i.e., the distance between the panel and the bone).

[0134] The relationship between the shear modulus *G* and the elastic modulus *E* is:

$$G = E/2(1+\gamma) \quad (4),$$

where, γ refers to the Poisson's ratio of the skin $0 < \gamma < 0.5$. Thus the shear modulus *G* is less than the elastic modulus *E*, and under the same driving force, the corresponding total deformation of the skin $S_{//} > S_{\perp}$. Generally, the Poisson's ratio of the skin is close to 0.4.

[0135] When the straight line of the driving force generated by the driving device is not parallel to the normal line of the area contacting or abutting the user's body of the panel, the driving force in the horizontal direction and the driving force in the vertical direction are expressed as the Equation (5) and Equation (6), respectively:

$$F_{\perp} = F \times cos\,(\theta) \quad (5),$$

$$F_{//} = F \times sin\,(\theta) \quad (6),$$

where, the relationship between the driving force *F* and the deformation *S* of the skin may be shown in the following equation:

$$S = \sqrt[2]{{S_{\perp}}^2 + {S_{//}}^2} = \frac{h}{A} \times F \times \sqrt[2]{(cos\,(\theta)/E)^2 + (sin\,(\theta)/G)^2} \quad (7).$$

[0136] When the Poisson's ratio is 0.4, the descriptions regarding the relationship between the angle θ and the total deformation of the skin may be found elsewhere of the present disclosure.

[0137] FIG. 13 is a diagram illustrating an angle-relative displacement relationship of a bone conductive loudspeaker according to some embodiments of the present disclosure. As shown in FIG. 13, the relationship between the angle θ and the total deformation of the skin is that the greater the angle θ, and the greater the relative displacement, the greater the total deformation *S* of the skin. The greater the angle θ, and the less the relative displacement, the less the deformation $S_{\perp}$ of the skin in the vertical direction of the skin. When the angle θ is close to 90°, the deformation $S_{\perp}$ of the skin in the vertical direction of the skin gradually tends to 0.

[0138] The volume of the bone conductive loudspeaker in the low frequency part is positively correlated with the total deformation of the skin *S*. The larger the *S*, the larger the volume of the bone conductive loudspeaker in low frequency. The volume of the bone

conductive loudspeaker in the high frequency part is positively correlated with the deformation $S_{\perp}$ of the skin in the vertical direction of the skin. The larger the $S_{\perp}$, the larger the volume of the bone conductive loudspeaker in low frequency.

[0139] When the Poisson's ratio of the skin is 0.4, the detailed illustration of the relationship between the angle θ and total deformation of the skin S, the deformation $S_{\perp}$ of the skin in the vertical direction of the skin may be found in FIG. 13. As shown in FIG. 13, the relationship between the angle θ and the total deformation of the skin *S* is that the larger the angle θ and the larger the total deformation of the skin *S*, the larger the volume of the corresponding bone conductive loudspeaker in the low frequency part. As shown in FIG. 22, the relationship between the angle θ and the deformation $S_{\perp}$ of the skin in the vertical direction of the skin is that the larger the angle θ and the smaller the deformation $S_{\perp}$ of the skin in the vertical direction of the skin, the smaller the volume of the corresponding bone conductive loudspeaker in the high frequency part.

[0140] It may be seen from Equation (7) and curves in FIG. 13 that with the increase of the angle θ, the speed at which the total deformation of the skin S increases is different from the speed at which the deformation $S_{\perp}$ of the skin in the vertical direction of the skin decreases. The speed at which the total deformation of the skin *S* increases becomes faster at first, and then becomes slower, and the speed at which the deformation $S_{\perp}$ of the skin in the vertical direction of the skin decreases becomes faster and faster. In order to balance the volume of the bone conductive loudspeaker in the low frequency part and the high frequency part, the angle θ should be at an appropriate value, for example, within a range of θ is 5°~80°, 15°~70°, 25°~50°, 25°~35°, 25°~30°, or the like.

[0141] FIG. 14 is a schematic diagram illustrating frequency response curves of a bone conductive loudspeaker in a low-frequency part correspond to different angles θ according to some embodiments in the present disclosure. As shown in FIG. 14, the panel is in contact with the skin and transmits vibration to the skin. During this process, the skin may also affect the vibration of the bone conductive loudspeaker, so as to affect the frequency

response curve of the bone conductive loudspeaker. From the above analysis, it is found that the larger the included angle, the larger the total deformation of the skin under the same driving force, and for the bone conductive loudspeaker, it is equivalent to that the elasticity of the skin relative to the panel decreases. It may be further understood that when a certain angle θ is formed between the straight line of the driving force generated by the driving device and the normal line of the area contacting or abutting the user's body of the panel. Especially when the angle θ increases, the resonance peak in the low frequency area of the frequency response curve may be adjusted to a lower frequency area, thus making the low frequency to dive deeper and increasing signals in the low frequencies. Compared with other techniques to improve the low frequency components of the sound (e.g., adding a vibration transmission plate to the bone conductive loudspeaker), setting the included angle may suppress the increase of the vibration effectively while increasing the energy of the low frequency, so as to reduce the sense of vibration, which improves the sensitivity of the low frequency of the bone conductive loudspeaker significantly, and improves the sound quality and human experience. It should be noted that, in some embodiments, the increase of the low frequency and the reduction of the vibration may be expressed as when the angle θ increases in the range of (0, 90°), the energy in the range of the low frequency of the vibration or the sound signal(s) increases, and the sense of vibration also increases, but the degree of energy increase in the low frequency range is greater than the degree of vibration sensation increase. Thus, in relative effect, the vibration sensation is reduced relatively. It may be seen in FIG. 14, when the included angle is relatively large, the resonance peak in the low frequency area may appear in a lower frequency range, which extends the flat part of the frequency curvature, so as to improve the sound quality of the loudspeaker.

[0142] It should be noted that the illustration of the bone conductive loudspeaker described above is only a specific example, and should not be regarded as the only feasible implementation. Obviously, for those skilled in the art, after the basic principles of

the bone conductive loudspeaker, it may be possible to make various modifications and changes in forms and details of the specific methods and steps for implementing the bone conductive loudspeaker without departing from the principles, but the modifications and changes are still within the scope illustrated above. For example, the minimum angle θ between the straight line of the driving force generated by the driving device and the normal line of the area contacting or abutting the user's body of the panel may be any acute angle. The acute angle herein is not limited to 5°~80° described above. The angle θ may be less than 5°, such as 1°, 2°, 3°, 4°, etc. In other embodiments, the angle θ may be larger than 80° and less than 90°, such as 81°, 82°, 85°, etc. In some embodiments, the specific value of the angle θ may not be an integer (e.g., 81.3°、81.38°). Such deformations are all within the protection scope of the present disclosure.

[0143] FIG. 15 is a longitudinal sectional view illustrating a loudspeaker apparatus according to some embodiments of the present disclosure. As shown in Figure 15, the speaker may include a first magnetic unit 1502, a first magnetically conductive unit 1504, a second magnetically conductive unit 1506, a first vibration plate 1508, a voice coil 1510, a second vibration plate 1512, and a vibration panel 1514. As used herein, some units of the earphone core of the loudspeaker apparatus may correspond to the magnetic circuit component. In some embodiments, the magnetic circuit component may include the first magnetic unit 1502, the first magnetically conductive unit 1504, and the second magnetically conductive unit 1506. The magnetic circuit component may generate a first full magnetic field (also referred to "total magnetic field of the magnetic circuit component" or "first magnetic field").

[0144] The magnetic unit described in the present disclosure may refer to a unit that may generate a magnetic field, such as a magnet. The magnetic unit may have a magnetization direction. The magnetization direction may refer to a direction of a magnetic field inside the magnetic unit. In some embodiments, the first magnetic unit 302 may include one or more magnets. The first magnetic unit may generate a second

magnetic field. In some embodiments, the magnet may include a metal alloy magnet, ferrite, or the like. The metal alloy magnet may include neodymium iron boron, samarium cobalt, aluminum nickel cobalt, iron chromium cobalt, aluminum iron boron, iron carbon aluminum, or the like, or any combination thereof. Ferrite may include barium ferrite, steel ferrite, manganese ferrite, lithium manganese ferrite, or the like, or any combination thereof.

[0145] In some embodiments, a lower surface of the first magnetically conductive unit 1504 may be connected to an upper surface of the first magnetic unit 1502. The second magnetically conductive unit 1506 may be connected to the first magnetic unit 1502. It should be noted that the magnetically conductive unit herein may also refer to a magnetic field concentrator or an iron core. The magnetically conductive unit may adjust a distribution of a magnetic field (e.g., a second magnetic field generated by the first magnetic unit 1502). The magnetically conductive unit may include a unit made of a soft magnetic material. In some embodiments, the soft magnetic material may include metal materials, metal alloys, metal oxide materials, amorphous metal materials, etc., such as iron, iron-silicon alloys, iron-aluminum alloys, nickel-iron alloys, iron-cobalt series alloys, low carbon steel, silicon steel sheet, silicon steel sheet, ferrite, etc. In some embodiments, the magnetically conductive unit may be processed by casting, plastic processing, cutting processing, powder metallurgy, or the like, or any combination thereof. The casting may include sand casting, investment casting, pressure casting, centrifugal casting, etc. The plastic processing may include rolling, casting, forging, stamping, extrusion, drawing, or the like, or any combination thereof. The cutting processing may include turning, milling, planing, grinding, or the like. In some embodiments, the processing method of the magnetically conductive unit may include 3D printing, CNC machine tools, or the like. A connection manner between the first magnetically conductive unit 1504, the second magnetically conductive unit 1506, and the first magnetic unit 1502 may include bonding, snapping, welding, riveting, bolting, or the like, or any combination

thereof. In some embodiments, the first magnetic unit 1502, the first magnetically conductive unit 1504, and the second magnetically conductive unit 1506 may be disposed as an axisymmetric structure. The axisymmetric structure may be a ring structure, a columnar structure, or other axisymmetric structures.

[0146] In some embodiments, a magnetic gap may form between the first magnetic unit 1502 and the second magnetically conductive unit 1506. The voice coil 1510 may be disposed in the magnetic gap. The voice coil 1510 may be connected to the first vibration plate 1508. The first vibration plate 1508 may be connected to the second vibration plate 1512. The second vibration plate 1512 may be connected to the vibration panel 1514. When a current is passed into the voice coil 1510, the voice coil 1510 may be located in a magnetic field formed by the first magnetic unit 1502, the first magnetically conductive unit 1504, and the second magnetically conductive unit 1506, and applied to an ampere force. The ampere force may drive the voice coil 1510 to vibrate, and the vibration of the voice coil 1510 may drive the vibration of the first vibration plate 1508, the second vibration plate 1512, and the vibration panel 1514. The vibration panel 1514 may transmit the vibration to auditory nerves through tissues and bones, so that a person may hear a sound. The vibration panel 1514 may be in direct contact with human skins, or contact with the skins through a vibration transmission layer made of a specific material.

[0147] In some embodiments, for a loudspeaker apparatus with a single magnetic unit, magnetic induction line(s) passing through the voice coil may not be uniform and divergent. At the same time, magnetic leakage may form in the magnetic circuit. That is, more magnetic induction lines may leak outside the magnetic gap and fail to pass through the voice coil. As a result, a magnetic induction strength (or magnetic field strength) at the position of the voice coil may decrease, which may affect the sensitivity of the loudspeaker apparatus. Therefore, the loudspeaker apparatus 100 may further include at least one second magnetic unit and/or at least one third magnetically conductive unit (not shown in figures). The at least one second magnetic unit and/or at least one third magnetically

conductive unit may suppress the leakage of the magnetic induction lines and restrict the shape of the magnetic induction lines passing through the voice coil. Therefore, more magnetic induction lines may pass through the voice coil as horizontally and densely as possible to increase the magnetic induction strength (or magnetic field strength) at the position of the voice coil, thereby increasing the sensitivity of the loudspeaker apparatus, and further improving the mechanical conversion efficiency of the loudspeaker apparatus (i.e., the efficiency of converting the input power of the loudspeaker apparatus into the mechanical energy of the vibration of the voice coil).

[0148] FIG. 16 is a longitudinal sectional view illustrating a magnetic circuit component 2100 according to some embodiments of the present disclosure. As shown in FIG. 16, the magnetic circuit component 2100 may include a first magnetic unit 2102, a first magnetically conductive unit 2104, a second magnetically conductive unit 2106, and a second magnetic unit 2108. In some embodiments, the first magnetic unit 2102 and/or the second magnetic unit 2108 may include any one or more magnets described in the present disclosure. In some embodiments, the first magnetic unit 2102 may include a first magnet, and the second magnetic unit 2108 may include a second magnet. The first magnet may be the same as or different from the second magnet. The first magnetically conductive unit 2104 and/or the second magnetically conductive unit 2106 may include any one or more magnetically conductive materials described in the present disclosure. The processing manner of the first magnetically conductive unit 2104 and/or the second magnetically conductive unit 2106 may include any one or more processing manners described in the present disclosure. In some embodiments, the first magnetic unit 2102 and/or the first magnetically conductive unit 2104 may be disposed as an axisymmetric structure. For example, the first magnetic unit 2102 and/or the first magnetically conductive unit 2104 may be a cylinder, a cuboid, or a hollow ring (e.g., the cross-section is a shape of the runway). In some embodiments, the first magnetic unit 2102 and the first magnetically conductive unit 2104 may be coaxial cylinders with the same or different

diameters. In some embodiments, the second magnetically conductive unit 2106 may be a groove-type structure. The groove-type structure may include a U-shaped section (as shown in FIG. 15). The groove-type second magnetically conductive unit 2106 may include a bottom plate and a side wall. In some embodiments, the bottom plate and the side wall may be integrally formed as a whole. For example, the side wall may be formed by extending the bottom plate in a direction perpendicular to the bottom plate. In some embodiments, the bottom plate may be connected to the side wall through any one or more connection manners described in the present disclosure. The second magnetic unit 2108 may be disposed as a ring shape or a sheet shape. In some embodiments, the second magnetic unit 2108 may be the ring shape. The second magnetic unit 2108 may include an inner ring and an outer ring. In some embodiments, the shape of the inner ring and/or the outer ring may be a ring, an ellipse, a triangle, a quadrangle, or any other polygons. In some embodiments, the second magnetic unit 2108 may be formed by arranging a number of magnets. Both ends of any one of the number of magnets may be connected to or have a certain distance from both ends of an adjacent magnet. The spacing between the magnets may be the same or different. In some embodiments, the second magnetic unit 2108 may be formed by arranging two or three sheet-shaped magnets equidistantly. The shape of the sheet-shaped magnet may be fan-shaped, a quadrangular shape, or the like. In some embodiments, the second magnetic unit 2108 may be coaxial with the first magnetic unit 2102 and/or the first magnetically conductive unit 2104.

[0149] In some embodiments, the upper surface of the first magnetic unit 2102 may be connected to the lower surface of the first magnetically conductive unit 2104. The lower surface of the first magnetic unit 2102 may be connected to the bottom plate of the second magnetically conductive unit 306. The lower surface of the second magnetic unit 2108 may be connected to the side wall of the second magnetically conductive unit 2106. The connection manners between the first magnetic unit 2102, the first magnetically conductive unit 2104, the second magnetically conductive unit 2106, and/or the second magnetic unit

2108 may include bonding, snapping, welding, riveting, bolting, or the like, or any combination thereof.

[0150] In some embodiments, a magnetic gap may be formed between the first magnetic unit 2102 and/or the first magnetically conductive unit 2104 and the inner ring of the second magnetic unit 2108. A voice coil 2128 may be disposed in the magnetic gap. In some embodiments, heights of the second magnetic unit 2108 and the voice coil 2128 relative to the bottom plate of the second magnetically conductive unit 2106 may be equal. In some embodiments, the first magnetic unit 2102, the first magnetically conductive unit 2104, the second magnetically conductive unit 2106, and the second magnetic unit 2108 may form a magnetic circuit. In some embodiments, the magnetic circuit component 2100 may generate a first full magnetic field (also referred to "total magnetic field of magnetic circuit component" or "first magnetic field"). The first magnetic unit 2102 may generate a second magnetic field. The first full magnetic field may be formed by magnetic fields generated by all components (e.g., the first magnetic unit 2102, the first magnetically conductive unit 2104, the second magnetically conductive unit 2106, and the second magnetic unit 2108) in the magnetic circuit component 2100. The magnetic field strength of the first full magnetic field in the magnetic gap (also referred to as magnetic induction strength or magnetic flux density) may be greater than the magnetic field strength of the second magnetic field in the magnetic gap. In some embodiments, the second magnetic unit 2108 may generate a third magnetic field. The third magnetic field may increase the magnetic field strength of the first full magnetic field in the magnetic gap. The third magnetic field increasing the magnetic field strength of the first full magnetic field herein may mean that the magnetic strength of the first full magnetic field in the magnetic gap when the third magnetic field exists (i.e., the second magnetic unit 2108 exists) may be greater than that of the first full magnetic field when the third magnetic field does not exist (i.e., the second magnetic unit 2108 does not exist). In other embodiments of the specification, unless otherwise specified, the magnetic circuit component may mean a

structure including all magnetic units and magnetically conductive units. The first full magnetic field may represent the magnetic field generated by the magnetic circuit component as a whole. The second magnetic field, the third magnetic field, ..., and the N-th magnetic field may respectively represent the magnetic fields generated by the corresponding magnetic units. In different embodiments, the magnetic unit that generates the second magnetic field (the third magnetic field, ..., or the N-th magnetic field) may be the same or different.

[0151] In some embodiments, an included angle between a magnetization direction of the first magnetic unit 2102 and a magnetization direction of the second magnetic unit 2108 may be between 0 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the second magnetic unit 2108 may be between 45 degrees and 135 degrees. In some embodiments, the induced angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the second magnetic unit 2108 may be equal to or greater than 90 degrees. In some embodiments, the magnetization direction of the first magnetic unit 2102 may be perpendicular to the lower surface or the upper surface of the first magnetic unit 302 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the second magnetic unit 2108 may be directed from the inner ring of the second magnetic unit 2108 to the outer ring (as shown by the direction b on the right side of the first magnetic unit 2102 in the figure, the magnetization direction of the first magnetic unit 2102 may deflect 90 degrees in a clockwise direction).

[0152] In some embodiments, at the position of the second magnetic unit 2108, an included angle between the direction of the first full magnetic field and the magnetization direction of the second magnetic unit 2108 may not be greater than 90 degrees. In some embodiments, at the position of the second magnetic unit 2108, the included angle between the direction of the magnetic field generated by the first magnetic unit 2102 and

the direction of the magnetization of the second magnetic unit 2108 may be less than or equal to 90 degrees, such as 0 degrees, 10 degrees, 20 degrees, or the like.

[0153] Compared with a magnetic circuit component with a single magnetic unit, the second magnetic unit 2108 may increase the total magnetic flux in the magnetic gap of the magnetic circuit component 2100, thereby increasing the magnetic induction intensity in the magnetic gap. And, under the action of the second magnetic unit 2108, originally scattered magnetic induction lines may converge to the position of the magnetic gap, further increasing the magnetic induction intensity in the magnetic gap.

[0154] FIG.17 is a longitudinal sectional view illustrating a magnetic circuit component 2600 according to some embodiments of the present disclosure. As shown in FIG. 17, different from the magnetic circuit component 2100, the magnetic circuit component 2600 may further include at least one electrically conductive unit (e.g., a first electrically conductive unit 2118, a second electrically conductive unit 2120, and a third electrically conductive unit 2122).

[0155] The electrically conductive unit may include a metal material, a metal alloy material, an inorganic non-metal material, or other conductive materials. The metal material may include gold, silver, copper, aluminum, etc. The metal alloy material may include an iron-based alloy, an aluminum-based alloy material, a copper-based alloys, a zinc-based alloys, etc. The inorganic non-metal material may include graphite, etc. The electrically conductive unit may be a sheet shape, a ring shape, a mesh shape, or the like. The first electrically conductive unit 2118 may be disposed on an upper surface of the first magnetically conductive unit 2104. The second electrically conductive unit 2120 may be connected to the first magnetic unit 2102 and the second magnetically conductive unit 2106. The third electrically conductive unit 2122 may be connected to a side wall of the first magnetic unit 2102. In some embodiments, the first magnetically conductive unit 2104 may protrude from the first magnetic unit 2102 to form a first concave portion. The third electrically conductive unit 2122 may be disposed on the first concave portion. In

some embodiments, the first electrically conductive unit 2118, the second electrically conductive unit 2120, and the third electrically conductive unit 2122 may include the same or different conductive materials. The first electrically conductive unit 2118, the second electrically conductive unit 2120, and the third electrically conductive unit 2122 may be respectively connected to the first magnetically conductive unit 2104, the second magnetically conductive unit 2106 and/or the first magnetic unit 2102 through any one or more connection manners described in the present disclosure.

[0156] A magnetic gap may be formed between the first magnetic unit 2102, the first magnetically conductive unit 2104, and the inner ring of the second magnetic unit 2108. A voice coil 2128 may be disposed in the magnetic gap. The first magnetic unit 2102, the first magnetically conductive unit 2104, the second magnetically conductive unit 2106, and the second magnetic unit 2108 may form a magnetic circuit. In some embodiments, the electrically conductive unit may reduce an inductive reactance of the voice coil 2128. For example, if a first alternating current flows through the voice coil 2128, a first alternating induced magnetic field may be generated near the voice coil 2128. Under the action of the magnetic field in the magnetic circuit, the first alternating induced magnetic field may cause the inductive reactance of the voice coil 2128 and hinder the movement of the voice coil 2128. When an electrically conductive unit (e.g., the first electrically conductive unit 2118, the second electrically conductive unit 2120, and the third electrically conductive unit 2122) is disposed near the voice coil 2128, the electrically conductive unit may induce a second alternating current under the action of the first alternating induced magnetic field. A third alternating current in the electrically conductive unit may generate a second alternating induced magnetic field near the third alternating current. The second alternating induction magnetic field may be opposite to the first alternating induction magnetic field, and weaken the first alternating induction magnetic field, thereby reducing the inductive reactance of the voice coil 2128, increasing the current in the voice coil, and improving the sensitivity of the speaker.

[0157] FIG.18 is a longitudinal sectional view illustrating a magnetic circuit component 2700 according to some embodiments of the present disclosure. As shown in FIG. 18, different from the magnetic circuit component 2500, the magnetic circuit component 2700 may further include a third magnetic unit 2110, a fourth magnetic unit 2112, a fifth magnetic unit 2114, a third magnetically conductive unit 2116, a sixth magnetic unit 2124, and a seventh magnetic unit 2126. The third magnetic unit 2110, the fourth magnetic unit 2112, the fifth magnetic unit 2114, the third magnetically conductive unit 2116 and/or the sixth magnetic unit 2124, and the seventh magnetic unit 2126 may be disposed as coaxial ring cylinders.

[0158] In some embodiments, an upper surface of the second magnetic unit 2108 may be connected to the seventh magnetic unit 2126. A lower surface of the second magnetic unit 2108 may be connected to the third magnetic unit 2110. The third magnetic unit 2110 may be connected to the second magnetically conductive unit 2106. An upper surface of the seventh magnetic unit 2126 may be connected to the third magnetically conductive unit 2116. The fourth magnetic unit 2112 may be connected to the second magnetically conductive unit 2106 and the first magnetic unit 2102. The sixth magnetic unit 2124 may be connected to the fifth magnetic unit 2114, the third magnetically conductive unit 2116, and the seventh magnetic unit 2126. In some embodiments, the first magnetic unit 2102, the first magnetically conductive unit 2104, the sixth magnetic unit 2124, the second magnetically conductive unit 2106, the second magnetic unit 2108, the third magnetic unit 2110, the fourth magnetic unit 2112, the fifth magnetic unit 2114, the third magnetically conductive unit 2116, and the seventh magnetic unit 2126 may form a magnetic circuit and a magnetic gap.

[0159] In some embodiments, an included angle between a magnetization direction of the first magnetic unit 2102 and a magnetization direction of the sixth magnetic unit 2124 may be between 0 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization

direction of the sixth magnetic unit 2124 may be between 45 degrees and 135 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the sixth magnetic unit 2124 may not be higher than 90 degrees. In some embodiments, the magnetization direction of the first magnetic unit 2102 may be perpendicular to a lower surface or an upper surface of the first magnetic unit 2102 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the sixth magnetic unit 2124 may be directed from an outer ring of the sixth magnetic unit 2124 to an inner ring (as shown by the direction g on the right side of the first magnetic unit 2102 in the figure, the magnetization direction of the first magnetic unit 2102 may deflect 270 degrees in a clockwise direction). In some embodiments, the magnetization direction of the sixth magnetic unit 2124 may be the same as that of the fourth magnetic unit 2112 in the same vertical direction.

[0160] In some embodiments, at the position of the sixth magnetic unit 2124, an included angle between the direction of the magnetic field generated by the magnetic circuit component 2700 and the magnetization direction of the sixth magnetic unit 2124 may not be higher than 90 degrees. In some embodiments, at the position of the sixth magnetic unit 2124, the included angle between the direction of the magnetic field generated by the first magnetic unit 2102 and the magnetized direction of the sixth magnetic unit 2124 may be less than or equal to 90 degrees, such as 0 degrees, 10 degrees, or 20 degrees.

[0161] In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the seventh magnetic unit 2126 may be between 0 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the seventh magnetic unit 2126 may be between 45 degrees and 135 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2102 and the magnetization direction of the seventh magnetic unit 2126 may not be higher than 90 degrees. In some embodiments, the

magnetization direction of the first magnetic unit 2102 may be perpendicular to a lower surface or an upper surface of the first magnetic unit 2102 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the seventh magnetic unit 2126 may be directed from the lower surface of the seventh magnetic unit 2126 to the upper surface (as shown in the direction f on the right side of the first magnetic unit 2102 in the figure, the magnetization direction of the first magnetic unit 2102 may deflect 360 degrees in a clockwise direction). In some embodiments, the magnetization direction of the seventh magnetic unit 2126 may be opposite to that of the third magnetic unit 2110.

[0162] In some embodiments, at the position of the seventh magnetic unit 2126, the included angle between the direction of the magnetic field generated by magnetic circuit component 2700 and the direction of magnetization of the seventh magnetic unit 2126 may not be higher than 90 degrees. In some embodiments, at the position of the seventh magnetic unit 2126, the included angle between the direction of the magnetic field generated by the first magnetic unit 2102 and the magnetized direction of the seventh magnetic unit 2126 may be less than or equal to 90 degrees, such as 0 degrees, 10 degrees, or 20 degrees.

[0163] In the magnetic circuit component 2700, the third magnetically conductive unit 2116 may close the magnetic circuit generated by the magnetic circuit component 2700, so that more magnetic induction lines may be concentrated in the magnetic gap, thereby implementing the effect of suppressing the magnetic leakage, increasing the magnetic induction strength in the magnetic gap, and improving the sensitivity of the loudspeaker apparatus.

[0164] FIG.19 is a longitudinal sectional view illustrating a magnetic circuit component 2900 according to some embodiments of the present disclosure. As shown in FIG. 19, the magnetic circuit component 2900 may include a first magnetic unit 2902, a first

magnetically conductive unit 2904, a first full magnetic field changing unit 2906, and a second magnetic unit 2908.

[0165] An upper surface of the first magnetic unit 2902 may be connected to a lower surface of the first magnetically conductive unit 2904. The second magnetic unit 2908 may be connected to the first magnetic unit 2902 and the first full magnetic field changing unit 2906. The connection manners between the first magnetic unit 2902, the first magnetically conductive unit 2904, the first full magnetic field changing unit 2906, and/or the second magnetic unit 2908 may be based on any one or more connection manners described in the present disclosure. In some embodiments, the first magnetic unit 2902, the first magnetically conductive unit 2904, the first full magnetic field changing unit 2906, and/or the second magnetic unit 2908 may form a magnetic circuit and a magnetic gap.

[0166] In some embodiments, the magnetic circuit component 2900 may generate a first full magnetic field. The first magnetic unit 2902 may generate a second magnetic field. A magnetic field intensity of the first full magnetic field in the magnetic gap may be greater than the magnetic field intensity of the second magnetic field in the magnetic gap. In some embodiments, the second magnetic unit 2908 may generate a third magnetic field. The third magnetic field may increase a magnetic field strength of the second magnetic field in the magnetic gap.

[0167] In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the second magnetic unit 2908 may be between 0 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the second magnetic unit 2908 may be between 45 degrees and 135 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the second magnetic unit 2908 may not be higher than 90 degrees.

[0168] In some embodiments, at the position of the second magnetic unit 2908, the included angle between a direction of the first full magnetic field and the magnetization direction of the second magnetic unit 2908 may not be higher than 90 degrees. In some embodiments, at the position of the second magnetic unit 2908, the included angle between the direction of the magnetic field generated by the first magnetic unit 2902 and the direction of magnetization of the second magnetic unit 2908 may be a less than or equal to 90 degrees, such as 0 degrees, 10 degrees, or 20 degrees. As another example, the magnetization direction of the first magnetic unit 2902 may be perpendicular to the lower surface or the upper surface of the first magnetic unit 2902 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the second magnetic unit 2908 may be directed from the outer ring of the second magnetic unit 2908 to the inner ring (as shown by the direction c on the right side of the first magnetic unit 2902 in the figure, the magnetization direction of the first magnetic unit 2902 may deflect 270 degrees in a clockwise direction).

[0169] Compared with a magnetic circuit component with a single magnetic unit, the first full magnetic field changing unit 2906 in the magnetic circuit component 2900 may increase the total magnetic flux in the magnetic gap, thereby increasing the magnetic induction intensity in the magnetic gap. And, under the action of the first full magnetic field changing unit 2906, originally scattered magnetic induction lines may converge to the position of the magnetic gap, further increasing the magnetic induction intensity in the magnetic gap.

[0170] FIG.20 is a longitudinal sectional view illustrating a magnetic circuit component 3000 according to some embodiments of the present disclosure. As shown in FIG. 20, in some embodiments, the magnetic circuit component 3000 may include the first magnetic unit 2902, a first magnetically conductive unit 2904, a first full magnetic field changing unit 2906, a second magnetic unit 2908, a third magnetic unit 2910, a fourth magnetic unit 2912, a fifth magnetic unit 2916, a sixth magnetic unit 2918, a seventh magnetic unit 2920,

and a second ring unit 2922. In some embodiments, the first full magnetic field changing unit 2906 and/or the second ring unit 2922 may include a ring-shaped magnetic unit or a ring-shaped magnetically conductive unit. The ring-shaped magnetic unit may include any one or more magnetic materials described in the present disclosure. The ring-shaped magnetically conductive unit may include any one or more magnetically conductive materials described in the present disclosure.

[0171] In some embodiments, the sixth magnetic unit 2918 may be connected to the fifth magnetic unit 2916 and the second ring unit 2922. The seventh magnetic unit 2920 may be connected to the third magnetic unit 2910 and the second ring unit 2922. In some embodiments, the first magnetic unit 2902, the fifth magnetic unit 2916, the second magnetic unit 2908, the third magnetic unit 2910, the fourth magnetic unit 2912, the sixth magnetic unit 2918, and/or the seventh magnetic unit 2920, the first magnetically conductive unit 2904, the first full magnetic field changing unit 2906, and the second ring unit 2922 may form a magnetic circuit.

[0172] In some embodiments, an included angle between the magnetization direction of the first magnetic unit 2902 and a magnetization direction of the sixth magnetic unit 2918 may be between 0 degrees and 180 degrees. In some embodiments, the angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the sixth magnetic unit 2918 may be between 45 degrees and 135 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the sixth magnetic unit 2918 may not be higher than 90 degrees. In some embodiments, the magnetization direction of the first magnetic unit 2902 may be perpendicular to the lower surface or the upper surface of the first magnetic unit 2902 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the sixth magnetic unit 2918 may be directed from an outer ring of the sixth magnetic unit 2918 to an inner ring (as shown by the direction f on a right side of the first magnetic unit 2902 in the figure, the magnetization direction of the first

magnetic unit 2902 may deflect 270 degrees in a clockwise direction). In some embodiments, in the same vertical direction, the magnetization direction of the sixth magnetic unit 2918 may be the same as that of the second magnetic unit 2908. In some embodiments, the magnetization direction of the first magnetic unit 2902 may be perpendicular to the lower surface or the upper surface of the first magnetic unit 2902 and be vertically upward (as shown by the direction a in the figure). The magnetization direction of the seventh magnetic unit 2920 may be directed from the lower surface of the seventh magnetic unit 2920 to the upper surface (as shown by the direction e on the right side of the first magnetic unit 2902 in the figure, the magnetization direction of the first magnetic unit 2902 may deflect 360 degrees in the clockwise direction). In some embodiments, a magnetization direction of the seventh magnetic unit 2920 may be the same as that of the fourth magnetic unit 2912.

[0173] In some embodiments, at a position of the sixth magnetic unit 2918, an included angle between a direction of a magnetic field generated by the magnetic circuit component 2900 and the magnetization direction of the sixth magnetic unit 2918 may not be higher than 90 degrees. In some embodiments, at the position of the sixth magnetic unit 2918, the included angle between the direction of the magnetic field generated by the first magnetic unit 2902 and the direction of magnetization of the sixth magnetic unit 2918 may be less than or equal to 90 degrees, such as 0 degrees, 10 degrees, or 20 degrees.

[0174] In some embodiments, an included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the seventh magnetic unit 2920 may be between 0 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the seventh magnetic unit 2920 may be between 45 degrees and 135 degrees. In some embodiments, the included angle between the magnetization direction of the first magnetic unit 2902 and the magnetization direction of the seventh magnetic unit 2920 may not be higher than 90 degrees.

[0175] In some embodiments, at a position of the seventh magnetic unit 2920, an included angle between a direction of a magnetic field generated by the magnetic circuit component 3000 and the magnetization direction of the seventh magnetic unit 2920 may not be higher than 90 degrees. In some embodiments, at the position of the seventh magnetic unit 2920, the included angle between the direction of the magnetic field generated by the first magnetic unit 2902 and the direction of magnetization of the seventh magnetic unit 2920 may be less than or equal to 90 degrees, such as 0 degrees, 10 degrees, or 20 degrees.

[0176] In some embodiments, the first full magnetic field changing unit 2906 may be a ring-shaped magnetic unit. In such cases, a magnetization direction of the first full magnetic field changing unit 2906 may be the same as that of the second magnetic unit 2908 or the fourth magnetic unit 2912. For example, on the right side of the first magnetic unit 2902, the magnetization direction of the first full magnetic field changing unit 2906 may be directed from an outer ring to an inner ring of the first full magnetic field changing unit 2906. In some embodiments, the second ring unit 2922 may be a ring-shaped magnetic unit. In such cases, a magnetization direction of the second ring unit 2922 may be the same as that of the sixth magnetic unit 2918 or the seventh magnetic unit 2920. For example, on the right side of the first magnetic unit 2902, the magnetization direction of the second ring unit 2922 may be directed from an outer ring to an inner ring of the second ring unit 2922.

[0177] In the magnetic circuit component 3000, a number of magnetic units may increase the total magnetic flux. Different magnetic units may interact with each other, thereby suppressing the leakage of the magnetic induction lines, increasing the magnetic induction strength in the magnetic gap, and improving the sensitivity of the loudspeaker apparatus.

[0178] FIG.21 is a longitudinal sectional view illustrating a magnetic circuit component 3100 according to some embodiments of the present disclosure. As shown in FIG. 21, the magnetic circuit component 3100 may include a first magnetic unit 3102, a first

magnetically conductive unit 3104, a second magnetically conductive unit 3106, and a second magnetic unit 3108.

[0179] In some embodiments, the first magnetic unit 3102 and/or the second magnetic unit 3108 may include any one or more of the magnets described in the present disclosure. In some embodiments, the first magnetic unit 3102 may include a first magnet. The second magnetic unit 3108 may include a second magnet. The first magnet may be the same as or different from the second magnet. The first magnetically conductive unit 3104 and/or the second magnetically conductive unit 3106 may include any one or more magnetically conductive materials described in the present disclosure. The processing manner of the first magnetically conductive unit 3104 and/or the second magnetically conductive unit 3106 may include any one or more processing manners described in the present disclosure. In some embodiments, the first magnetic unit 3102, the first magnetically conductive unit 3104, and/or the second magnetic unit 3108 may be disposed as an axisymmetric structure. For example, the first magnetic unit 3102, the first magnetically conductive unit 3104, and/or the second magnetic unit 3108 may be cylinders. In some embodiments, the first magnetic unit 3102, the first magnetically conductive unit 3104, and/or the second magnetic unit 3108 may be coaxial cylinders with the same diameter or different diameters. The thickness of the first magnetic unit 3102 may be greater than or equal to the thickness of the second magnetic unit 3108. In some embodiments, the second magnetically conductive unit 3106 may be a groove-type structure. The groove-type structure may include a U-shaped section. The groove-type second magnetically conductive unit 3106 may include a bottom plate and a side wall. In some embodiments, the bottom plate and the side wall may be integrally formed as a whole. For example, the side wall may be formed by extending the bottom plate in a direction perpendicular to the bottom plate. In some embodiments, the bottom plate may be connected to the side wall through any one or more connection manners described in the present disclosure. The second magnetic unit 3108 may be disposed as a ring shape

or a sheet shape. The shape of the second magnetic unit 3108 may refer to descriptions elsewhere in the specification. In some embodiments, the second magnetic unit 3108 may be coaxial with the first magnetic unit 3102 and/or the first magnetically conductive unit 3104.

[0180] An upper surface of the first magnetic unit 3102 may be connected to a lower surface of the first magnetically conductive unit 3104. A lower surface of the first magnetic unit 3102 may be connected to the bottom plate of the second magnetically conductive unit 3106. A lower surface of the second magnetic unit 3108 may be connected to an upper surface of the first magnetically conductive unit 3104. A connection manner between the first magnetic unit 3102, the first magnetically conductive unit 3104, the second magnetically conductive unit 3106 and/or the second magnetic unit 3108 may include one or more manners such as bonding, snapping, welding, riveting, bolting, or the like, or any combination thereof.

[0181] A magnetic gap may be formed between the first magnetic unit 3102, the first magnetically conductive unit 3104, and/or the second magnetic unit 3108 and the side wall of the second magnetically conductive unit 3106. A voice coil may be disposed in the magnetic gap. In some embodiments, the first magnetic unit 3102, the first magnetically conductive unit 3104, the second magnetically conductive unit 3106, and the second magnetic unit 3108 may form a magnetic circuit. In some embodiments, the magnetic circuit component 3100 may generate a first full magnetic field. The first magnetic unit 3102 may generate a second magnetic field. The first full magnetic field may be formed by magnetic fields generated by all components (e.g., the first magnetic unit 3102, the first magnetically conductive unit 3104, the second magnetically conductive unit 3106, and the second magnetic unit 3108) in the magnetic circuit component 3100. A magnetic field strength of the first full magnetic field in the magnetic gap (also referred to magnetic induction strength or magnetic flux density) may be greater than a magnetic field strength of the second magnetic field in the magnetic gap. In some embodiments, the second

magnetic unit 3108 may generate a third magnetic field. The third magnetic field may increase the magnetic field strength of the second magnetic field in the magnetic gap.

[0182] In some embodiments, an included angle between a magnetization direction of the second magnetic unit 3108 and a magnetization direction of the first magnetic unit 3102 may be between 90 degrees and 180 degrees. In some embodiments, the included angle between the magnetization direction of the second magnetic unit 3108 and the magnetization direction of the first magnetic unit 3102 may be between 150 degrees and 180 degrees. In some embodiments, the magnetization direction of the second magnetic unit 3108 may be opposite to that of the first magnetic unit 3102 (the direction a and the direction b shown in the figure).

[0183] Compared with a magnetic circuit component with a single magnetic unit, the magnetic circuit component 3100 may add the second magnetic unit 3108. The magnetization direction of the second magnetic unit 3108 may be opposite to the magnetization direction of the first magnetic unit 3102, which may suppress a magnetic leakage of the first magnetic unit 3102 in the magnetization direction. Therefore, the magnetic field generated by the first magnetic unit 3102 may be more compressed into the magnetic gap, thereby increasing the magnetic induction strength within the magnetic gap.

[0184] It should be noted that the description of the loudspeaker apparatus described above is merely for illustration purposes and should not be regarded as the only feasible implementation solution. Obviously, for those skilled in the art, after understanding the basic principle of the loudspeaker apparatus, it may be possible to make various modifications and changes in forms and details of the specific methods and operations of implementing the loudspeaker apparatus without departing from the principles, but these modifications and changes are still within the scope described above. For example, the magnetic unit in the magnetic circuit component is not limited to the first magnetic unit, the second magnetic unit, the third magnetic unit, the fourth magnetic unit, the fifth magnetic unit, the sixth magnetic unit, and the seventh magnetic unit. The number of magnetic

units may be increased or decreased. Such deformations are all within the protection scope of the present disclosure.

[0185] In some embodiments, the loudspeaker apparatus (e.g., MP3 Player) described above may also transmit the sound to the user through air conduction. When the air condition is used to transmit the sound, the loudspeaker apparatus may include one or more sound sources. The sound source may be located at a specific position of the user's head, for example, the top of the head, a forehead, a cheek, a temple, an auricle, the back of an auricle, etc., without blocking or covering an ear canal. FIG. 22 is a schematic diagram illustrating transmitting a sound through air conduction according to some embodiments of the present disclosure.

[0186] As shown in FIG. 22, a sound source 2210 and a sound source 2220 may generate sound waves with opposite phases ("+" and "-" in the figure indicate the opposite phases). For brevity, the sound source mentioned herein may refer to sound outlets of the loudspeaker apparatus that may output sounds. For example, the sound source 2210 and the sound source 2220 may be two sound outlets respectively located at specific positions of the eyeglasses (for example, the core housing 20, or the circuit housing 30).

[0187] In some embodiments, the sound source 2210 and the sound source 2220 may be generated by the same vibration device 2201. The vibration device 2201 may include a diaphragm (not shown in the figure). When the diaphragm is driven to vibrate by an electric signal, the front side of the diaphragm may drive the air to vibrate, the sound source 2210 may form at the sound outlet through a sound guiding channel 2212, the back of the diaphragm may drive air to vibrate, and the sound source 3320 may form at the sound outlet through a sound guiding channel 3322. The sound guiding channel may refer to a sound transmission route from the diaphragm to the corresponding sound outlet. In some embodiments, the sound guiding channel may be a route surrounded by a specific structure on the loudspeaker apparatus (for example, the earphone housing 220 in FIG. 19, or the eyeglass temple 15 in FIG. 1). It should be known that, in some alternative

embodiments, the sound source 3310 and the sound source 3320 may also be generated by different vibrating diaphragms of different vibration devices, respectively.

[0188] Among the sounds generated by the sound source 2210 and the sound source 2220, one portion may be transmitted to the ear of the user to form the sound heard by the user. Another portion may be transmitted to the environment to form a leaked sound. Considering that the sound source 2210 and the sound source 2220 are relatively close to the ears of the user, for convenience of description, the sound transmitted to the ears of the user may be referred to as a near-field sound. The leaked sound transmitted to the environment may be referred to as a far-field sound. In some embodiments, the near-field/far-field sounds of different frequencies generated by the loudspeaker apparatus may be related to a distance between the sound source 2210 and the sound source 2220. Generally speaking, the near-field sound generated by the loudspeaker apparatus may increase as the distance between the two sound sources increases, while the generated far-field sound (the leaked sound) may increase with increasing the frequency.

[0189] For the sounds of different frequencies, the distance between the sound source 2210 and the sound source 2220 may be designed, respectively, so that a low-frequency near-field sound (e.g., a sound with a frequency of less than 800Hz) generated by the loudspeaker apparatus may be as large as possible and a high-frequency far-field sound (e.g., a sound with a frequency greater than 2000 Hz) may be as small as possible. In order to implement the above purpose, the loudspeaker apparatus may include two or more sets of dual sound sources. Each set of the dual sound sources may include two sound sources similar to the sound source 2210 and the sound source 2220, and generate sounds with specific frequencies, respectively. Specifically, a first set of the dual sound sources may be used to generate low frequency sounds. A second set of the dual sound sources may be used to generate high frequency sounds. In order to obtain more low-frequency near-field sounds, the distance between two sound sources in the first set of the dual sound sources may be set to a larger value. Since the low-frequency signal has a

longer wavelength, the larger distance between the two sound sources may not cause a large phase difference in the far-field, and not form excessive leaked sound in the far-field. In order to make the high-frequency far-field sound smaller, the distance between the two sound sources in the second set of the dual sound sources may be set to a smaller value. Since the high-frequency signal has a shorter wavelength, the smaller distance between the two sound sources may avoid the generation of the large phase difference in the far-field, and thus the generation of the excessive leaked sounds may be avoided. The distance between the second set of the dual sound sources may be less than the distance between the first set of the dual sound sources.

[0190] The beneficial effects of the embodiments of the present disclosure may include but be not limited to: (1) the protective sleeve of the ear hook may elastically abut against the core housing, thereby improving the waterproof performance of the loudspeaker apparatus; (2) the size of the forming mold may be reduced by using different molds to form the ear hook and the core housing separately, thereby reducing the difficulty of mold processing and forming the ear hook and the core housing during production; (3) the sound quality of the loudspeaker may be improved by adjusting the angle between the normal line A of the panel or the normal line A' of the contact surface contacting human skin of the panel and the line B of the driving force generated by the driving device; (4) the sensitivity of the loudspeaker apparatus may be improved by adding a magnetic unit, a magnetically conductive unit and an electrically conductive unit in the magnetic circuit components; (5) the ear hook may use elastic metal wire with a certain elastic deformation, thereby being adapted to users with different ear shapes and head shapes. It should be noted that different embodiments may have different beneficial effects. In different embodiments, the possible beneficial effects may be any one or a combination of the above, and may be any other beneficial effects that may be obtained.

[0191] The basic concepts have been described above. Obviously, for persons having ordinary skills in the art, the disclosure of the invention is merely by way of example, and

does not constitute a limitation on the present disclosure. Although not explicitly stated here, those skilled in the art may make various modifications, improvements, and amendments to the present disclosure. These alterations, improvements, and modifications are intended to be suggested by this disclosure and are within the spirit and scope of the exemplary embodiments of this disclosure.

WHAT IS CLAIMED IS

1. A loudspeaker apparatus, comprising:

an ear hook including a first plug end and a second plug end, the ear hook being surrounded by a protective sleeve, the protective sleeve being made of an elastic waterproof material;

a core housing for accommodating an earphone core, the core housing being fixed to the first plug end and elastically abutted against the protective sleeve; and

a circuit housing for accommodating a control circuit or a battery, the circuit housing being fixed to the second plug end, the control circuit or the battery driving the earphone core to vibrate, the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a normal line of the housing panel.

2. The loudspeaker apparatus of claim 1, wherein the ear hook further includes:

an elastic metal wire;

a wire; and

a fixed sleeve, the fixed sleeve fixing the wire on the elastic metal wire, the protective sleeve being formed, by injection molding, on periphery of the elastic metal wire, the wire, the fixed sleeve, the first plug end, and the second plug end.

3. The loudspeaker apparatus of claim 2, wherein

the first plug end and the second plug end are formed, by injection molding, at both ends of the elastic metal wire respectively,

the first plug end and the second plug end are arranged with a first wiring channel and a second wiring channel respectively, and

the wire extends along the first wiring channel and the second wiring channel.

4. The loudspeaker apparatus of claim 3, wherein the wire passes through the first wiring channel and the second wiring channel.

5. The loudspeaker apparatus of claim 3, wherein

the first wiring channel includes a first wiring groove and a first wiring hole connecting the first wiring groove and an outer end surface of the first plug end,

the wire extends along the first wiring groove and the first wiring hole and is exposed on the outer end surface of the first plug end,

the second wiring channel includes a second wiring groove and a second wiring hole connecting the second wiring groove and the outer end surface of the first plug end, and

the wire extends along the second wiring groove and the second wiring hole and is exposed on the outer end surface of the second plug end.

6. The loudspeaker apparatus of claim 2, wherein the ear hook includes at least two fixed sleeves spaced apart along the elastic metal wire.

7. The loudspeaker apparatus of claim 1, wherein

the core housing is arranged with a first socket connecting with an outer end surface of the core housing,

a stopping block is arranged on an inner sidewall of the first socket, and

the first socket is connected to the first plug end.

8. The loudspeaker apparatus of claim 7, wherein the first plug end includes:

an inserting portion being at least partially inserted into the first socket and abutting against an outer side surface of the stopping block; and

two elastic hooks being arranged on a side of the inserting portion facing inside of the core housing, wherein:

the two elastic hooks are brought together under action of external thrust and the stopping block, and

after passing through the stopping block, the two elastic hooks are elastically restored to be stuck on an inner surface of the stopping block to realize the fixation of the core housing and the first plug end.

9. The loudspeaker apparatus of claim 8, wherein

the inserting portion is partially inserted into the first socket, and

an exposed part of the inserting portion is arranged in a stepped manner to form an annular table surface spaced apart from the outer end surface of the core housing.

10. The loudspeaker apparatus of claim 9, wherein

the protective sleeve further extends to a side of the annular table surface facing the outer end surface of the core housing, and

when the core housing and the first plug end are fixed, the protective sleeve elastically abuts against the core housing to realize sealing.

11. The loudspeaker apparatus of claim 1, wherein

the loudspeaker apparatus further includes a fastener,

the circuit housing is arranged with a second socket, and

the second plug end is at least partially inserted into the second socket and connected to the second socket by the fastener.

12. The loudspeaker apparatus of claim 11, wherein

the second plug end is arranged with a slot perpendicular to an inserting direction of the second socket,

a through hole corresponding to a position of the slot is arranged on a first sidewall of the circuit housing;

the fastener includes two parallel pins and a connecting portion for connecting the pins, and

the pins are inserted into the slot from outside of the circuit housing through the through hole to realize the plug and fixation of the circuit housing and the second plug end.

13. The loudspeaker apparatus of claim 1, wherein the ear hook further includes a housing sheath integrally formed with the protective sleeve, the housing sheath being wrapped around periphery of the circuit housing.

14. The loudspeaker apparatus of claim 1, wherein

the housing panel and the earphone core are in a transmission connection, and

all or part of the housing panel is used to contact or abut a user's body to conduct a sound generated by the vibration of the earphone core.

15. The loudspeaker apparatus of claim 14, wherein when a straight line of the driving force has a positive direction pointing to outside of the loudspeaker apparatus from the housing panel and the normal line has a positive direction pointing to the outside of the loudspeaker apparatus, an angle between the two lines in their positive direction is an acute angle.

16. The loudspeaker apparatus of claim 14, wherein

the earphone core includes a coil and a magnetic circuit system, and

an axis of the coil or the magnetic circuit system is not parallel to the normal line, the axis being perpendicular to a radial plane of the coil or the magnetic circuit system.

17. The loudspeaker apparatus of claim 14, wherein

the driving force has a component in a first quadrant or a third quadrant of a XOY plane coordinate system, wherein

an origin O of the XOY plane coordinate system is on a contact surface between the loudspeaker apparatus and a human body, an X-axis of the XOY plane coordinate system is parallel to a coronal axis of the human body, a Y-axis of the XOY plane coordinate system is parallel to a sagittal axis of the human body, a positive direction of the X-axis faces outside of the human body, and a positive direction of the Y-axis faces front of the human body.

18. The loudspeaker apparatus of claim 14, wherein a region of the housing panel used to contact or abut the user's body includes a flat surface or a quasi-flat surface.

19. The loudspeaker apparatus of claim 1, wherein the earphone core further includes a magnetic circuit component generating a first magnetic field, the magnetic circuit component including:

a first magnetic unit configured to generate a second magnetic field;

a first magnetically conductive unit; and

at least one second magnetic unit, the at least one second magnetic unit surrounding the first magnetic unit and forming a magnetic gap with the first magnetic unit, a magnetic field strength of the first magnetic field in the magnetic gap being greater than a magnetic field strength of the second magnetic field in the magnetic gap.

20. The loudspeaker apparatus of claim 19, wherein the magnetic circuit component further includes:

a second magnetically conductive unit; and

at least one third magnetic unit being connected to the second magnetically conductive unit and the at least one second magnetic unit.

21. The loudspeaker apparatus of claim 20, wherein the magnetic circuit component further includes:

at least one fourth magnetic unit being located below the magnetic gap and connected to the first magnetic unit and the second magnetically conductive unit.

22. The loudspeaker apparatus of claim 19, wherein the magnetic circuit component further includes:

at least one fifth magnetic unit being connected to an upper surface of the first magnetically conductive unit.

23. The loudspeaker apparatus of claim 22, wherein the magnetic circuit component further includes:

a third magnetically conductive unit being connected to an upper surface of the fifth magnetic unit, wherein the third magnetically conductive unit is configured to suppress a leakage of a field strength of the first magnetic field.

24. The loudspeaker apparatus of claim 20, wherein

the first magnetically conductive unit is connected to the upper surface of the first magnetic unit,

the second magnetically conductive unit includes a bottom plate and a sidewall; and

the first magnetic unit is connected to the bottom plate of the second magnetically conductive unit.

25. The loudspeaker apparatus of claim 20, further comprising:

at least one electrically conductive unit being connected to at least one unit of the first magnetic unit, the first magnetically conductive unit, or the second magnetically conductive unit.

ABSTRACT

The present disclosure discloses a loudspeaker apparatus. The loudspeaker apparatus may include an ear hook, a core housing, and a circuit housing. The ear hook may include a first plug end and a second plug end. The ear hook may be surrounded by a protective sleeve. The protective sleeve may be made of an elastic waterproof material. The core housing may be used for accommodating an earphone core. The core housing may be fixed to the first plug end and elastically abutted against the protective sleeve. The circuit housing may be used for accommodating a control circuit or a battery. The circuit housing may be fixed to the second plug end. The control circuit or the battery may drive the earphone core to vibrate. The vibration of the earphone core may generate a driving force to drive a housing panel of the core housing to vibrate. The driving force may be not parallel to a normal line of the housing panel. In the present disclosure, the core housing may elastically abut against the protective sleeve surrounding the ear hook to improve the overall waterproof effect of the loudspeaker apparatus and simplify the manufacturing and assemble process of the loudspeaker apparatus.

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	20608-0081US00
First Named Inventor	LI, Chaowu
Title	LOUDSPEAKER APPARATUS
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [ ] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 68] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
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警告：
WARNING:

呈请人/申请人应小心避免在专利申请中备案的文件中提交个人信息，这有可能会造成身份盗窃。USPTO 从不要求为支持呈请或申请而提供社保号码、银行账号或信用卡号码等个人信息（除非是用于付款目的的支票或信用卡授权表 PTO-2038）。如果在提交给 USPTO 的文件中有此类个人信息，呈请人/申请人应当考虑在向 USPTO 提交文件之前编辑此类个人信息。兹告知呈请人/申请人，在公布申请（除非根据 37 CFR 1.213(a) 的规定在申请中提出不予公布的请求）或签发专利之后，专利申请记录将公之于众。而且，如果在公布的申请或签发的专利中引用了该申请，那么已弃用的申请记录也会公之于众（见37 CFR 1.14）。为付款目的而提交的支票和信用卡授权表 PTO-2038 不会保留在申请文件中，因此不会向公众公布。

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

发明人依法登记的姓名
LEGAL NAME OF INVENTOR

发明人：LI, Yongjian　　日期（选填）：_____
Inventor: _____　　Date (Optional): _____

签名：Li, Yongjian
Signature: _____

注意：此表格必须随附包含整个发明实体命名的申请信息表（PTO/AIA/14 或同等信息表），或者此信息表必须先前已被提交。其他每名发明人均需使用一份 PTO/AIA/01 信息表。
Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	LOUDSPEAKER APPARATUS
First Named Inventor/Applicant Name:	Chaowu LI
Filer:	Yangzhou Harry Du/yue li
Attorney Docket Number:	20608-0081US00

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1820**

Electronic Acknowledgement Receipt

EFS ID:	41517192
Application Number:	17137389
International Application Number:	
Confirmation Number:	1993
Title of Invention:	LOUDSPEAKER APPARATUS
First Named Inventor/Applicant Name:	Chaowu LI
Customer Number:	131839
Filer:	Yangzhou Harry Du
Filer Authorized By:	
Attorney Docket Number:	20608-0081US00
Receipt Date:	30-DEC-2020
Filing Date:	
Time Stamp:	03:34:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1820
RAM confirmation Number	E2020BT435305415
Deposit Account	506942
Authorized User	liuyun shen

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	2020-12-30-ADS-20608-0081US00.pdf	1823361 f26550fb00fc0e0b7f5140876d700a0b72620edd	no	8
Warnings:					
Information:					
2	Drawings-only black and white line drawings	2020-12-30-FIGs-20608-0081US00.pdf	617551 dc6cf413593dd1505c2d6fe6ad90843fa59276fc	no	14
Warnings:					
Information:					
3	Power of Attorney	2020-12-30-POA-20608-0081US00.pdf	2283876 923c8e70c299d5f81f88b3656f09760f723e3354	no	2
Warnings:					
Information:					
4		2020-12-30-Preliminary-Amendment-20608-0081US00.pdf	210057 a4fb76c65ecdc8212e4661a39f9c2dda9d5e99a6	yes	8

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Preliminary Amendment	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	8

Warnings:					
Information:					
5		2020-12-30-Spec-20608-0081US00.pdf	644288 f77c45dd25ba1cf2f126c58c0d8d386ac4a2927c	yes	68

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	61
	Claims	62	67
	Abstract	68	68

Warnings:					
Information:					
6	Transmittal of New Application	2020-12-30-Transmittal-20608-0081US00.pdf	617905 a13c7732d311e30c90f851a9685abb9ddbc5de61	no	2
Warnings:					
Information:					
7	Oath or Declaration filed	Signed-Declaration-20608-0081WO00.pdf	191658 7d3cc2af73295d4ea6249314829a4c8b13fac543	no	2
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	34822 49f70364bf08acb2b0cc5bd836c014546aaa0f94	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	6423518		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Chaowu		LI	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Shenzhen	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Floors 1-4, Factory Building 26, Shancheng
Address 2	Industrial Park, Shiyan Street, Bao'an District
City	Shenzhen, Guangdong
State/Province	
Postal Code	518108
Country [i]	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yongjian		LI	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Shenzhen	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Floors 1-4, Factory Building 26, Shancheng
Address 2	Industrial Park, Shiyan Street, Bao'an District
City	Shenzhen, Guangdong
State/Province	
Postal Code	518108
Country [i]	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	131839		
Email Address	docketing@metis-ip.com	Add Email	Remove Email

Application Information:

Title of the Invention	LOUDSPEAKER APPARATUS		
Attorney Docket Number	20608-0081US00	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	14	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	131839		

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	PCT/CN2019/102397	2019-08-24

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[j] (if applicable)
201910009927.4	CN	2019-01-05	95DA

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	SHENZHEN VOXTECH CO., LTD.		
Mailing Address Information For Applicant:			
Address 1	Floors 1-4, Factory Building 26, Shancheng		
Address 2	Industrial Park, Shiyan Street, Bao'an District		
City	Shenzhen, Guangdong	**State/Province**	
Country	CN	Postal Code	518108
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

IPR2025-00842; Mojawa
Ex. 1002 - Page 1572

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	SHENZHEN VOXTECH CO., LTD.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	Floors 1-4, Factory Building 26, Shancheng		
Address 2	Industrial Park, Shiyan Street, Bao'an District		
City	Shenzhen, Guangdong	**State/Province**	
Country i	CN	Postal Code	518108
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yangzhou Du/			Date (YYYY-MM-DD)	2020-12-30
First Name	Yangzhou	Last Name	Du	Registration Number	65310

Additional Signature may be generated within this form by selecting the Add button. Add

IPR2025-00842; Mojawa
Ex. 1002 - Page 1573

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20608-0081US00
	Application Number	
Title of Invention	LOUDSPEAKER APPARATUS	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Ex. 1002 - Page 1575

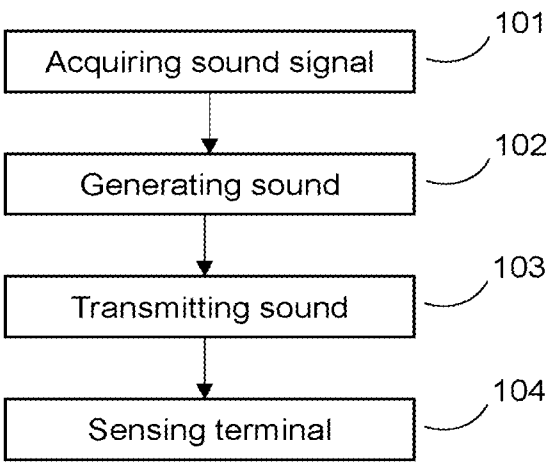
Acquiring sound signal
101
Generating sound
102
Transmitting sound
103
Sensing terminal
104

FIG. 1

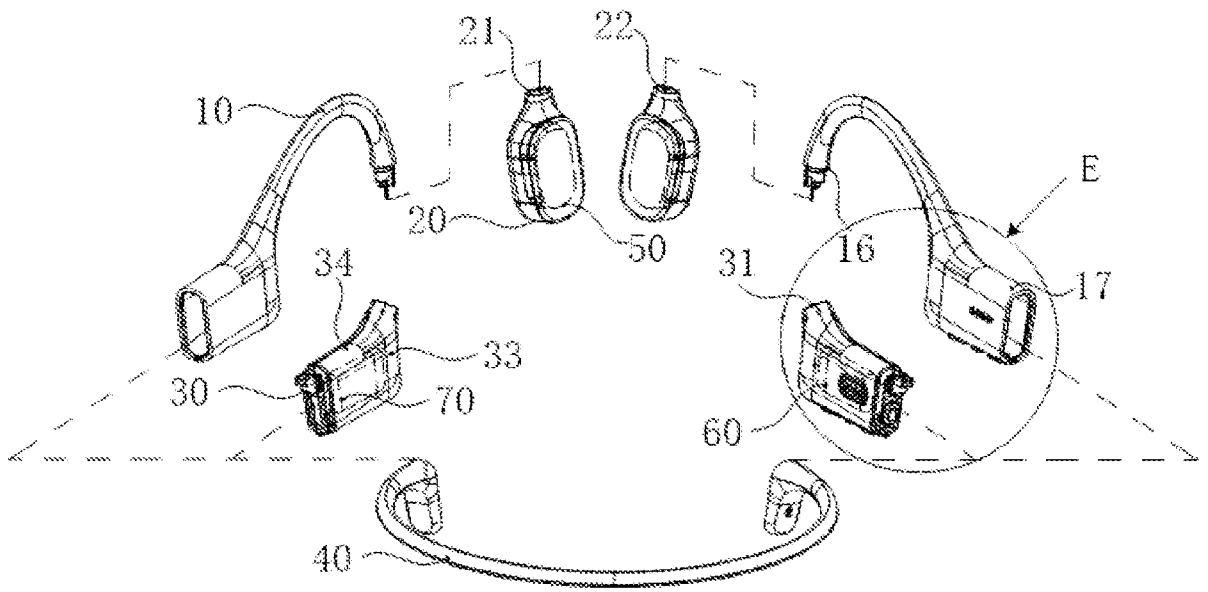

FIG. 2

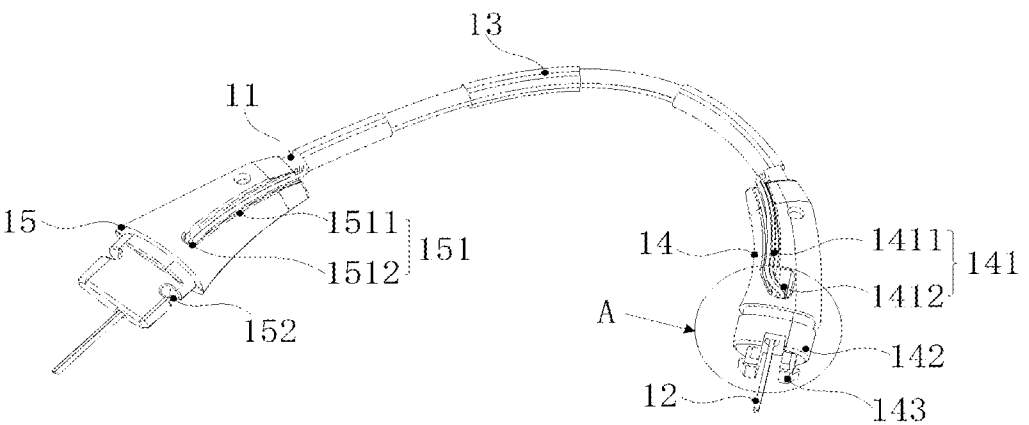

FIG. 3

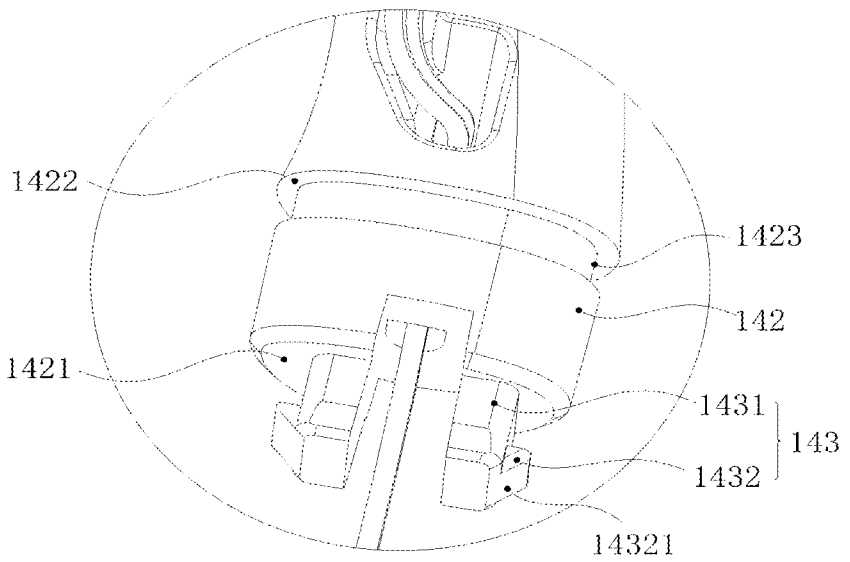

FIG. 4

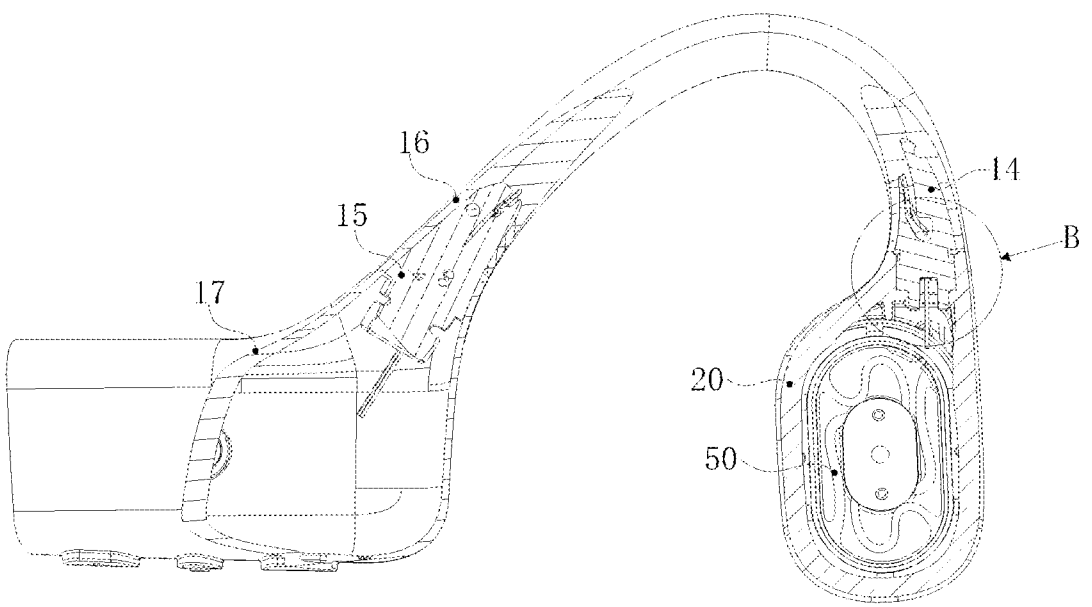

FIG. 5

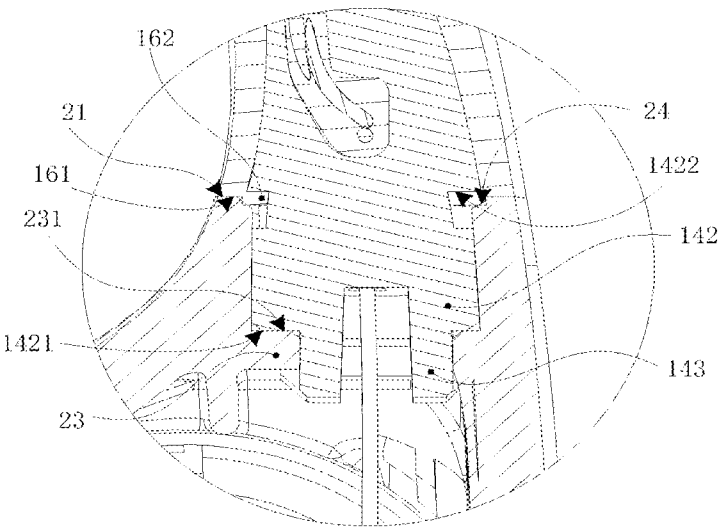
162
21
24
161
1422
231
142
1421
143
23

FIG. 6

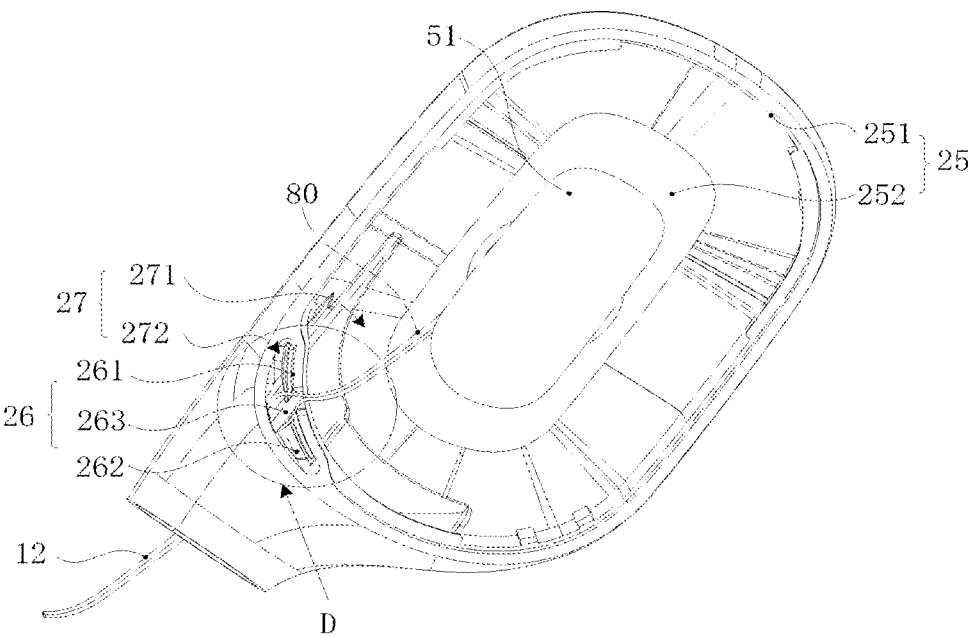
51
251
25
80
252
271
27
272
261
26
263
262
12
D

FIG. 7

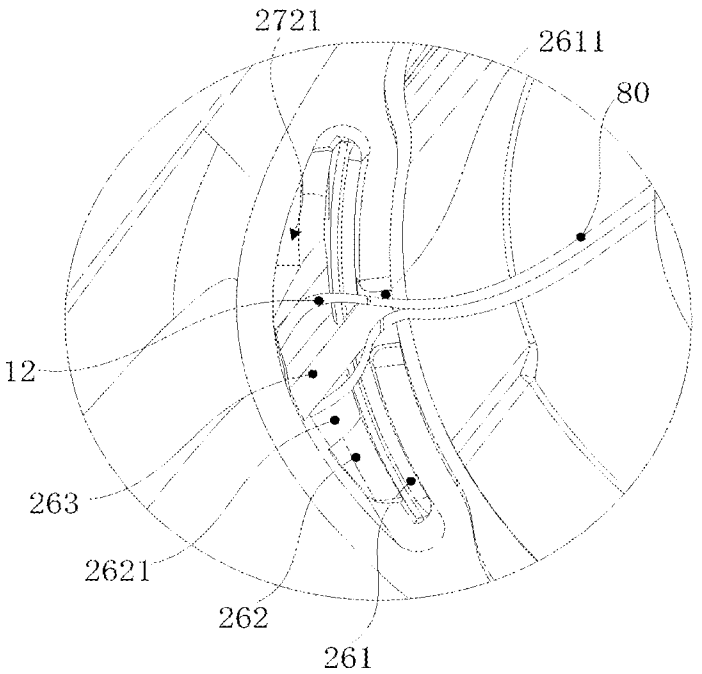
2721
2611
80
12
263
2621
262
261

FIG. 8

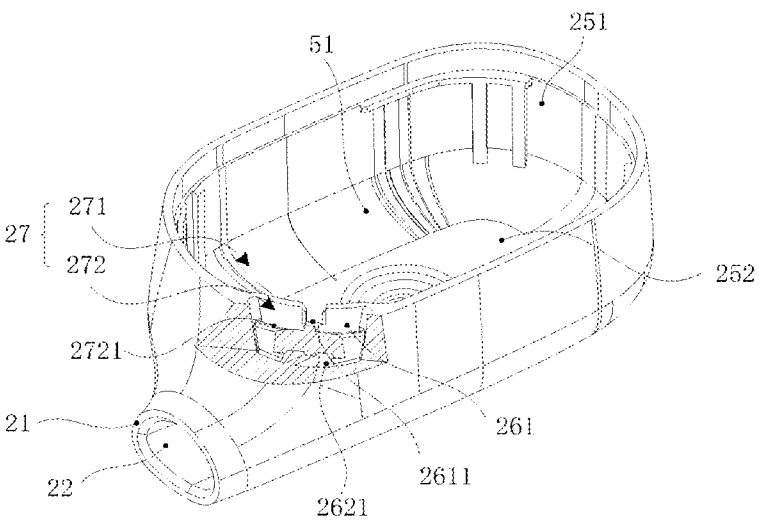
251
51
271
27
272
252
2721
21
261
22
2611
2621

FIG. 9

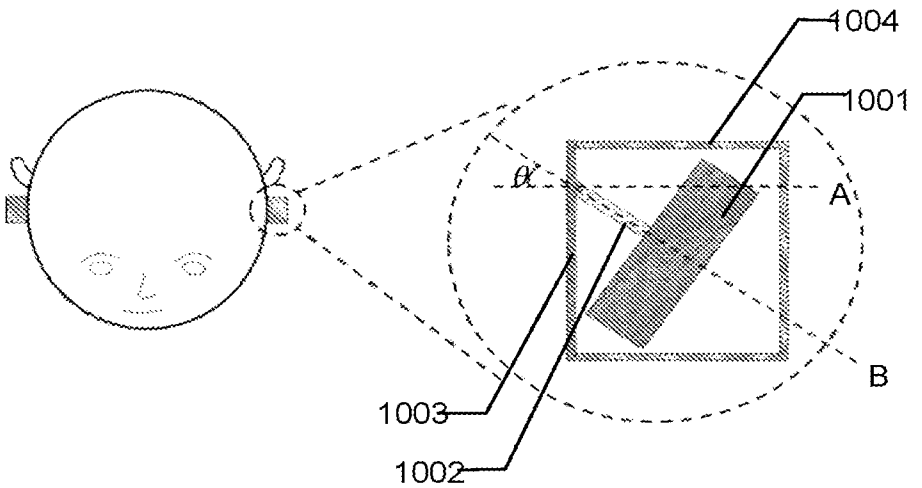

FIG. 10

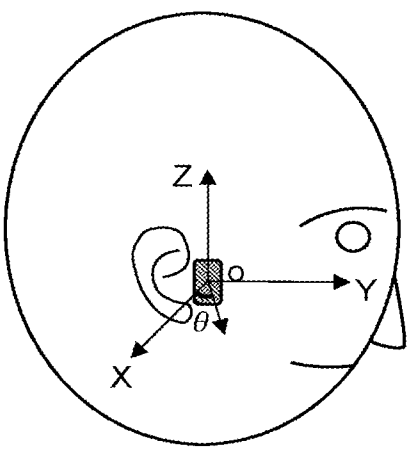

FIG. 11

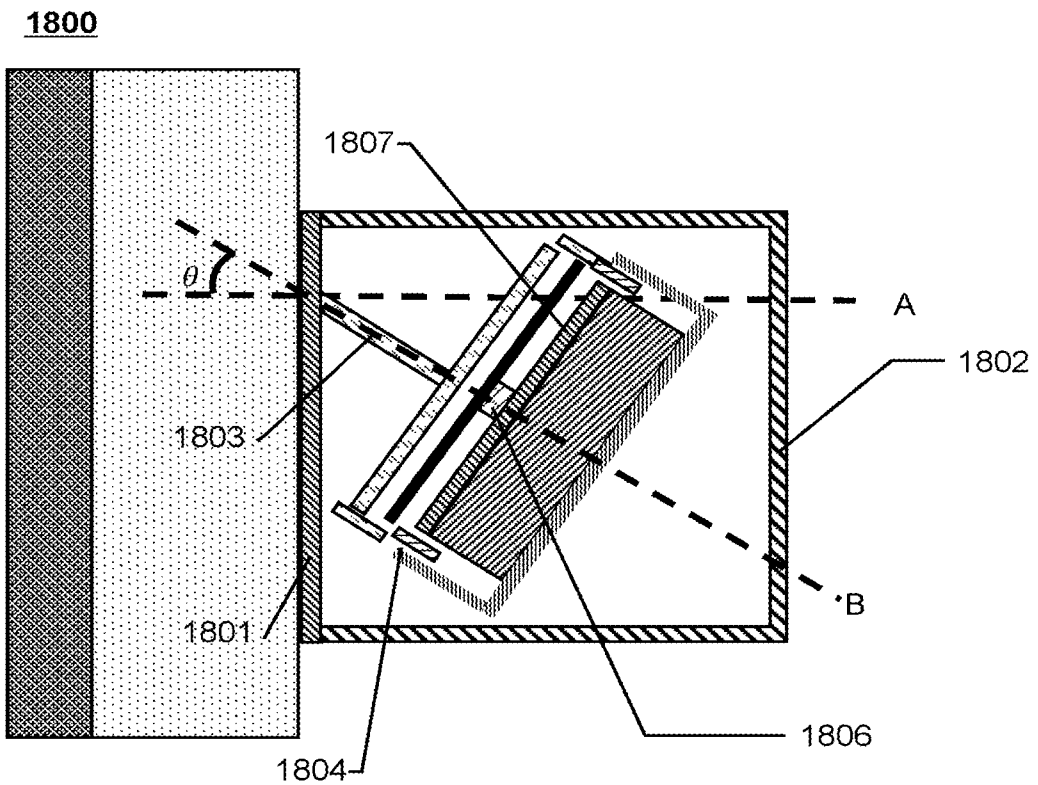

FIG. 12

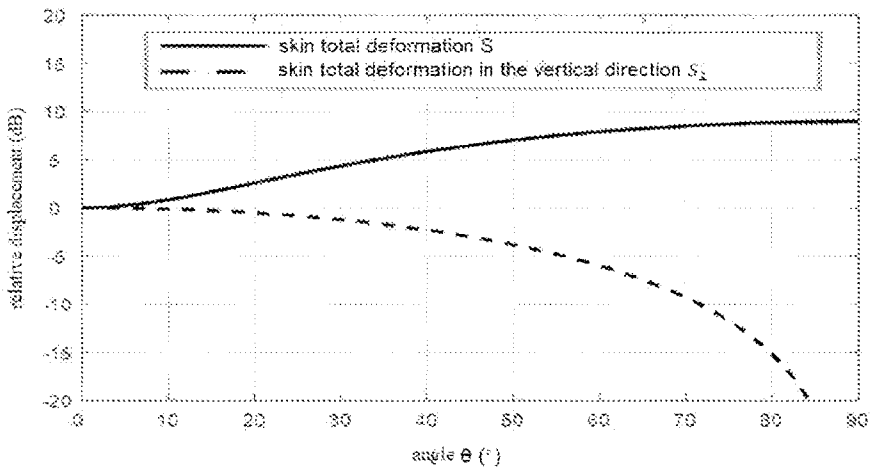
skin total deformation S
skin total deformation in the vertical direction S_z
relative displacement (dB)
angle θ (°)
20
15
10
5
0
-5
-10
-15
-20
0
10
20
30
40
50
60
70
80
90

FIG. 13

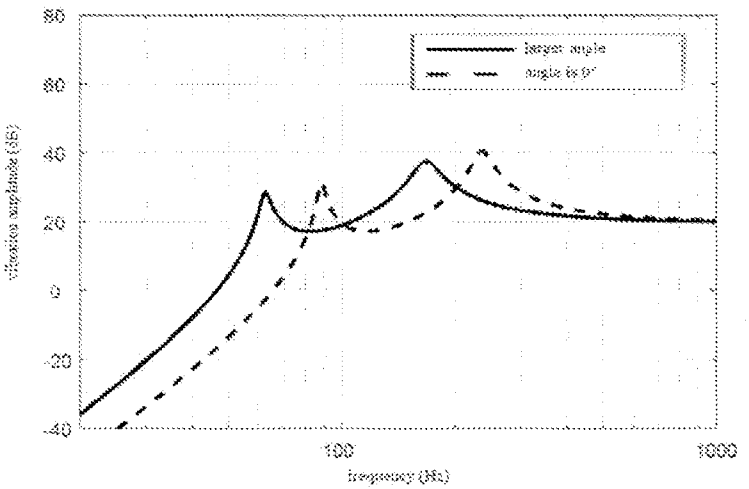
larger angle
angle is 0°
vibration amplitude (dB)
frequency (Hz)
60
40
20
0
-20
-40
100
1000

FIG. 14

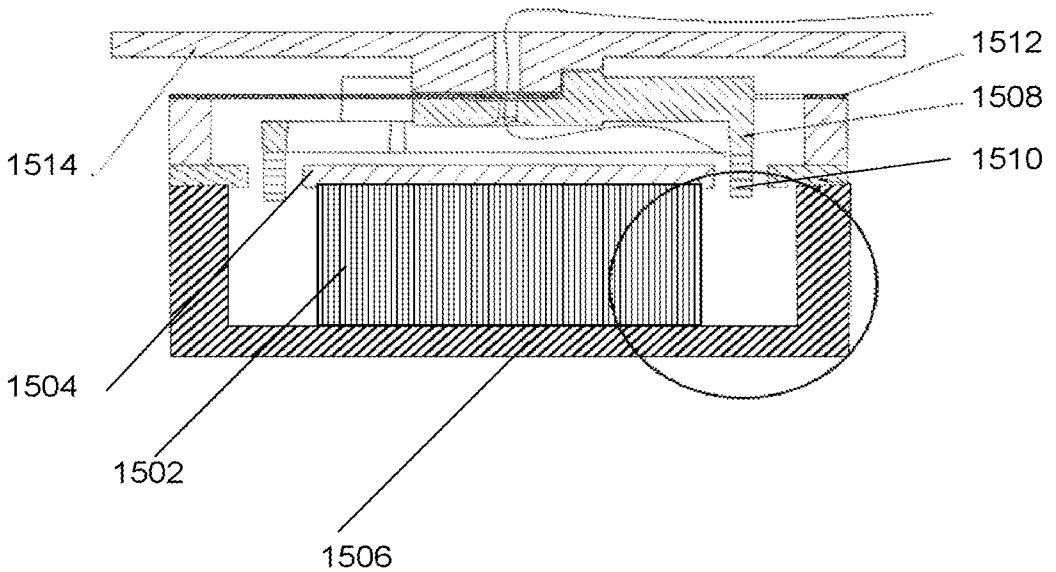

FIG. 15

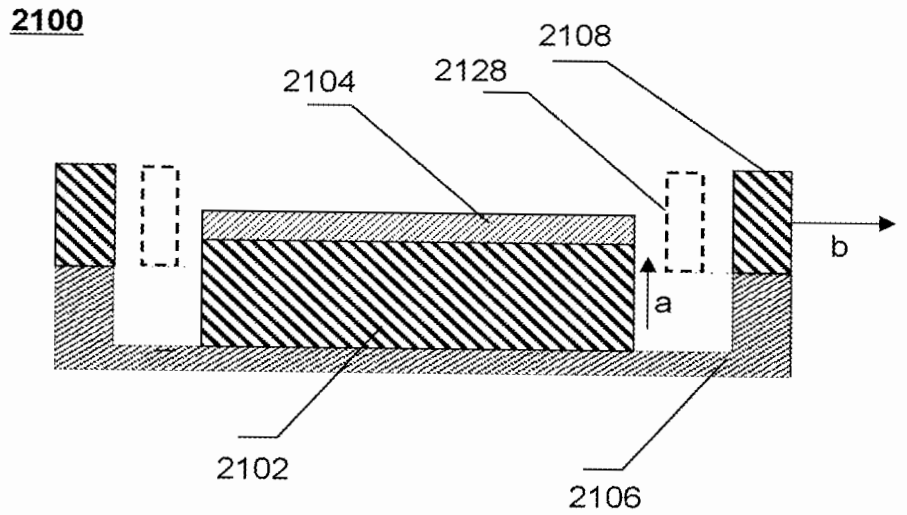
2100
2108
2104
2128
b
a
2102
2106

FIG. 16

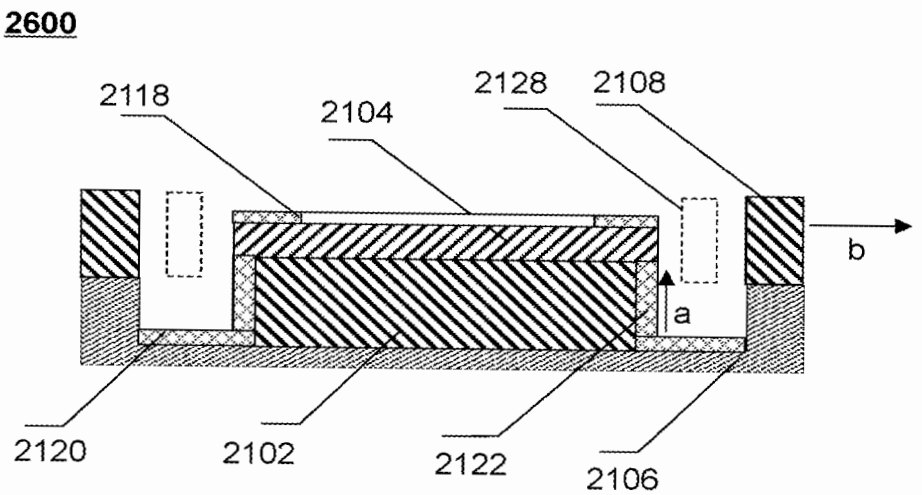
2600
2118
2104
2128
2108
b
a
2120
2102
2122
2106

FIG. 17

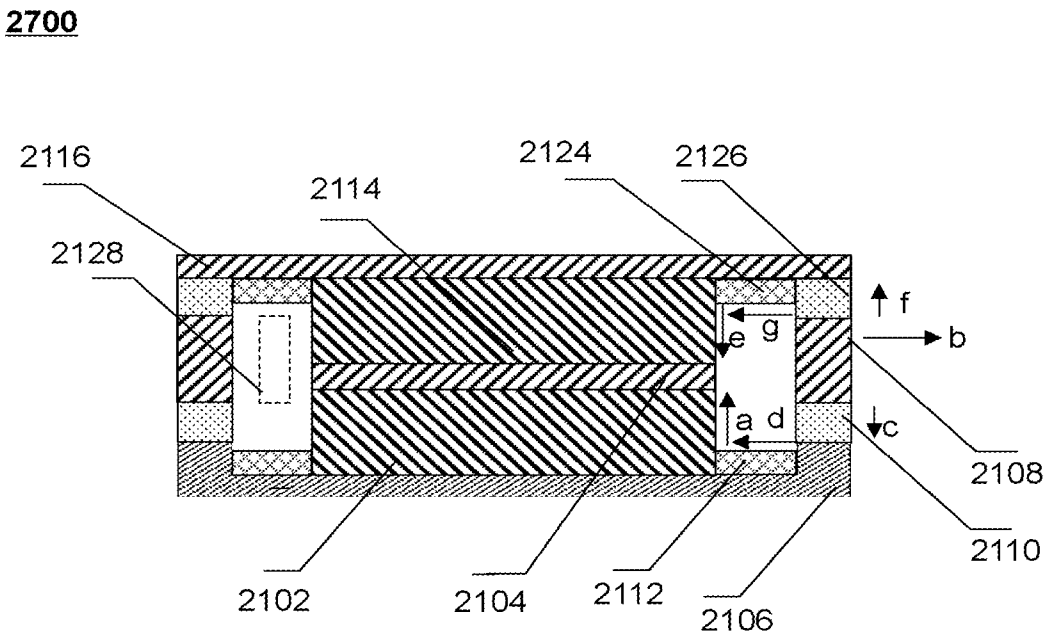
2700
2116
2114
2124
2126
2128
f
b
e
g
a
d
c
2108
2110
2102
2104
2112
2106

FIG. 18

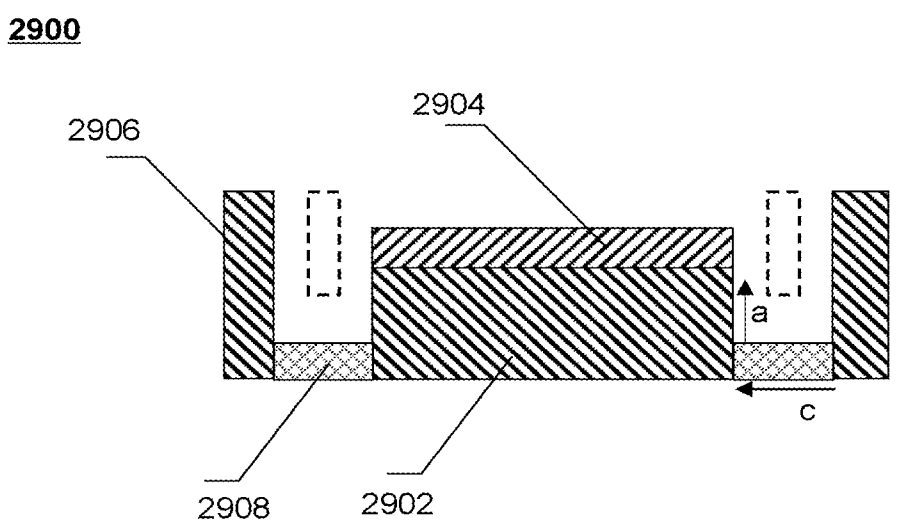
2900
2904
2906
a
c
2908
2902

FIG. 19

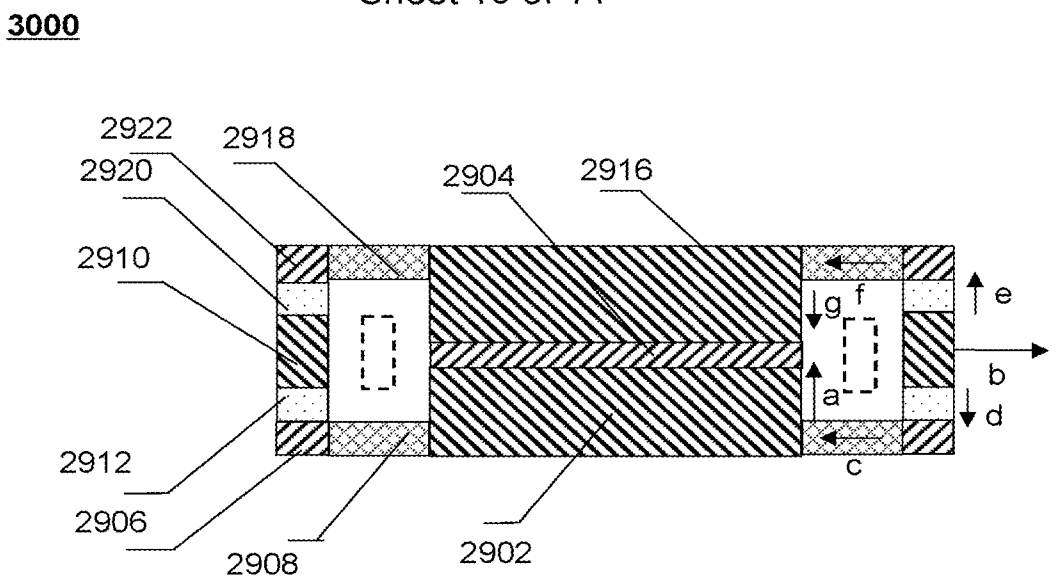
3000
2922
2918
2920
2904
2916
2910
g
f
e
b
a
d
2912
c
2906
2908
2902

FIG. 20

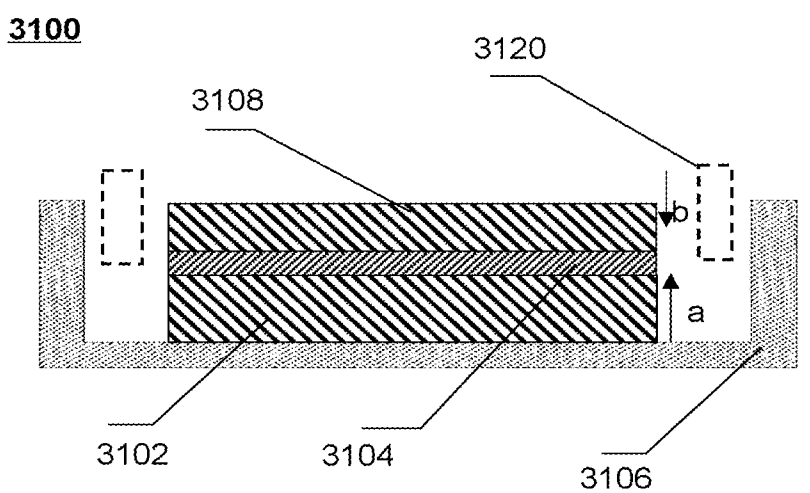
3100
3120
3108
b
a
3102
3104
3106

FIG. 21

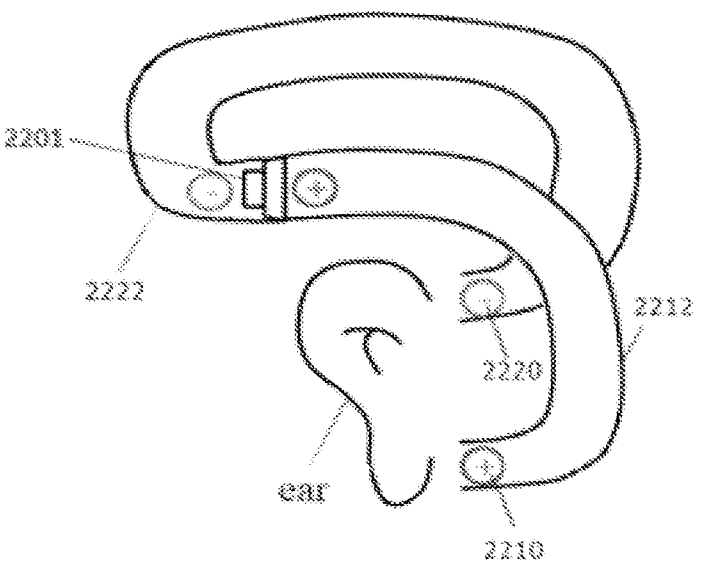

FIG. 22