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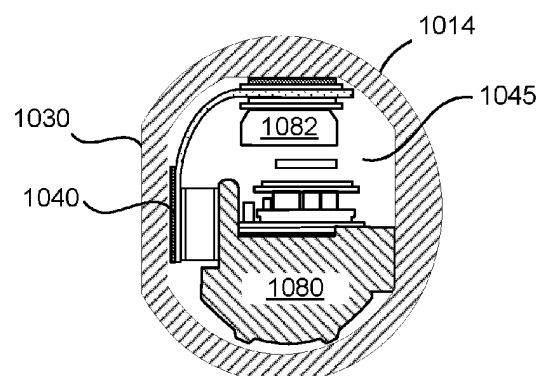
(71) Applicant: **Apple Inc.**  
**Cupertino CA 95014 (US)**

(72) Inventors:  
• **COUSINS, Benjamin A.**  
**Cupertino, 95014 (US)**  
• **OWENS, Travis**  
**Cupertino, 95014 (US)**  
• **JAIN, Karan**  
**Cupertino, 95014 (US)**  
• **PANECKI, Lee M.**  
**Cupertino, 95014 (US)**  
• **ZHANG, Mei**  
**Cupertino, 95014 (US)**  
• **CANNING, Julia**  
**Cupertino, 95014 (US)**

(74) Representative: **Barton, Russell Glen**  
**Withers & Rogers LLP**  
**2 London Bridge**  
**London SE1 9RA (GB)**

(54) **PORTABLE WIRELESS LISTENING DEVICE**

(57) An earphone comprising: a device housing that defines an interior cavity within the device housing; an acoustic port formed through a wall of the device housing; an audio driver disposed within the device housing and aligned to emit sound through the acoustic port; a user input region disposed along an exterior surface of the device housing; a flex circuit disposed within the interior cavity, the flex circuit including a first portion bonded at a first location to an inner surface of the device housing directly beneath the user-input region, a second portion bonded at a second location to an inner surface of the device housing spaced apart from the first location, and a third portion extending between the first and second portions; a force pixel disposed within the interior cavity and mounted to the first portion of the flex circuit below the user input region; a plurality of touch pixels disposed within the interior cavity between the force pixel and the user input region; sensor control circuitry disposed within the interior cavity and mounted to the second portion of the flex circuit; and a wireless antenna disposed within the interior cavity defined by the device housing.



**FIG. 10B**



## PARTIAL EUROPEAN SEARCH REPORT

Application Number

under Rule 62a and/or 63 of the European Patent Convention.  
This report shall be considered, for the purposes of  
subsequent proceedings, as the European search report

EP 23 15 7342

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 113 810 809 A (HUAWEI TECH CO LTD) 17 December 2021 (2021-12-17)	1-3, 6, 8, 9	INV. H04R1/10 H04R25/00
Y	* paragraphs [0105] - [0109]; figures 1-3D	10, 13	
A	*	11, 12, 14, 15	
X	US 2020/100013 A1 (HARJEE NAHID [US] ET AL) 26 March 2020 (2020-03-26) * paragraphs [0049] - [0050], [0065], [0069], [0075], [0077], [0082]; figures 1B-2A *	1-5, 8, 9	
Y	US 2019/098390 A1 (CARINO MARC-ANGELO P [US] ET AL) 28 March 2019 (2019-03-28) * paragraphs [0004], [0038] - [0040]; figure 7 *	10, 13	
			TECHNICAL FIELDS SEARCHED (IPC)
			H04R

## INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

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Place of search	Date of completion of the search	Examiner
The Hague	13 February 2024	Radomirescu, B-M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

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# INCOMPLETE SEARCH SHEET C

Application Number

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Claim(s) completely searchable:

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Claim(s) searched incompletely:

1-6, 8-15

Reason for the limitation of the search:

Due to the limited text space provided by the present "annex C" of the Search Report, only the conclusion of the reasoning regarding the "Incomplete Search" declaration has been indicated below. The entire reasoning is to be found in the Written Opinion accompanying the present Search Report.

"[...]

To conclude, for search and examination purposes, the features/terms "force pixel" and "touch pixel" are interpreted in accordance with their functioning disclosed in para.[0080] and the scope of the search has been limited accordingly. Nonetheless, for any further proceedings in the examination phase, at least the features of para.[0080] should be used to clarify the objected features/terms.

[...]

The above-mentioned non-compliance with the substantive provisions is such that a meaningful search for the entire, claimed subject-matter of the claims cannot be carried out (Rule 63 EPC and Guidelines B-VIII, 3). In the light of the provisions of Rule 63 EPC and the corresponding legal requirements, the Search Division has limited the search of the claimed subject-matter strictly to the embodiments and examples of the present application to the extent their are clear and sufficiently disclosed. Additional limitations have been already mentioned in section 2 above. The scope of the search was also further limited following to and in accordance with the objection of lack of unity detailed in section 4 below."



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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**see sheet B**

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

**1-6, 8-15**

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**1. claims: 1-6, 8, 9**

**Implementation of a force sensor for a wireless listening device.**

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**2. claim: 7**

**Manufacturing method for a flex circuit.**

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**3. claims: 10-15**

**Increasing the efficiency in use of a wireless listening device, in particular regarding the power management.**

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# **ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-02-2024

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
<b>CN 113810809 A</b>	<b>17-12-2021</b>	<b>NONE</b>	
<hr/>			
<b>US 2020100013 A1</b>	<b>26-03-2020</b>	<b>CN 110944258 A</b>	<b>31-03-2020</b>
		<b>CN 112995832 A</b>	<b>18-06-2021</b>
		<b>CN 114205706 A</b>	<b>18-03-2022</b>
		<b>CN 210143098 U</b>	<b>13-03-2020</b>
		<b>DE 112019004722 T5</b>	<b>29-07-2021</b>
		<b>JP 7147043 B2</b>	<b>04-10-2022</b>
		<b>JP 2021534638 A</b>	<b>09-12-2021</b>
		<b>JP 2022180518 A</b>	<b>06-12-2022</b>
		<b>KR 20210035246 A</b>	<b>31-03-2021</b>
		<b>KR 20220141345 A</b>	<b>19-10-2022</b>
		<b>KR 20220141346 A</b>	<b>19-10-2022</b>
		<b>KR 20230159644 A</b>	<b>21-11-2023</b>
		<b>KR 20240007962 A</b>	<b>17-01-2024</b>
		<b>US 2020100013 A1</b>	<b>26-03-2020</b>
		<b>US 2021168487 A1</b>	<b>03-06-2021</b>
		<b>US 2021314696 A1</b>	<b>07-10-2021</b>
		<b>US 2022417642 A1</b>	<b>29-12-2022</b>
		<b>US 2022417643 A1</b>	<b>29-12-2022</b>
		<b>WO 2020060725 A1</b>	<b>26-03-2020</b>
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<b>US 2019098390 A1</b>	<b>28-03-2019</b>	<b>NONE</b>	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82