Wearable device/smart watch

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Outline

- Introduction
- Spec
- Technology Analysis
- Industry Analysis
- Conclusion
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Introduction

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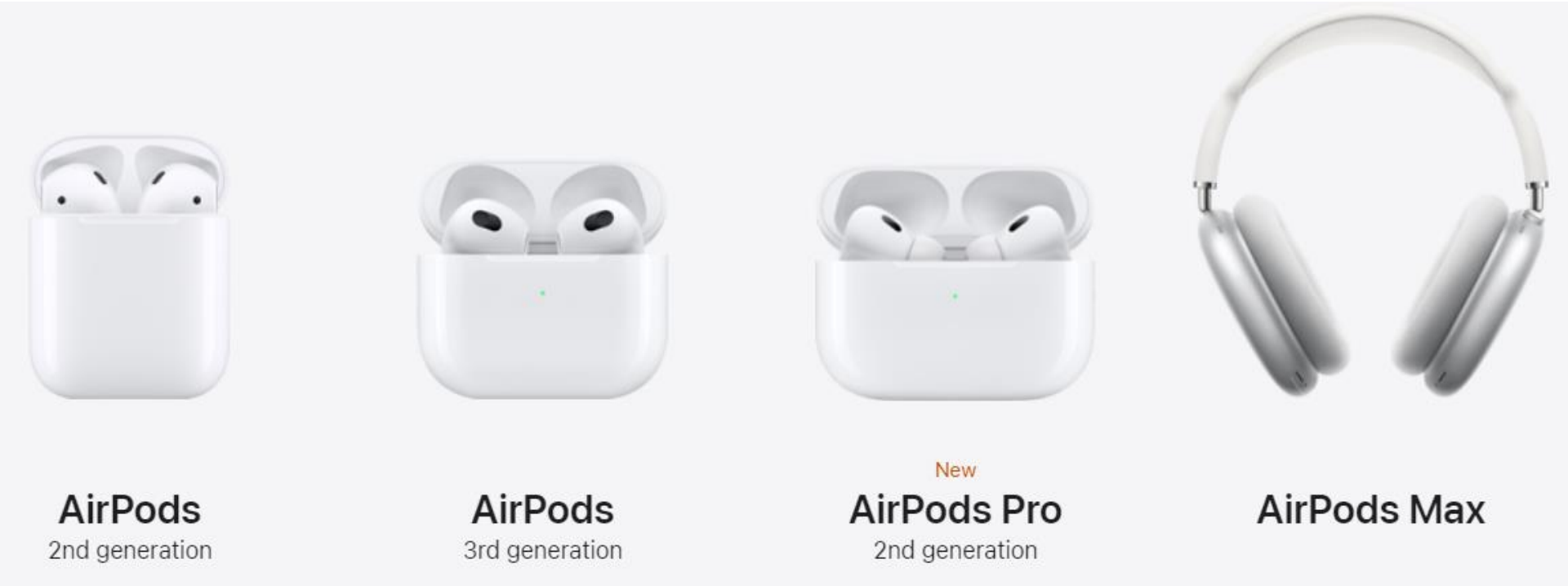
Product

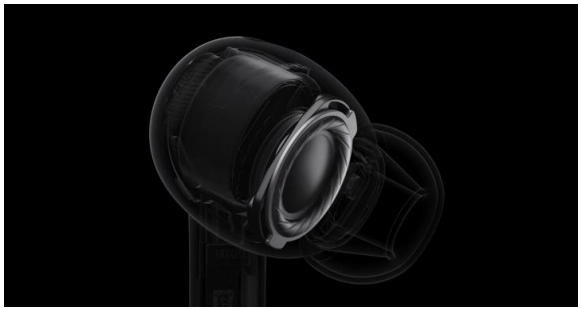

AirPods
2nd generation
AirPods
3rd generation
New
AirPods Pro
2nd generation
AirPods Max

Compare

	AirPods (2nd generation)	AirPods (3rd generation)	AirPods Pro (2nd generation)
Active Noise Cancellation			✓
Adaptive Transparency			✓
	Double-tap	Force sensor	Touch control
Personalized Spatial Audio with dynamic head tracking		✓	✓
Sweat and water resistant		✓	✓
chip	H1	H1	H2
Hey Siri	✓	✓	✓
listening time	5 hrs	6 hrs	6 hrs

AirPods Pro (2nd generation)

More immersive by every measure.



- **new adaptation algorithms**
  - process sound more quickly

- **A redesigned inward-facing microphone works with voice enhancement algorithms**
  - sounds more natural

- **A custom-built driver and amplifier**
  - you'll hear deeper bass and crisper highs.

Noise cancellation

- two times more noise cancellation than their predecessor

- **Active Noise Cancellation**
  - **Reduce more unwanted noise**
- **Adaptive Transparency**
  - **You can comfortably hear the world around you.**
- **Touch control**
- **Personalized listening**
  - **Dynamic head tracking**
  - **Adaptive EQ**
- **Charging Case**
  - U1 chip
  - lanyard loop
  - built-in speaker

Touch control

Play and pause audio.
One press

Skip forward.
Double-press

Skip back.
Triple-press

Turn the volume up or down.
swipe up or down.

- Use Siri with your AirPods Pro (2nd generation)
- Use Active Noise Cancellation and Transparency mode with your AirPods Pro (2nd generation)

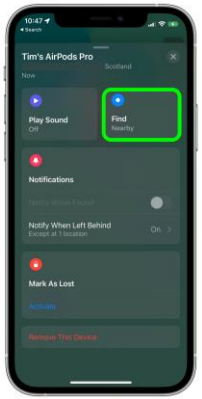
Personalized listening

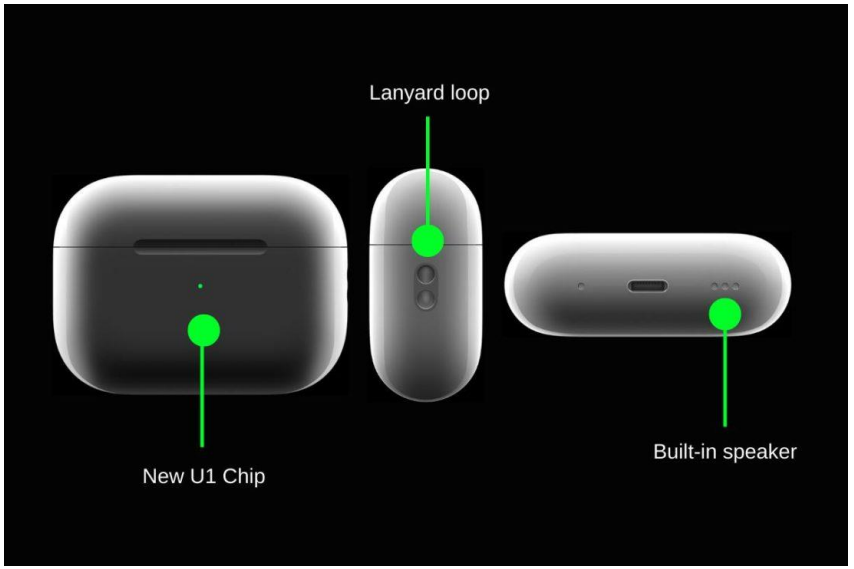
- Dynamic head tracking
  - in all-around-you sound
  - three-dimensional audio

- Adaptive EQ
  - Inward-facing microphones measure what you're hearing, then adjust the low to high frequencies of a song
  - hear every frequency just as it was intended.

Charging Case

- **U1 chip**
- **lanyard loop**
  - allows you to attach the case to a backpack or handbag.





- **built-in speaker**
  - help you easily locate it.
  - all-new tones alert you when the battery is low or pairing is complete.

Spec

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AirPods (1 Generation)

- W1 chip

AirPods Pro Teardown (H1 chip)

Germany Battery (3.7 V)
CP1154 (168 mWh)

AirPods Pro Teardown (H1 chip)

Drive unit

Voice coil

AirPods Pro Teardown (H1 chip)

H1 chip

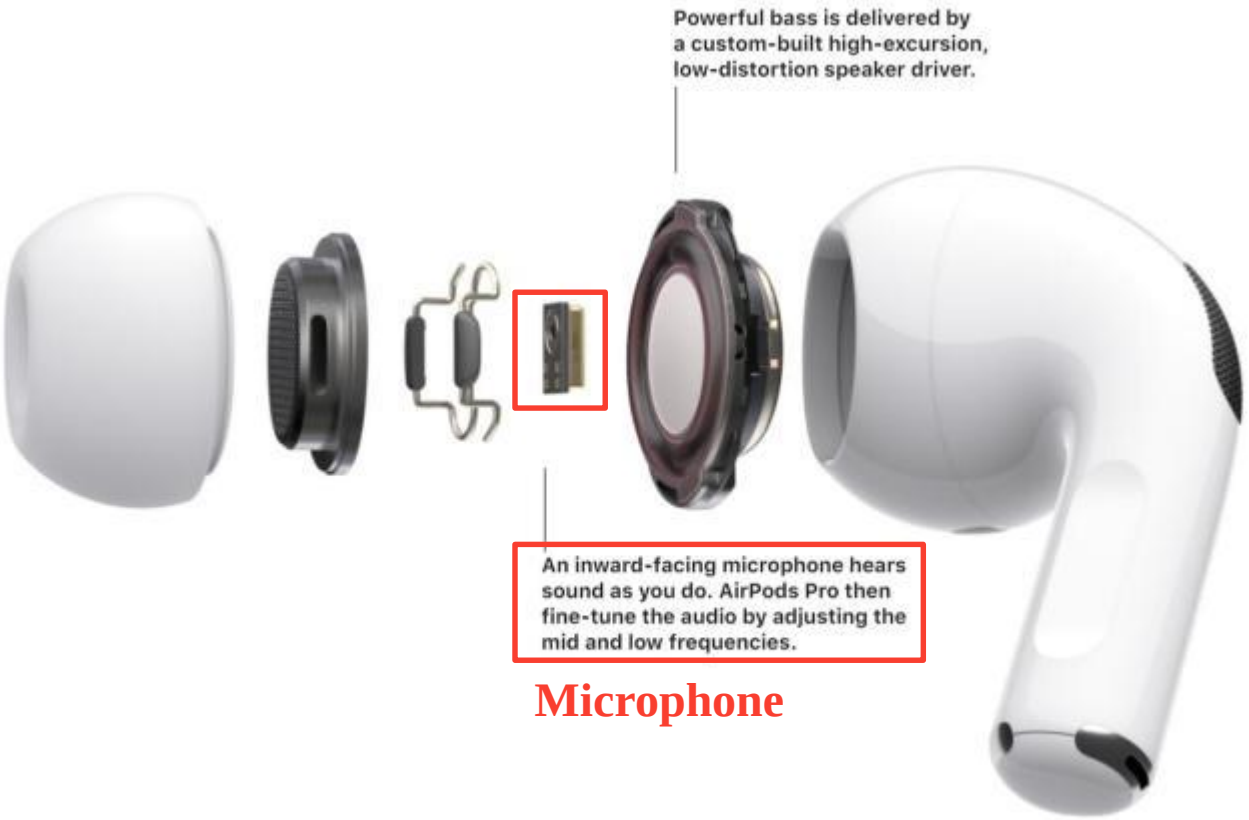
✓ ✓

Microphone

antenna

H1 chip

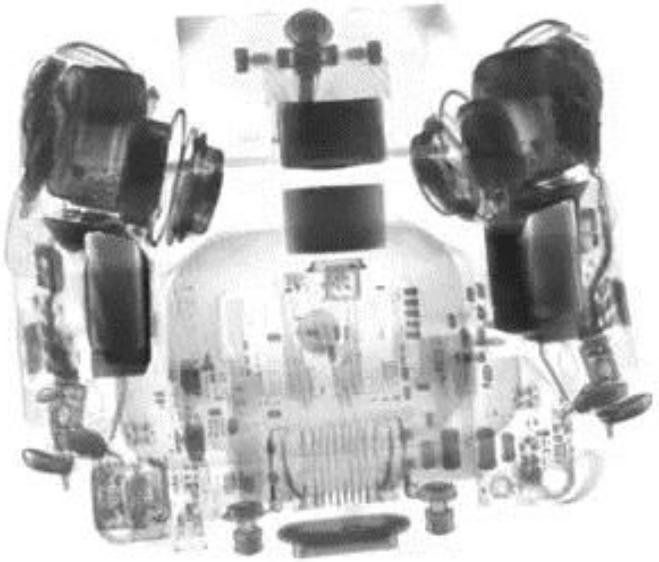
AirPods Pro Teardown (H1 chip)



Microphone

Infer whether your earplugs are worn correctly

AirPods Pro Teardown (H1 chip)



AirPods Pro2 Teardown (H2 chip)

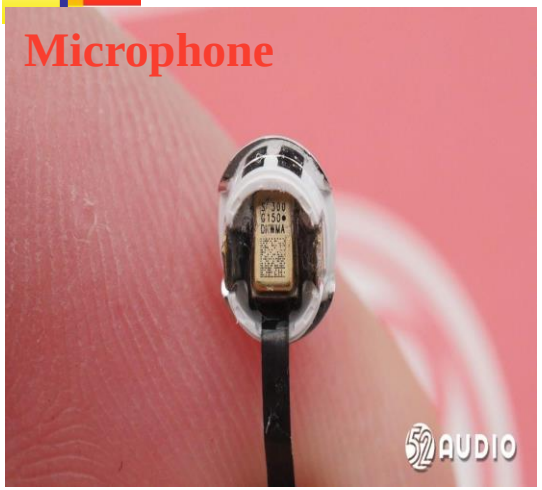
Samsung SDI(A2731)
Battery (3.66V)

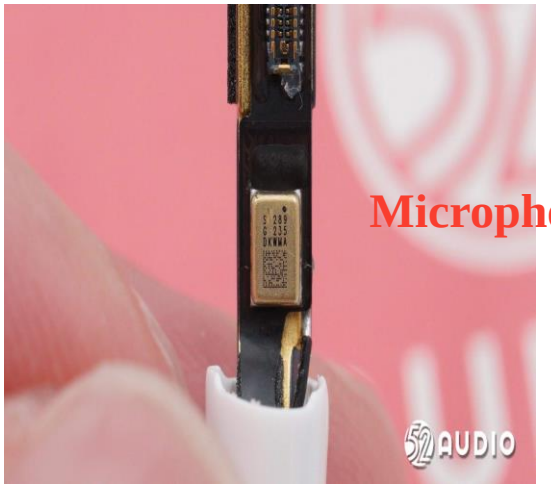
H2 chip

H2 chip(System in Package)

Microphone

AirPods Pro2 Teardown (H2 chip)





H2 chip(System in Package)

Technology Analysis

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Biometric

- Face
- Fingerprint
- Voiceprint
- Iris
- ECG
- Ear Canal

Ear Canal

- **Principle**
  - The shape of each person's ear is different, so the sound waves are input into the ear, the waveform of the rebound will be different.
    - Ear ID
- **Company**
  - Apple
  - NEC
- **Accuracy**
  - More than 99%

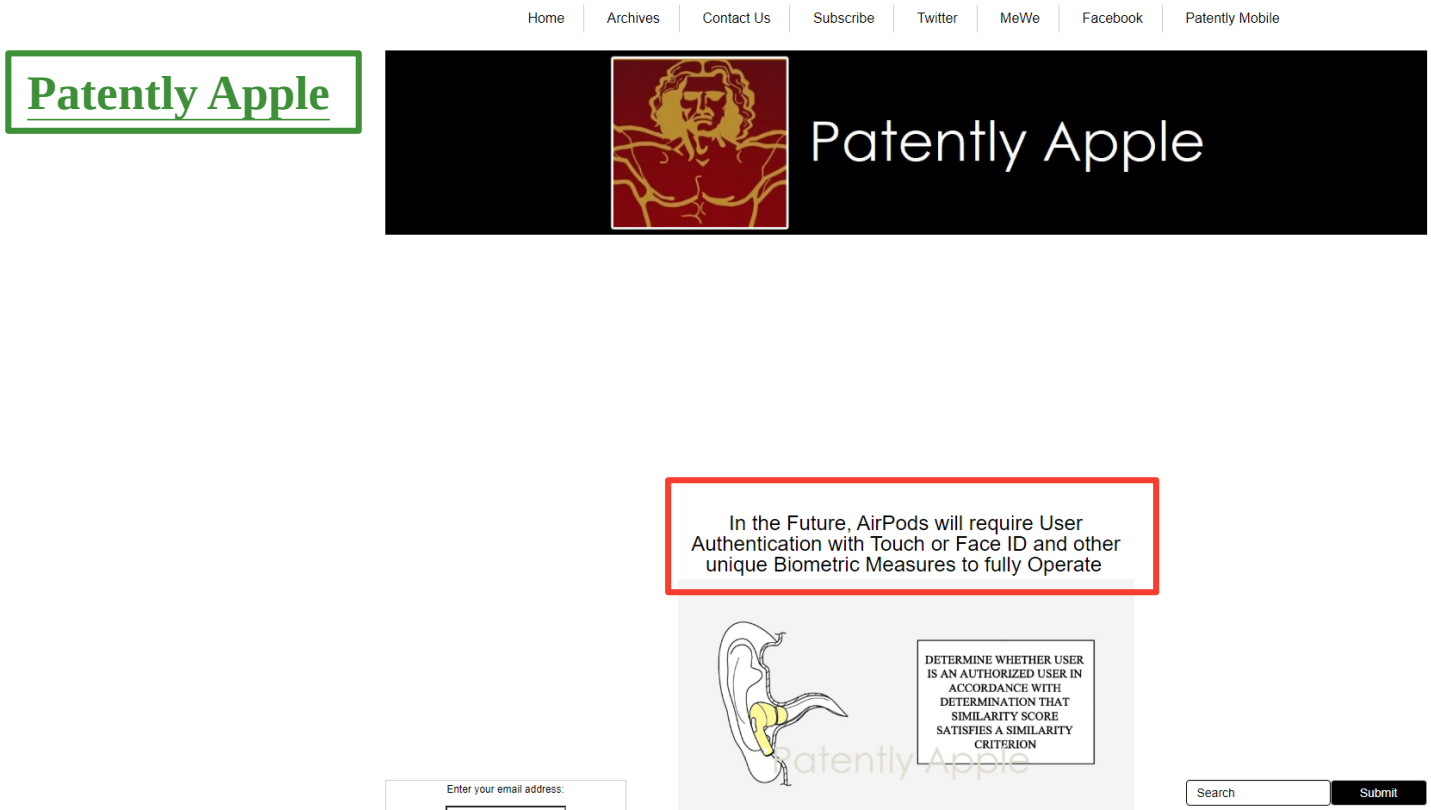
Ear Canal Biometric Device

- **The new patent, granted by the US Patent and Trademark Office and listed (USPTO) on January 27, 2022**
  - Ear Canal Biometric Device

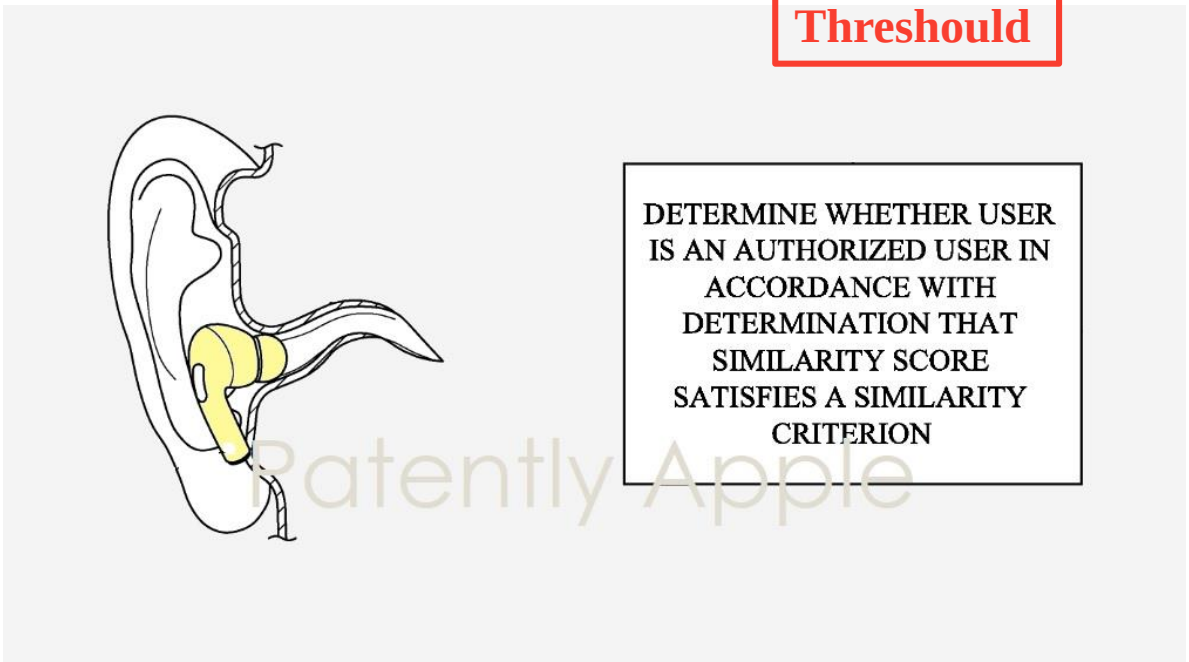
- **Conventional wireless headphones that connect to a person's smartphone typically allow use by an unauthorized person.**

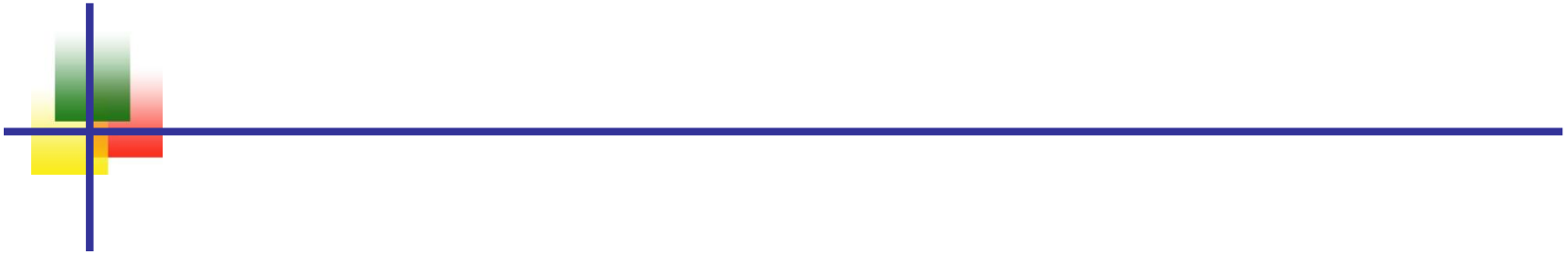
Patently Apple

- **In the Future, AirPods will require User Authentication with Touch or Face ID and other unique Biometric Measures to fully Operate**



- **Determine whether user is an authorize user in accordance with determination that similarity score satisfies a similarity criterion.**





user identification using headphones

However, conventional systems are generally lacking with respect to user identification using headphones. In particular, traditional systems are not well equipped to determine whether a user wearing a respective set of headphones is an authorized user of a corresponding device, such as a mobile phone.

risk releasing personal information

For example, conventional systems will typically allow any user (e.g., an unauthorized user) to place headphones in their ear, even if such headphones are communicatively coupled to the device of another user.

As a result, **conventional systems may risk releasing personal information from an associated device to unauthorized wearers of corresponding headphones.**

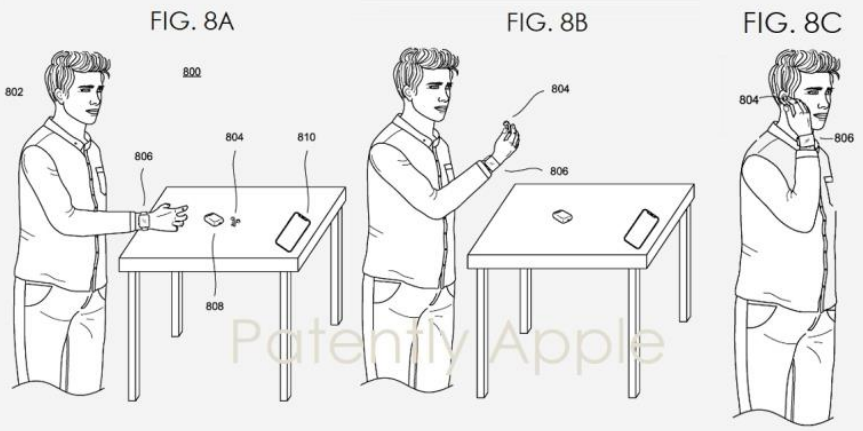
- **The shape of each person's ear is different, so the sound waves are input into the ear, the waveform of the rebound will be different.**

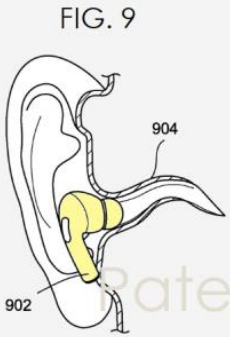
The authorization of the user may be further based on obtaining biometric information from a device, such as the wireless headphones. Biometric information associated with an ear of the user may be obtained from wireless headphones. For example, various signals may be output at wireless headphones wherein an impulse response is received from wireless headphones based on the output signals. The impulse response may correspond to a biometric representation related to an ear of the user (e.g., an inner-ear representation).

FIGS. 8A-8C illustrate a system for user identification using headphones.

FIG. 9 illustrates a system for user identification using headphones.

CLICK ON IMAGE TO ENLARGE





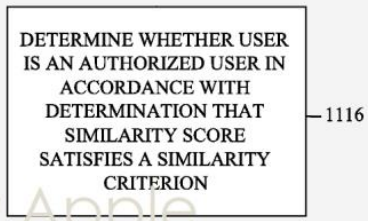
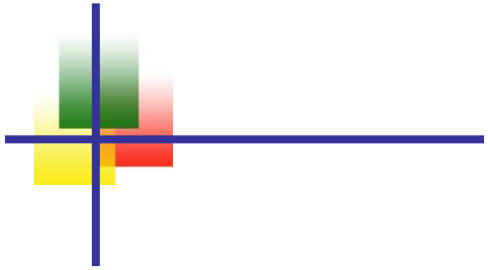


FIG. 11B illustrates a partial process for user identification using headphones.



In general, the additional input associated with the user may include one or more of a speech input and/or gait information associated with the user. For example, once a wireless headphone is placed in the ear of a user, a speech input may be received via the wireless headphone. In accordance with a determination that the received speech input corresponds to a stored voiceprint, the user may he identified as an authorized user of the wireless headphone 902 and an associated mobile device, for example. In some examples, once the wireless headphone is placed in an ear of the user, gait information is detected.

speech input→voiceprint

In particular, the gait information may be determined at a mobile device associated with wireless headphone and/or an Apple Watch associated with wireless headphone. The gait information may include, for example, information regarding a user's walking and/or running characteristics, such as characteristics related to steps, pace, stride, and the like. The gait information may be further compared to reference gait information. For example, the user's gait information may have previously been detected and stored (e.g., gait information representing a user's typical walking and/or running characteristics).

gait information

- **Considering that this is a patent application, the timing of such a product to market is unknown at this time.**

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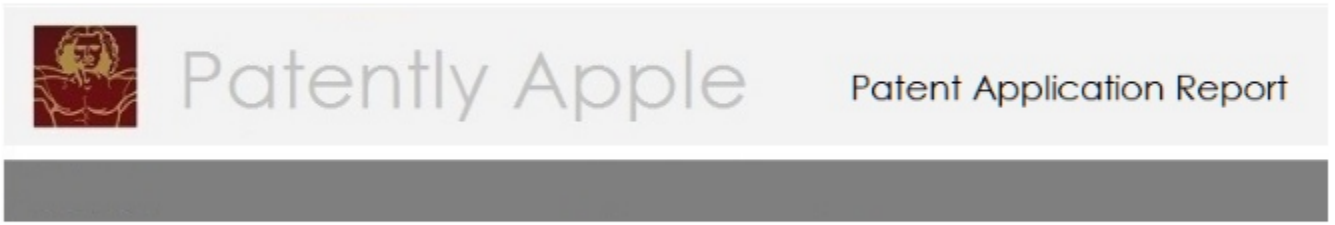

Posted by Jack Purcher on January 27, 2022 at 04:19 AM in 1A. Patent Applications, Audio, HomePod, AirPods, AirPods Max | Permalink | Comments (0)

However, AirPods aren't specifically mentioned in the patent, suggesting the product could come under a different name.

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AirPods Pro V.S. Sony WF-1000XM4

	AirPods Pro (2nd generation)	Sony WF-1000XM4
Chip	H2	V1
Bluetooth	5.3	5.2
Audio Coding	AAC	AAC、LDAC Hi-res
Bit rate	320Kbps	990Kbps

SWOT

STRENGHTS

- Apple ecosystem
- lanyard loop
- built-in speaker
- find my Airpods
- Adaptive Transparency
- Ear Canal Biometric Device

WEAKNESSES

- sound quality

OPORTUNITIES

- Ear Canal Biometric Device
- Microphone
- Patent

THREATS

- Sony WF-1000XM4

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Conclusion

- The new patent, granted by the US Patent and Trademark Office and listed (USPTO) on January 27, 2022.
- It is a new biometrics.
- User authentication can be achieved by receiving speech input or gait information through a wireless headphone.
- However, AirPods aren't specifically mentioned in the patent, suggesting the product could come under a different name.

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Reference

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