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(12) **United States Patent**
Paulson et al.

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(54) **TWO-WAY VOICE COMMUNICATION
DEVICE HAVING EXTERNAL ACOUSTIC
NOISE REDUCTION**

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(73) Assignee: **Etymotic Research, Inc.**, Elk Grove Village, IL (US)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Primary Examiner—Matthew D Anderson

(22) Filed: **Jan. 8, 2004**

Assistant Examiner—Wen W Huang

(65) **Prior Publication Data**

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(74) *Attorney, Agent, or Firm*—McAndrews, Held & Malloy, Ltd.

Related U.S. Application Data

(57) **ABSTRACT**

(60) Provisional application No. 60/439,234, filed on Jan. 9, 2003, provisional application No. 60/451,290, filed on Mar. 1, 2003, provisional application No. 60/507,629, filed on Sep. 30, 2003.

A two-way voice communication device which provides a high-level of acoustic noise reduction is disclosed. A resilient ear tip provides acoustic isolation and secures the earphone within the ear canal of the user. The ability to rotate the earphone within the ear canal allows the user to easily position an attached microphone. The audio signals may be conveyed by an included radio frequency receiver and radio frequency transmitter, or the earphone may be connected to an electrical audio device using a multi-conductor cable. Audio signals may be conveyed to one or both ears of a user. A switch to mute the audio signal from the microphone, or for supporting a push-to-talk mode of operation, may be included in the earphone housing, or on the cable.

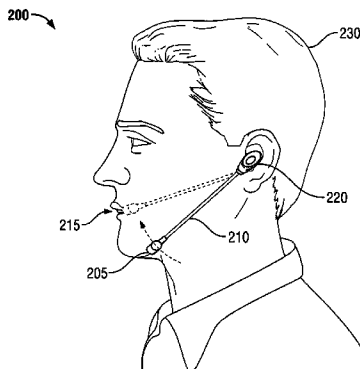
(51) **Int. Cl.**
H04M 1/00 (2006.01)
H04R 25/00 (2006.01)

(52) **U.S. Cl.** **455/550.1**; 455/569.1; 455/569.2; 455/575.1; 455/556.1; 381/370; 381/375; 381/380; 379/430

(58) **Field of Classification Search** 455/550.1, 455/569.1, 569.2, 570, 575.2, 575.6, 575.1, 455/556.1, 575, 556; 381/370, 375, 380; 379/430

See application file for complete search history.

37 Claims, 15 Drawing Sheets



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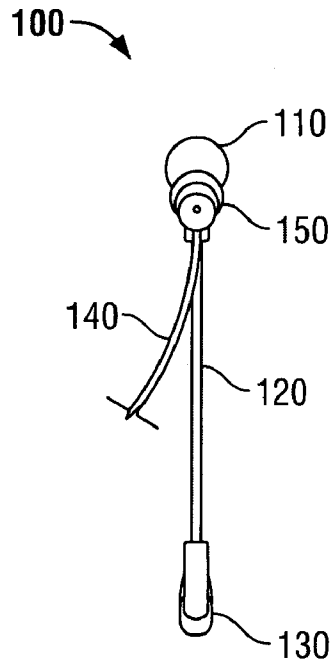


FIG. 1A

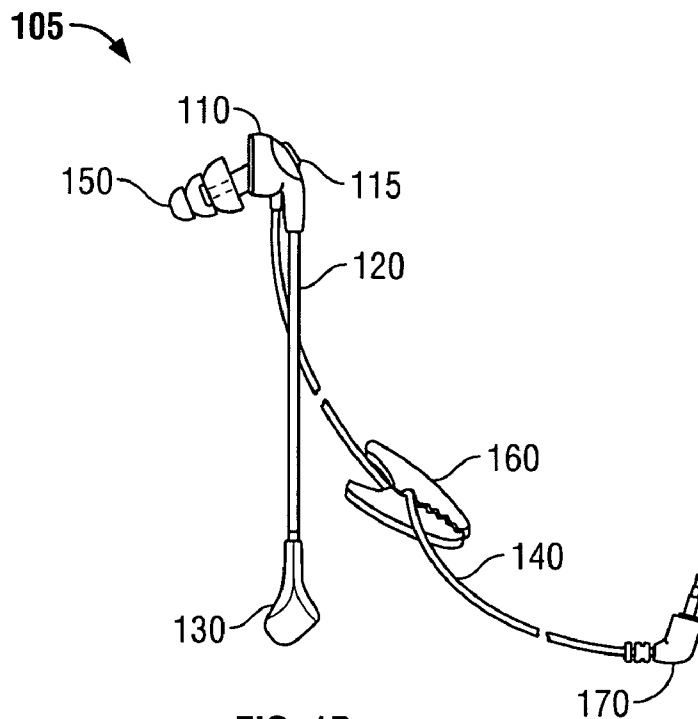


FIG. 1B

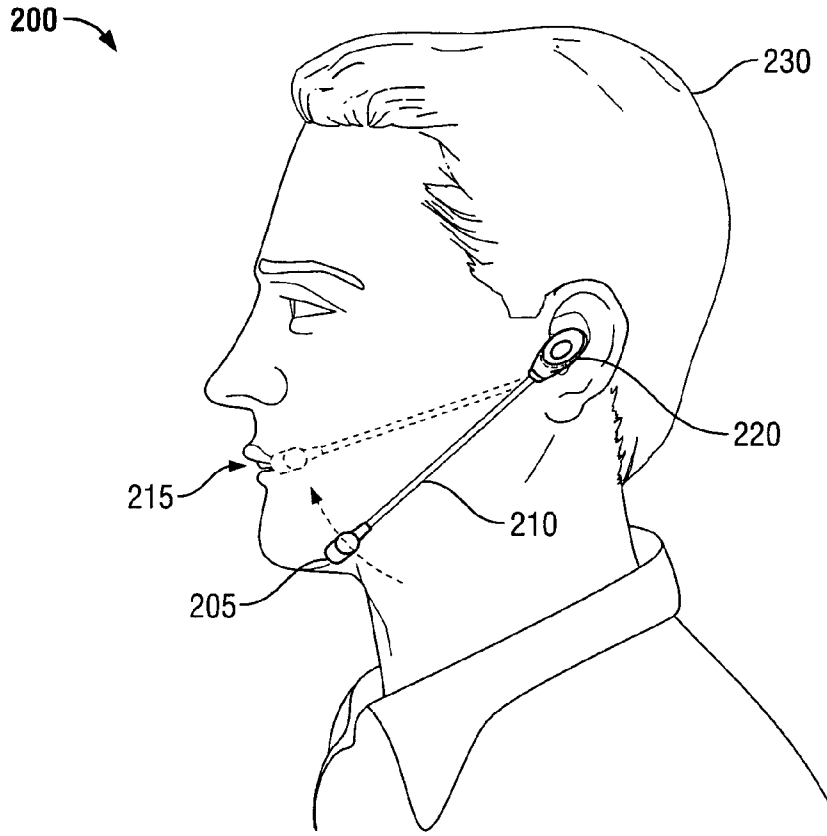


FIG. 2

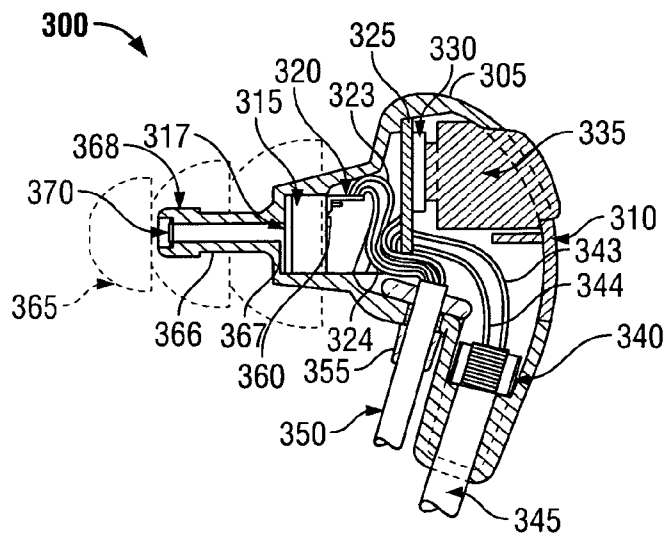


FIG. 3

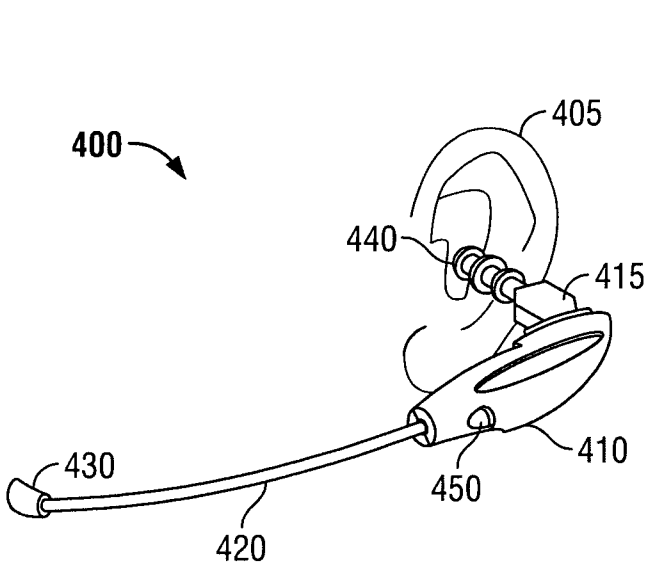


FIG. 4

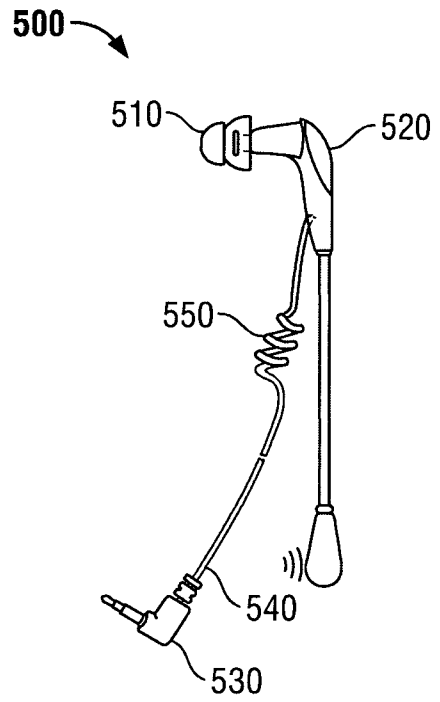


FIG. 5

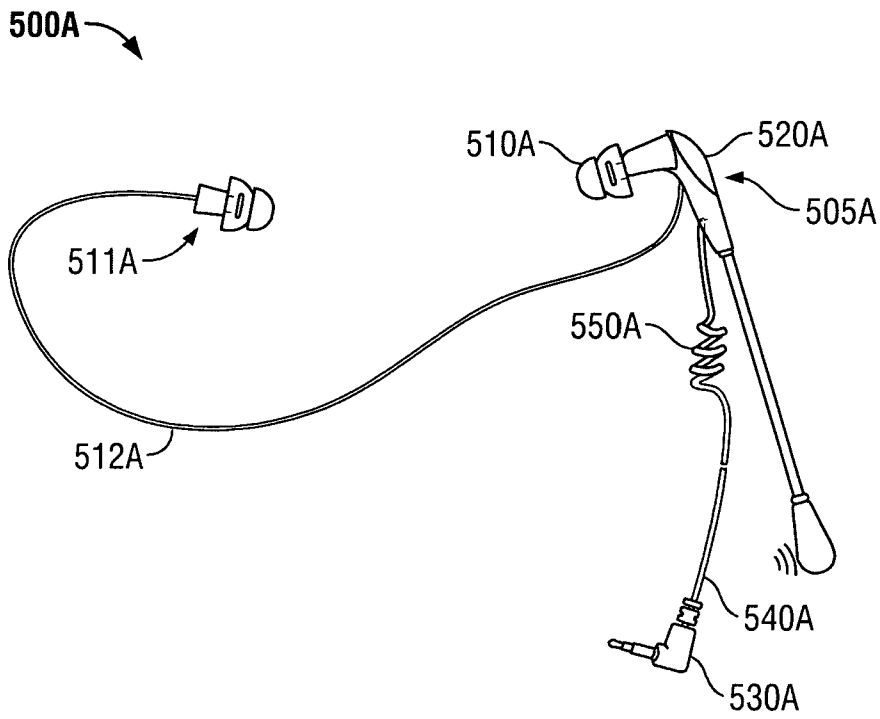


FIG. 5A

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