

EXHIBIT B



(12) **United States Patent**
Burnett

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(54) **DETECTING VOICED AND UNVOICED SPEECH USING BOTH ACOUSTIC AND NONACOUSTIC SENSORS**

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(22) Filed: **May 30, 2002**

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(51) **Int. Cl.**
G10L 11/06 (2006.01)

(52) **U.S. Cl.** **704/226; 704/214**

(58) **Field of Classification Search** None
See application file for complete search history.

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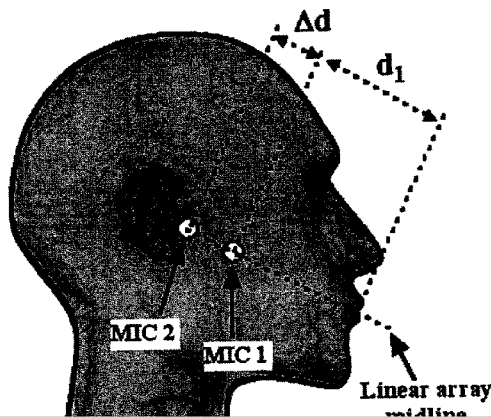
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(57) **ABSTRACT**

Systems and methods are provided for detecting voiced and unvoiced speech in acoustic signals having varying levels of background noise. The systems receive acoustic signals at two microphones, and generate difference parameters between the acoustic signals received at each of the two microphones. The difference parameters are representative of the relative difference in signal gain between portions of the received acoustic signals. The systems identify information of the acoustic signals as unvoiced speech when the difference parameters exceed a first threshold, and identify information of the acoustic signals as voiced speech when the difference parameters exceed a second threshold. Further, embodiments of the systems include non-acoustic sensors that receive physiological information to aid in identifying voiced speech.

5 Claims, 10 Drawing Sheets



US 7,246,058 B2

Page 2

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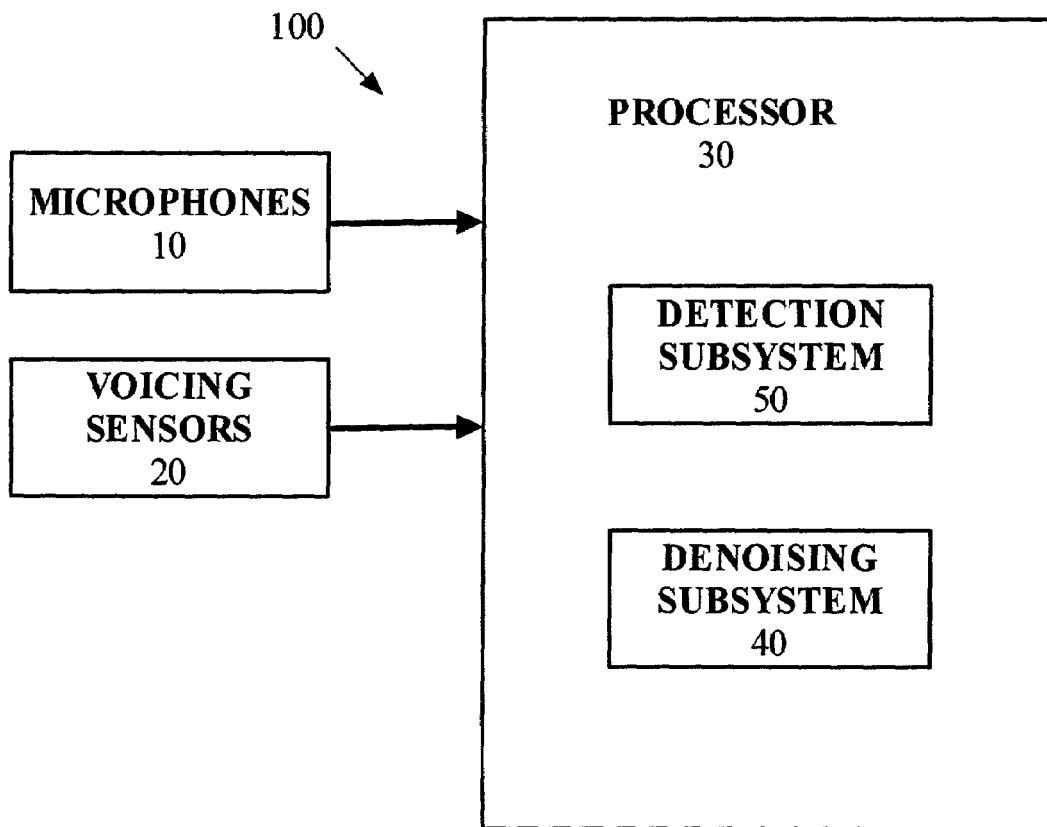


Figure 1

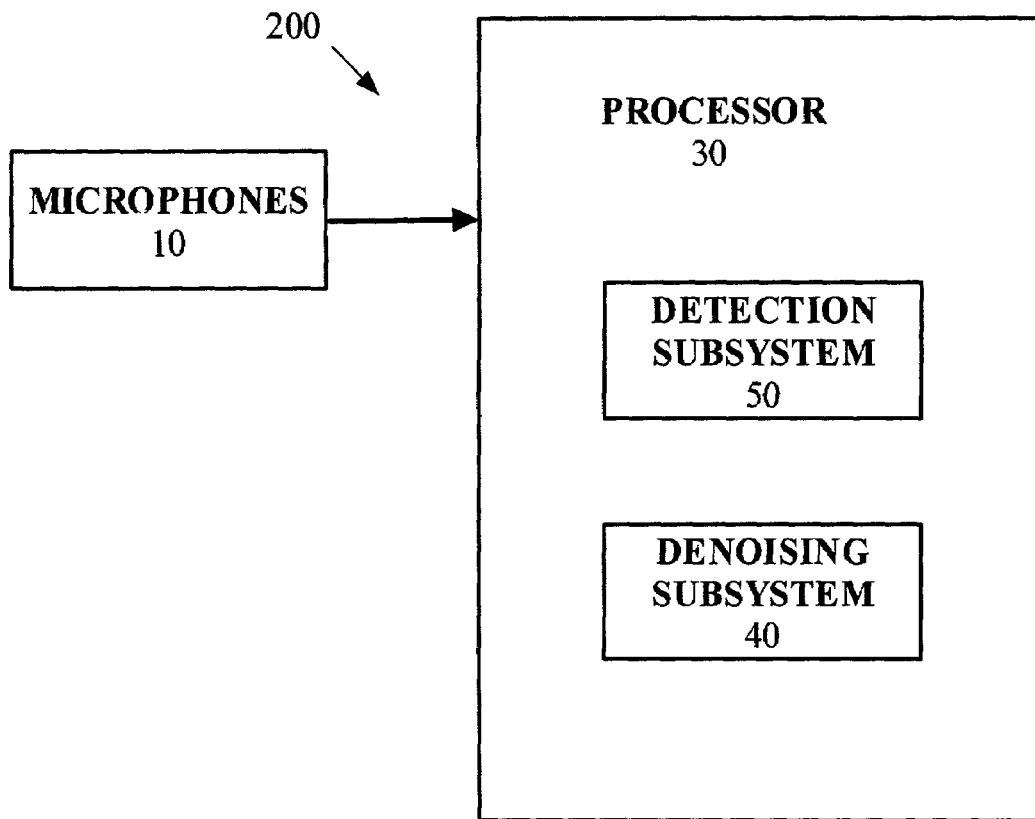


Figure 2

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