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(54) Title: MULTI-SENSORY SPEECH ENHANCEMENT USING A SPEECH-STATE MODEL

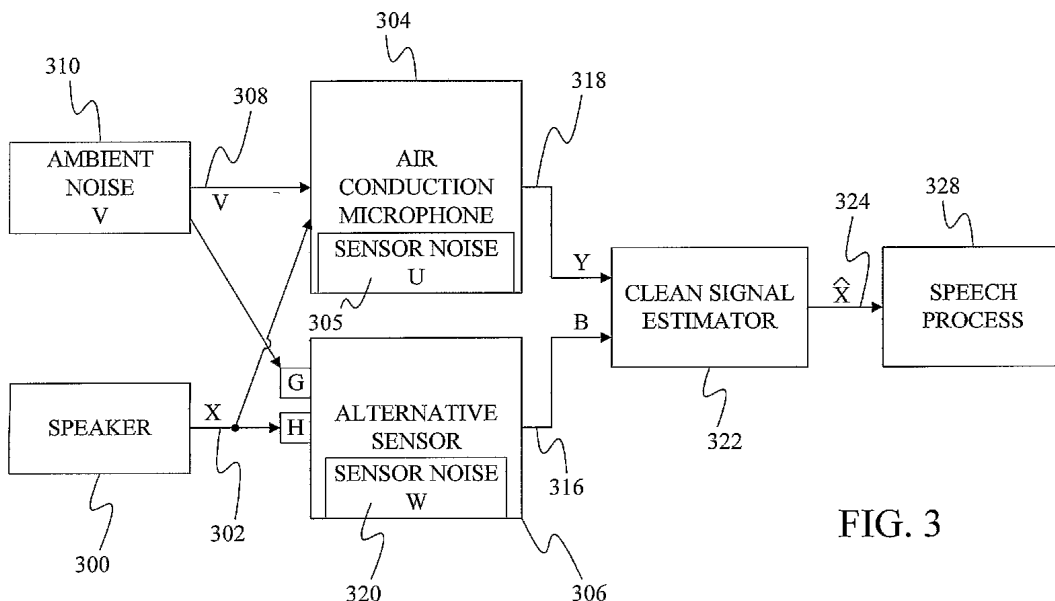


FIG. 3

(57) Abstract: A method and apparatus determine a likelihood of a speech state based on an alternative sensor signal (316) and an air conduction microphone signal (318). The likelihood of the speech state is used, together with the alternative sensor signal and the air conduction microphone signal, to estimate (322) a clean speech value for a clean speech signal (324).

WO 2007/001821 A3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC: **G10L 15/14(2006.01),21/00(2006.01),21/02(2006.01)**
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 USPC: **704/226,233,240,256.7**
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B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 704/226,233,240,256.7

 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)
 IEEE, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,590,241 A (PARK et al) 31 December 1996 (31.12.1996), column 4, line 10- column 5, line 29.	1-20
X	US 6,594,629 B1 (BASU et al) 15 July 2003 (15.07.2003), column 16, lines 26-54, column 18, lines 20-33, and figure 10.	1, 14, 18
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A		1-20
Y	US 6,778,954 B1 (KIM et al) 17 August 2004 (17.08.2004), column 3, line 52- column 5, line 20, column 7, lines 15-20.	7-8, 16
X	US 2004/0002858 A1 (ATTAIS et al) 01 January 2005 (01.01.2004), paragraphs 0011 and 0034.	1, 14, 18
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A		1-20

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

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"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"O" document referring to an oral disclosure, use, exhibition or other means		
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C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2004/0111260 A1 (DELIGNE et al) 10 June 2004 (10.06.2004), paragraphs 0036-0042.	1-6, 9, 13-15, 17-20 ----- 7-8, 16
X	US 2004/0267536 A1 (HERSHEY et al) 30 December 2004 (30.12.2004), figure 11.	1, 14, 18
X	ZHENG et al, Air- and Bone-Conductive Integrated Microphones for Robust Speech Detection and Enhancement, Automatic Speech Recognition and Understanding, IEEE Workshop on, December 2003, pages 249-254.	1-3, 7-9, 14, 18-20
X	HERSHEY et al, Model-based Fusion of Bone and Air Sensors for Speech Enhancement and Robust Speech Recognition, ISCA ITRW on Statistical and Perceptual Audio Processing, October 2004, pages 1-6.	1-20