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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

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4 March 2010

(54) Title: METHOD AND APPARATUS TO REDUCE NON-LINEAR DISTORTION

100

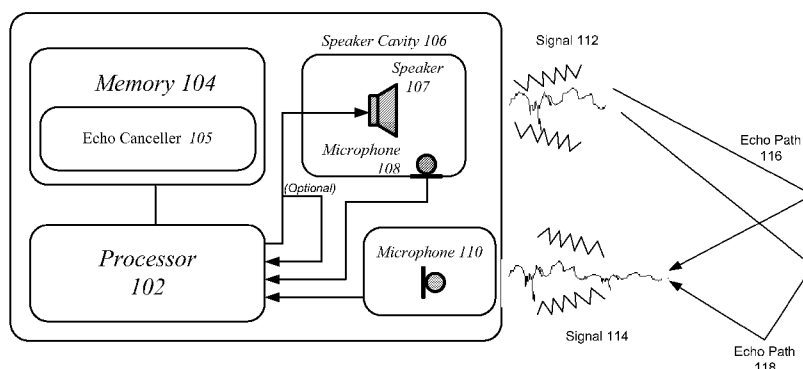


FIG. 1A

(57) Abstract: Techniques to reduce distortion in acoustic signals in mobile computing devices are described. For example, a mobile computing device may comprise a speaker operative to receive a first signal and output a second signal. The mobile computing device may further comprise a first microphone operative to receive the second signal and a second microphone operative to receive a third signal. An echo canceller may be coupled to the first microphone and the second microphone and may be operative to compare the second signal and the third signal and reduce distortion in the third signal based on the comparison. Other embodiments are described and claimed.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/042107**A. CLASSIFICATION OF SUBJECT MATTER****H04B 1/12(2006.01)i, H04B 1/62(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC H04B, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords : "echo", "speaker", "microphone"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5323458 A (SANGIL PARK et al.) 21 June 1994 See figures 2, 3 and corresponding specification.	1-3, 9-11
X	US 5796819 A (ERIC DOUGLAS ROMESBURG) 18 August 1998 See the abstract and figure 3-7.	1-3, 9-11
X	US 7003099 B1 (MING ZHANG et al.) 21 February 2006 See figure 1.	1-3, 9-11
X	US 2002-0015500 A1 (HARM JAN WILLEM BELT et al.) 07 February 2002 See figure 1.	1-3, 9-11
X	JP 2008-060715 A (NIPPON TELEGR & TELEPH CORP.) 13 March 2008 See figures 3 and 6.	1-3, 9-11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/042107**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 4-8, 12-15
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/042107

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5323458 A	21.06.1994	None	
US 5796819 A	18.08.1998	AU 719049 B2 CN 1226349 A CN 1169312 C EP 0914721 A2 EP 0914721 B1 JP 4046197 B2 JP 2000-515345 A KR 10-0338657 B1 WO 1998-004079 A2	04.05.2000 18.08.1999 29.09.2004 12.05.1999 19.12.2001 30.11.2007 14.11.2000 19.09.2002 29.01.1998
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JP 2008-060715 A	13.03.2008	None	