PATENT N°: US 9015038 B2

Jurisdiction: US

Names of the Evaluators		
Lead Evaluator	**Assistant Evaluator #1**	**Assistant Evaluator #2**
Allen RUBENSTEIN	Jochen EHLERS	Kan ZU

The above mentioned Evaluators hereby declare that the following claim(s):

- Claim 1
- Claim 30

in the above referenced patent, is(are) essential to making, using in, selling within, or importing into, the countries of registration, any 3GPP product (the applicable Product Categories are given below) that is or purports to be in compliance with the following parts of the Third Generation Partnership Program (3GPP) technical standards:
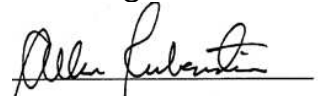
- Document 3GPP TS 26.445 V12.1.0 (2014-12): Sections 5.2.3.5, 5.2.3.5.1, 5.2.3.5.2, 5.2.3.5.3, 5.2.3.5.6 and 5.2.3.5.7

Claim 1 is relevant for 3GPP Terminal Products and 3GPP Base Station Products.
Claim 30 is relevant for 3GPP Terminal Products and 3GPP Base Station Products.

Authorized signature and date
August 22, 2017

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

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(54) **CODING GENERIC AUDIO SIGNALS AT LOW BITRATES AND LOW DELAY**

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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 848 days.

(21) Appl. No.: **13/280,707**

(22) Filed: **Oct. 25, 2011**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 61/406,379, filed on Oct. 25, 2010.

(51) **Int. Cl.**
G10L 11/04	(2006.01)
G10L 19/20	(2013.01)
G10L 19/02	(2013.01)
G10L 19/08	(2013.01)

(52) **U.S. Cl.**
CPC *G10L 19/20* (2013.01); *G10L 19/02* (2013.01); *G10L 19/08* (2013.01)

(58) **Field of Classification Search**
USPC 704/203, 205, 219, 223, 500–504, 704/229–230, 206, 221, 227
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2007/0225971	A1 *	9/2007	Bessette	704/203
2007/0299656	A1 *	12/2007	Son et al.	704/205
2009/0240491	A1 *	9/2009	Reznik	704/219

FOREIGN PATENT DOCUMENTS

CN	1527282 A	9/2004
EP	2146344 A1	1/2010
WO	9960561	11/1999

OTHER PUBLICATIONS

Griffin et al., "Multiband Excitation Vocoder," IEEE Transactaions on Acoustics, Speech, and Signal Processing, 36 (8):1223-1235, Aug. 1988.

Yeldener et al., "A High Quality Speech Coding Algorithm Suitable for Future INMARSAT Systems," Proceedings of the 7th European Signal Processing Conference (EUSIPCO-94), Sep. 1994, pp. 407-410.

(Continued)

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(57) **ABSTRACT**

A mixed time-domain/frequency-domain coding device and method for coding an input sound signal, wherein a time-domain excitation contribution is calculated in response to the input sound signal. A cut-off frequency for the time-domain excitation contribution is also calculated in response to the input sound signal, and a frequency extent of the time-domain excitation contribution is adjusted in relation to this cut-off frequency. Following calculation of a frequency-domain excitation contribution in response to the input sound signal, the adjusted time-domain excitation contribution and the frequency-domain excitation contribution are added to form a mixed time-domain/frequency-domain excitation constituting a coded version of the input sound signal. In the calculation of the time-domain excitation contribution, the input sound signal may be processed in successive frames of the input sound signal and a number of sub-frames to be used in a current frame may be calculated.

58 Claims, 6 Drawing Sheets