



- (51) **International Patent Classification:**
H01S 3/08 (2006.01) *H01S 3/10* (2006.01)
- (21) **International Application Number:**
PCT/US2012/038015
- (22) **International Filing Date:**
15 May 2012 (15.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/486,695 16 May 2011 (16.05.2011) US
- (71) **Applicant (for all designated States except US):** **OE-WAVES, INC.** [US/US]; 465 N. Halstead Street, Suite 140, Pasadena, CA 91107 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **MALEKI, Lute** [US/US]; 1230 Glen Oaks Boulevard, Pasadena, CA 91105 (US). **MATSKO, Andrew** [US/US]; 380 S. Euclid Avenue, Apt. #210, Pasadena, CA 91101 (US).
- (74) **Agent:** **AI, Bing;** Perkins Coie LLP, P.O. Box 1247, Seattle, WA 98111-1247 (US).
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))

(88) **Date of publication of the international search report:**
25 April 2013

WO 2012/158727 A3

(54) **Title:** GENERATION OF SINGLE OPTICAL TONE, RF OSCILLATION SIGNAL AND OPTICAL COMB IN A TRIPLE-OSCILLATOR DEVICE BASED ON NONLINEAR OPTICAL RESONATOR

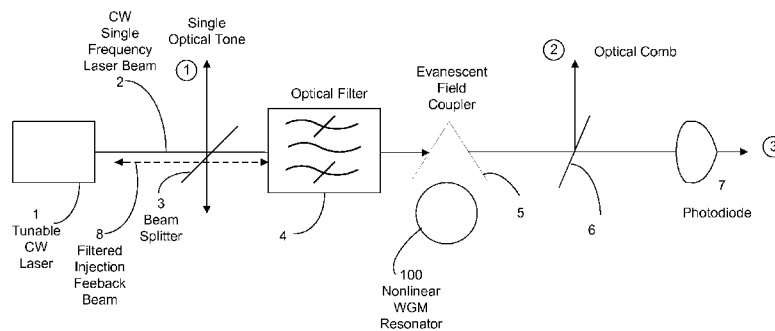


FIG. 1

(57) **Abstract:** Techniques and devices based on optical resonators made of nonlinear optical materials to form triple-oscillator devices for generating a single optical tone, a radio frequency (RF) oscillation signal and an optical frequency comb signal having different optical frequencies.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/038015**A. CLASSIFICATION OF SUBJECT MATTER****H01S 3/08(2006.01)i, H01S 3/10(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)

H01S 3/08; H01S 3/10; H01S 3/30; G02B 6/26; G02F 1/03; H01S 3/083; H04B 10/00; H01S 5/00; H01S 3/17; H04B 10/04

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

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: "RESONATOR," "LASER," "COMB," "FILTER," "SPLITTER," "RIADIO," "FREQUENCY," "OSCILLATOR," "PHOTODIODE," AND "PHOTODETECTOR"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0118375 A1 (MALEKI LUTE et al.) 13 May 2010 See abstract; figures 1A, 3, 5, 9-14; paragraphs [20]-[31], [41]-[44], [64]-[93].	1-21
A	US 2005-0286602 A1 (DEANA GUNN et al.) 29 December 2005 See abstract; figures 1-6, 15A-18; paragraphs [23]-[55], [83]-[96].	1-21
A	US 2011-0069723 A1 (DONG LIANG et al.) 24 March 2011 See abstract; figures 14-23A; paragraphs [125]-[162].	1-21
A	US 2002-0021765 A1 (LUTE MALEKI et al.) 21 February 2002 See abstract; figures 1-7; paragraphs [17]-[27].	1-21
A	US 7630417 B1 (MALEKI LUTFOLLAH et al.) 08 December 2009 See abstract; figures 5A, 5B, 12; column 8 line 31 - column 9, line 18.	1-21

 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

25 JANUARY 2013 (25.01.2013)

Date of mailing of the international search report

28 JANUARY 2013 (28.01.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Cho Sung Chan

Telephone No. 82-42-481-8462



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/038015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0118375 A1	13.05.2010	US 8159736 B2	17.04.2012
US 2005-0286602 A1	29.12.2005	US 2008-0001062 A1 US 7260279 B2 US 7480425 B2 WO 2005-122346 A2 WO 2005-122346 A3	03.01.2008 21.08.2007 20.01.2009 22.12.2005 16.11.2006
US 2011-0069723 A1	24.03.2011	CN 102239434 A EP 2374034 A1 JP 2012-511260 A WO 2010-065788 A1	09.11.2011 12.10.2011 17.05.2012 10.06.2010
US 2002-0021765 A1	21.02.2002	US 6871025 B2	22.03.2005
US 7630417 B1	08.12.2009	None	