

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 August 2002 (29.08.2002)

PCT

(10) International Publication Number
WO 02/067440 A3

(51) International Patent Classification⁷: A61B 8/00, 8/06

(21) International Application Number: PCT/US02/00724

(22) International Filing Date: 11 January 2002 (11.01.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/757,762 11 January 2001 (11.01.2001) US

(71) Applicant: GENERAL ELECTRIC COMPANY
[US/US]; 1 River Road, Schenectady, NY 12345 (US).

(72) Inventors: RICHARD, Yung, Chiao; N53W16749
Prairie Dawn, Menomonee Falls, WI 53051 (US).
THEODORE, Lauer, Rhyne; 2310 E. Glendale Avenue,
Whitefish Bay, WI 53211 (US).

(74) Agents: DENNIS, M. Flaherty et al.; Ostrager Chong &
Flaherty LLP, 825 Third Avenue, New York, NY 10022
(US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN,
YU, ZA, ZM, ZW.

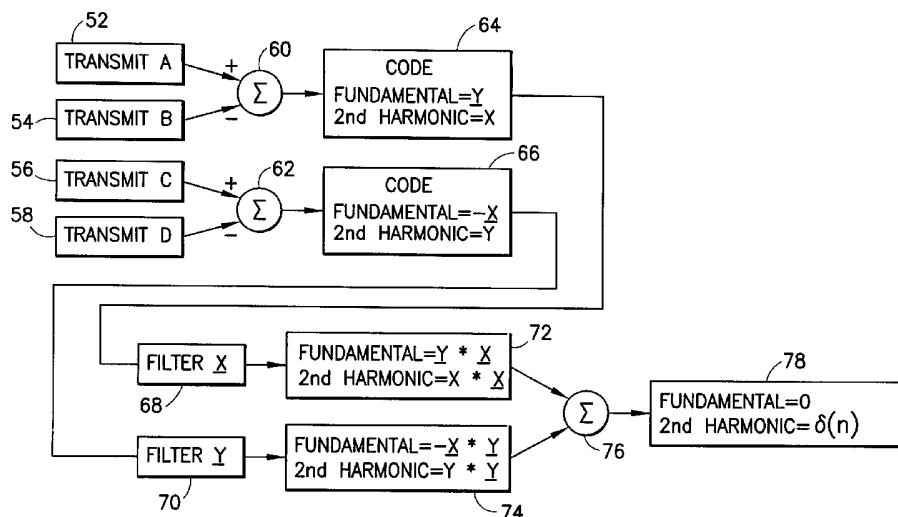
(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Published:
— with international search report

(88) Date of publication of the international search report:
13 March 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ULTRASOUND HARMONIC GOLAY-CODED EXCITATION WITH DIFFERENTIAL PULSING



(57) Abstract: Harmonic imaging using harmonic Golay-coded excitation that encodes the fundamental (64) and second harmonic signals (66) utilizes the transmit sequences encoded using QPSK implemented as quarter-cycle circular rotations or shifts of the base pulse. This is implemented by time shifting the chips of the transmit sequence encoded with a "j" or "-j" code symbol by 1/4 fractional cycle at center frequency relative to the chips encoded with a "1" or "-1" code symbol. A different QPSK transmit code is used for each of four transmits A, B, C and D. The transmit codes are selected such that (A-B) and (C-D) are encoded by Y and -X, respectively, while (A²-B²) and (C²-D²) are encoded by X and Y, respectively, where X and Y form a Golay code pair. The coding and decoding technique achieves fundamental suppression and second harmonic compression for a given Golay code pair X and Y.

WO 02/067440 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/00724

A. CLASSIFICATION OF SUBJECT MATTER		
IPC(7) : A61B 8/00, 8/06		
US CL : 600/443, 458		
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) U.S. : 600/437, 440-447, 455-459; 73/625, 626, 861.25; 367/7, 11, 138		
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) Please See Continuation Sheet		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,146,328 A (Chiao et al.) 14 November 2000 (14.11.2000), the entire document.	1-24
A	US 6,095,977 A (Hall et al.) 01 August 2000 (01.08.2000), col. 7, line 10 - col. 9, line 31.	1-24
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> 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	"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
"E"	earlier application or patent published on or after the international filing date	"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
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search	Date of mailing of the international search report	
15 June 2002 (15.06.2002)	12 DEC 2002	
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Ali Imam Telephone No. 703-308-1148	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/00724

Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: golay code, ultrasound, ultrasonic, harmonic, fundamental, contrast agent