

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
27 January 2005 (27.01.2005)

PCT

(10) International Publication Number
WO 2005/008272 A2

(51) International Patent Classification⁷: **G01S**
(21) International Application Number:
PCT/US2004/022377
(22) International Filing Date: 12 July 2004 (12.07.2004)
(25) Filing Language: English
(26) Publication Language: English
(30) Priority Data:
60/485,981 11 July 2003 (11.07.2003) US
60/549,111 1 March 2004 (01.03.2004) US

(74) Agents: **SPECKMAN, Ann** et al.; Speckman Law Group PLLC, 1501 Western Avenue, Suite 100, Seattle, Washington 98101 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): **BLUE VIEW TECHNOLOGIES, INC.** [US/US]; Blue View Technologies, Inc., 3518 Fremont Avenue, N., Suite 270, Seattle, Washington 98103 (US).

(71) Applicants and

(72) Inventors: **BACHELOR, Scott** [US/US]; 16995 Seminole Rd NE, Poulsbo, Washington 98370 (US). **THOMPSON, R.** [US/US]; 449 - 20th Avenue, Kirkland, Washington 98033 (US). **SEAWALL, Jason** [US/US]; 524 N.E. 92nd Street, Seattle, Washington 98115 (US).

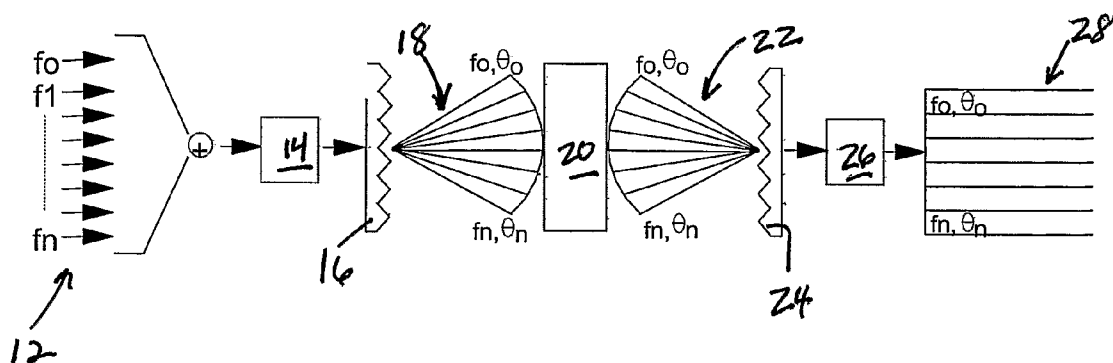
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

[Continued on next page]

(54) Title: SYSTEMS AND METHODS IMPLEMENTING FREQUENCY-STEERED ACOUSTIC ARRAYS FOR 2D AND 3D IMAGING



(57) Abstract: Frequency-steered acoustic arrays [30, 60, 120, etc.] transmitting and/or receiving multiple, angularly dispersed acoustic beams are used to generate 2D and 3D images. Input pulses to the arrays are generally non-linear, frequency-modulated pulses. Frequency-steered acoustic arrays may be provided in one-dimensional linear and two dimensional planar and curvilinear configurations, may be operated as single order or multiple order arrays, may employ periodic or non-periodic transducer element spacing, and may be mechanically scanned to generate 3D volumetric data. Multiple imaging fields of view may generated in different directions by switching the polarity of phase-shifted array transducer elements. Multiple frequency-steered arrays arranged in an X-configuration [150, 152, 164, 166] provide a wide, contiguous field of view and multiple frequency steered arrays arranged in a T-configuration [170, 172, 220] provide orthogonally oriented fields of view. Methods and systems for operating acoustic arrays in a frequency-steered mode in combination a mechanical beam steering mode, electronic time-delay and phase shift beam forming modes, and phase comparison angle estimation modes are also provided.

WO 2005/008272 A2



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.