(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 May 2005 (19.05.2005)

PCT

(10) International Publication Number
WO 2005/044440 A2

(51) International Patent Classification[7]: B01J

(21) International Application Number:
PCT/US2004/037177

(22) International Filing Date:
5 November 2004 (05.11.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/517,501 5 November 2003 (05.11.2003) US

(71) Applicant *(for all designated States except US)*: **THE CREST GROUP, INC.** [US/US]; Scotch Road, P.O. Box 7266, Trenton, NJ 08628 (US).

(72) Inventor: **GOODSON, Michael, J.**; 92 Rolling Hill Road, Skillman, NJ 08558 (US).

(74) Agents: **EVERETT, Stephen, M.** et al.; Stallman & Pollock LLP, 353 Sacramento Street, Suite 2200, San Francisco, CA 94111 (US).

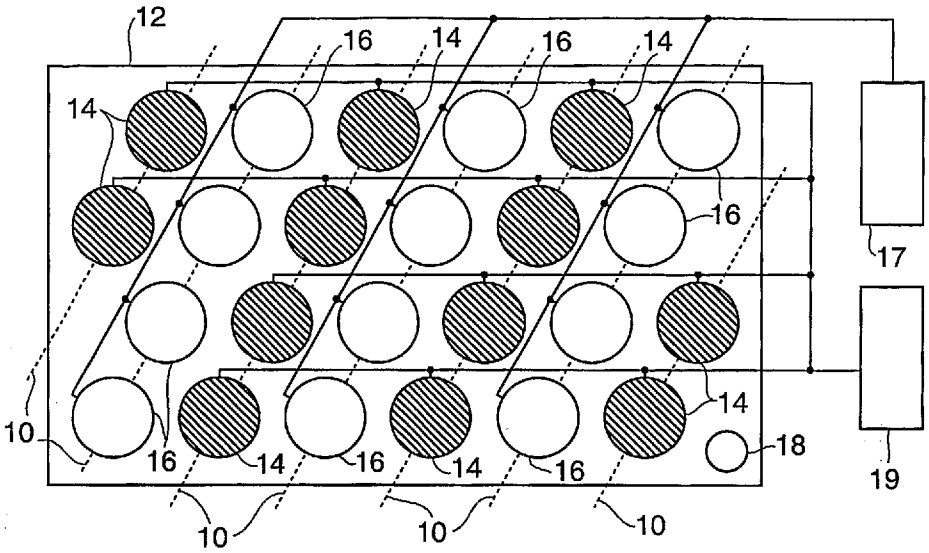
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, 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.

(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, IS, 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*

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: ULTRASONIC PROCESSING METHOD AND APPARATUS WITH MULTIPLE FREQUENCY TRANSDUCERS



(57) Abstract: Ultrasonic processing apparatus and methods are disclosed, which includes multiple transducers of at least two different resonant frequencies supplying ultrasonic energy to a liquid filled tank containing components to be cleaned or processed ultrasonically. The transducers are arranged in equilateral triangular patterns along diagonal lines on a wall of the tank so that each transducer has an adjacent transducer of a different frequency. Alternatively, the apparatus includes one or more rod transducers having different resonant frequencies so that the apparatus provides a mixture of various frequencies of ultrasonic energy to the tank. Another aspect of the invention involves selecting transducers with different resonant frequencies that are outside an excluded subrange, and powering the transducers by a driving signal that sweeps through the resonant frequencies of the transducers and the excluded subrange.

WO 2005/044440 A2