

(51) International Patent Classification:
G01N 3/40 (2006.01)(21) International Application Number:
PCT/US2011/049787(22) International Filing Date:
30 August 2011 (30.08.2011)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicants (for all designated States except US): **GEORGIA TECH RESEARCH CORPORATION** [US/US]; 505 10th Street NW, Atlanta, Georgia 30332-0415 (US). **WU, Tsun-Yen** [—/US]; Apt. B304, 251 10th Street NW, Atlanta, Georgia 30318 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **UME, Ifeanyi, Charles** [US/US]; 674 Park Village Drive, Atlanta, Georgia 30306 (US).(74) Agents: **SCHNEIDER, Ryan, A.** et al.; Suite 5200, 600 Peachtree Street NE, Atlanta, Georgia 30308 (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, 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.

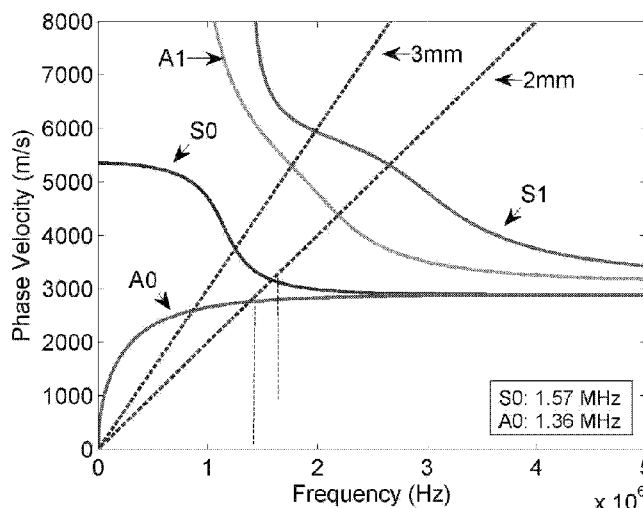
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, 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).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: WELD ANALYSIS USING LASER GENERATED NARROWBAND LAMB WAVES

Fig. 2a



(57) **Abstract:** A system and method for measuring various weld characteristics is presented. The system and method can comprise a means to measure penetration depth of butt welds in thin plates, for example, using laser generated ultrasonics. Superimposed line sources (SLS) can be used to generate narrowband ultrasonics. A signal processing procedure that combines wavenumber-frequency (k - ω) domain filtering and synthetic phase tuning (SPT) is used to reduce the complexity of Lamb wave signals. The reflection coefficients for different wavelengths corresponding to each wave mode can be calculated. Regression analysis that can include stepwise regression and corrected Akaike's information criterion (AIC) can be performed to build prediction models that use the reflection coefficients as predictors.