



(51) International Patent Classification:

B23K 20/12 (2006.01) **B23K 20/233** (2006.01)
B23K 20/22 (2006.01) **B23K 101/20** (2006.01)
B23K 20/227 (2006.01)

(21) International Application Number:

PCT/US2009/053645

(22) International Filing Date:

13 August 2009 (13.08.2009)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/088,868 14 August 2008 (14.08.2008) US

(71) Applicant (for all designated States except US): **SMITH INTERNATIONAL, INC.** [US/US]; 1310 Rankin Rd., Houston, TX 77073 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KESHAVAN, Madapusi, K.** [US/US]; 38 Waterford Bend, The Woodlands, TX 77381 (US). **STEEL, Russell, J.** [US/US]; 667 South 420 East, Salem, UT 84653 (US). **ROTH, Cary, A.** [US/US]; 906 Spring Source Place, Spring, TX 77373 (US). **ALSUP, Shelton, W.** [US/US]; 1523 Heights Blvd. #8, Houston, TX 77008 (US).

(74) Agents: **BERGMAN, Jeffrey S.** et al.; Osha ° Liang LLP, 909 Fannin Street, Suite 3500, Houston, TX 77010 (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, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, 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, 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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

20 May 2010

(54) Title: METHODS OF TREATING HARDBANDED JOINTS OF PIPE USING FRICTION STIR PROCESSING

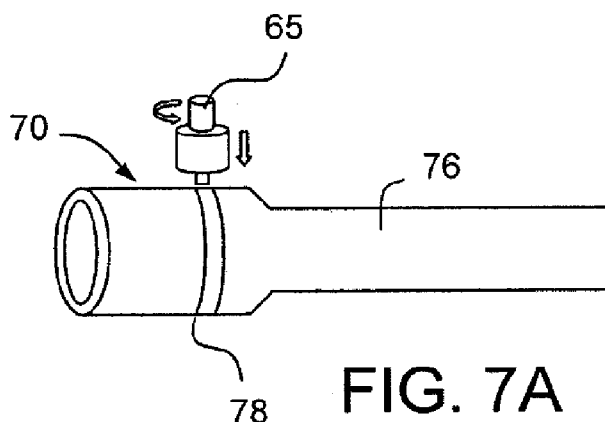


FIG. 7A

(57) Abstract: A method for treating a wear reducing material welded to a surface of a tool used in a wellbore operation that includes friction stirring the wear reducing material into the surface of the tool is disclosed. Method for improving the properties of a wear reducing material on a tool are also disclosed.