

CORRECTED VERSION

(19) World Intellectual Property Organization International Bureau



(10) International Publication Number WO 2015/188155 A8

(43) International Publication Date 10 December 2015 (10.12.2015)

- (51) International Patent Classification: E21B 1/12 (2006.01) E21B 31/00 (2006.01) E21B 4/14 (2006.01) E21B 31/107 (2006.01) E21B 7/24 (2006.01) E21B 31/113 (2006.01) E21B 28/00 (2006.01)
(21) International Application Number: PCT/US2015/034573
(22) International Filing Date: 5 June 2015 (05.06.2015)
(25) Filing Language: English
(26) Publication Language: English
(30) Priority Data: 62/008,279 5 June 2014 (05.06.2014) US 14/732,494 5 June 2015 (05.06.2015) US
(71) Applicant: KLX ENERGY SERVICES LLC [US/US]; 2700 Post Oak Blvd, Suite 1400, Houston, TX 77056 (US).
(72) Inventor: BAUDOIN, Toby Scott; 1302 Aaron road, Rayne, LA 70578 (US).
(74) Agent: RUPP, Brian C.; Drinker Biddle & Reath LLP, 191 N. Wacker Drive, Suite 3700, Chicago, IL 60606-1698 (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, BN, 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, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— with international search report (Art. 21(3))

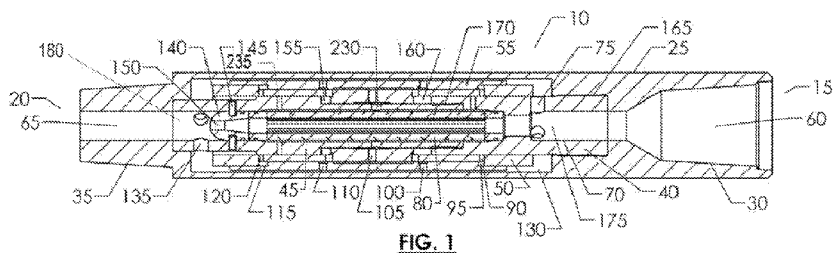
(48) Date of publication of this corrected version:

4 August 2016

(15) Information about Correction:

see Notice of 4 August 2016

(54) Title: HYDRAULIC PIPE STRING VIBRATOR FOR REDUCING WELL BORE FRICTION



(57) Abstract: A friction reduction apparatus (FRA) positioned onto a pipe string comprises a tubular housing, upper and lower mandrels having variously configured fluid flow passages and ports, a valve and a shifter. Fluid travelling through the apparatus causes the valve and shifter to reciprocate, repeatedly opening and closing flow passages. Each of these cycles creates a pulse in the fluid column creating vibrations that reduce friction in the pipe string. The FRA can be used in conjunction with a ball or dart activated tool positioned downhole from the FRA.

WO 2015/188155 A8