



(43) International Publication Date
28 June 2012 (28.06.2012)

(10) International Publication Number
WO 2012/087496 A2

- (51) **International Patent Classification:**
A61M 5/162 (2006.01) *B23P 17/04* (2006.01)
- (21) **International Application Number:**
PCT/US2011/062284
- (22) **International Filing Date:**
29 November 2011 (29.11.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
12/974,212 21 December 2010 (21.12.2010) US
- (71) **Applicant** (for all designated States except US): **HAL-LIBURTON ENERGY SERVICES, INC.** [US/US]; 10200 Bellaire Boulevard, Houston, TX 77072 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants** (for US only): **DYKSTRA, Jason, D.** [US/US]; 2601 Beltline Road, Carrollton, TX 75006 (US). **FRIPP, Michael, L.** [US/US]; 2601 Beltline Road, Carrollton, TX 75006 (US).
- (74) **Agent:** **HIGGINS, Sheri, L.**; Sheri Higgins Law, P.L.L.C., 4224 University Boulevard, Dallas, TX 75205 (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, RW, 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, 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).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

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

(54) **Title:** AN EXIT ASSEMBLY WITH A FLUID DIRECTOR FOR INDUCING AND IMPEDING ROTATIONAL FLOW OF A FLUID

(57) **Abstract:** According to an embodiment, an exit assembly comprises: a first fluid inlet; a first fluid outlet; and at least one fluid director, wherein the fluid enters the exit assembly in one direction, in another direction, or combinations thereof, and wherein the at least one fluid director induces flow of the fluid rotationally about the assembly when the fluid enters in the one direction and impedes flow of the fluid rotationally about the assembly when the fluid enters in the another direction. In another embodiment, the exit assembly includes two or more fluid inlets. According to another embodiment, a flow rate restrictor comprises: a fluid switch; and the exit assembly. According to another embodiment, the flow rate restrictor is for use in a subterranean formation.



WO 2012/087496 A2