



- (51) **International Patent Classification:**
G01F 23/292 (2006.01) **G01K 11/32** (2006.01)
E21B 47/10 (2012.01)
- (21) **International Application Number:**
PCT/US2014/032131
- (22) **International Filing Date:**
28 March 2014 (28.03.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/806,076 28 March 2013 (28.03.2013) US
- (71) **Applicant: EXXONMOBIL RESEARCH AND ENGINEERING COMPANY** [US/US]; 1545 Route 22 East, P.O. box 900, Annandale, NJ 08801-0900 (US).
- (72) **Inventors: ZHANG, Yibing**; 16 Darby Court, Annandale, NJ 08801 (US). **YEGANEH, Mohsen, Shahmirzadi**; 826 Atkinson Circle, Hillsborough, NJ 08844 (US). **KEISER, Geoff**; 49 Burnham Road Apt. 2, Morris Plains, NJ 07950 (US). **LI, Zhen**; 6738 Westchester Court, Houston, TX 77025 (US). **SONG, Limin**; 42 Zaitz Farm Road, West

Windsor, NJ 08550 (US). **STARKEY, Michael, G.**; 46b Skimmers Lane, Ashtead, Surrey KT21 2NN (GB).

- (74) **Agents: BARRETT, Glenn, T.** et al.; Exxonmobil Research And Engineering Company, 1545 Route 22 East, P.O. Box 900, Annandale, NJ 08801-0900 (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, LT, 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, 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,

[Continued on next page]

- (54) **Title: SYSTEM AND METHOD FOR IDENTIFYING LEVELS OR INTERFACES OF MEDIA IN A VESSEL**

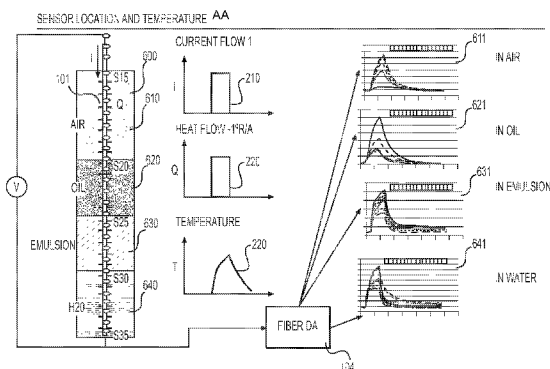


FIG. 6

(57) **Abstract:** Systems and methods for identifying the level of media in a vessel with a sensing cable including an optical fiber sensor array aligned with a heating element disposed in the vessel. An excitation source is configured to propagate at least one heat pulse through the heating element along at least a portion of the sensing cable to affect an exchange of thermal energy between the heating element and the one or more media exposed to the sensing cable. An optical signal interrogator is adapted to receive a signal from each of a plurality of sensor locations and measure a temperature profile corresponding to the heat pulse at the sensor locations. A control unit is configured to identify a level of each of media by determining properties of the media exposed to the sensing cable at each of the sensor locations based on the temperature profile corresponding thereto.



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).

— *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))*

Published:

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