



(51) International Patent Classification:

F28D 7/06 (2006.01) *B01J 19/24* (2006.01)
C10G 9/20 (2006.01) *B01J 19/02* (2006.01)
C10G 9/36 (2006.01) *B01J 19/00* (2006.01)

(21) International Application Number:

PCT/US2011/029626

(22) International Filing Date:

23 March 2011 (23.03.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

12/762,910 19 April 2010 (19.04.2010) US

(71) Applicant (for all designated States except US): **EXXON-MOBIL CHEMICAL PATENTS INC.** [US/US]; 5200 Bayway Drive, Baytown, TX 77520-2101 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SPICER, David, B.** [AU/US]; 5319 Del Monte Drive, Houston, TX 77056 (US). **JONES, Jeffrey, P.** [US/US]; 16511 Brook Forrest Drive, Houston, TX 77059 (US).

(74) Agents: **KNIGHT, Brent, R.** et al.; ExxonMobil Chemical Company, Law Technology, P.O. Box 2149, Baytown, TX 77522-2149 (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, 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).

[Continued on next page]

(54) Title: APPARATUS AND METHODS FOR UTILIZING HEAT EXCHANGER TUBES IN HYDROCARBON STREAM CRACKING UNITS

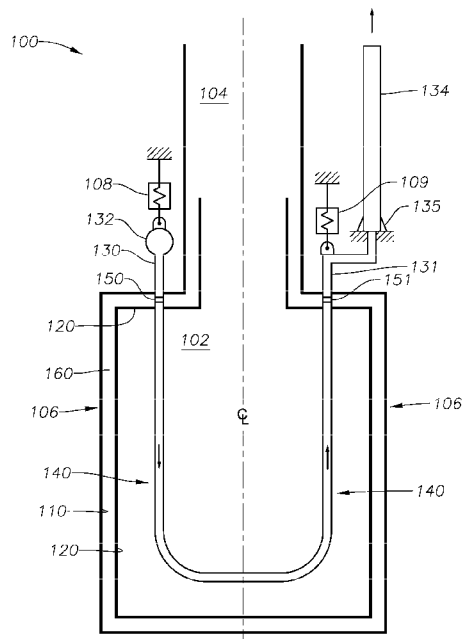


Fig. 1

(57) Abstract: In one aspect, the present techniques include a heat exchange apparatus including: a) a body comprising an interior cavity, the body including: a first surface and a second surface defining at least a portion of the body and the first surface positioned exterior with respect to the second surface and the interior cavity, and the second surface positioned exterior with respect to the interior cavity and interior with respect to the first surface; b) a first conduit for conveying a fluid to the body; c) a second conduit in fluid communication with the first conduit wherein the second conduit is positioned at least partially within the interior cavity of the body; and d) a joint between the first conduit and the second conduit, wherein the joint moves between a first location and a second location based on the temperature within the interior cavity, wherein at least one of said first location and said second location is positioned intermediate the first surface and the second surface.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *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:

10 October 2013

Published:

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