

(43) International Publication Date
25 March 2021 (25.03.2021)



(10) International Publication Number
WO 2021/055021 A1

(51) International Patent Classification:
F25J 3/02 (2006.01)

(21) International Application Number:

PCT/US2020/028731

(22) International Filing Date:

17 April 2020 (17.04.2020)

(25) **Filing Language:** English

(26) **Publication Language:** English

(30) Priority Data:

62/902,460 19 September 2019 (19.09.2019) US

(71) Applicant: EXXONMOBIL UPSTREAM RESEARCH

COMPANY [US/US]; 22777 Springwoods Village Parkway, (EMHC-N1-4A-607), Spring, TX 77389 (US).

(72) **Inventors:** **LIU, Yijun**; 20102 Elaine Rose Ct, Spring, TX 77379 (US). **PIERRE, Fritz Jr.**; 18011 Bayou Mead Trail, Humble, TX 77346 (US).

(74) **Agent: JENSEN, Nathan, O.** et al.; ExxonMobil Upstream Research Company, 22777 Springwoods Village Parkway, (EMHC-NI-4A-607), Spring, TX 77389 (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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, 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, ST, SV, SY, TH, TJ, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(54) Title: PRETREATMENT AND PRE-COOLING OF NATURAL GAS BY HIGH PRESSURE COMPRESSION AND EXPANSION

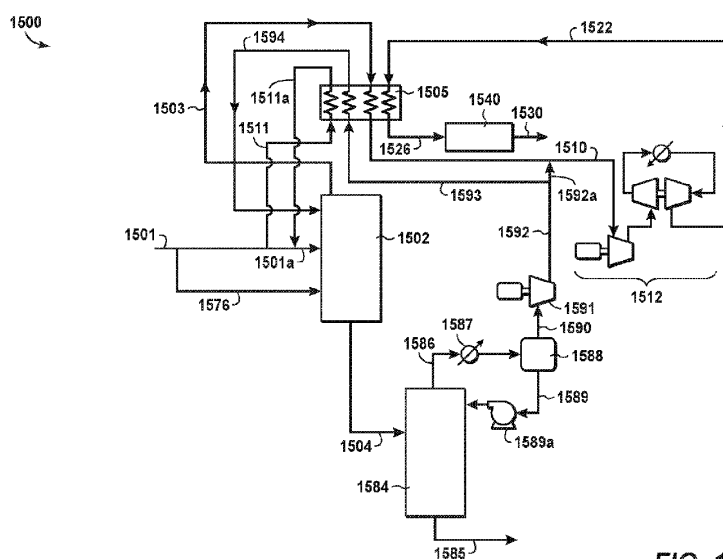


FIG. 15

(57) **Abstract:** A method and apparatus for producing liquefied natural gas. A portion of a natural gas stream is cooled in a first heat exchanger and re-combined with the natural gas stream, and heavy hydrocarbons are removed therefrom to generate a separated natural gas stream and a separator bottom stream. Liquids are separated from the separator bottom stream to form an overhead stream, which is cooled and separated to form a recycle gas stream. The recycle gas stream is compressed. A first portion of the compressed recycle gas stream is directed through the first heat exchanger and directed to the separator as a column reflux stream. The separated natural gas stream is used as a coolant in the first heat exchanger to thereby generate a pretreated natural gas stream, which is compressed and liquefied.

[Continued on next page]

WO 2021/055021 A1

(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:

- *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))*

Published:

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