



(43) International Publication Date
30 October 2014 (30.10.2014)

- (51) International Patent Classification:
F17C 5/00 (2006.01)
- (21) International Application Number:
PCT/US2014/034970
- (22) International Filing Date:
22 April 2014 (22.04.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/814,697 22 April 2013 (22.04.2013) US
- (71) Applicant: **CHART INDUSTRIES, INC.** [US/US]; 2200 Airport Industrial Drive, Suite 500, Ball Ground, GA 30107 (US).
- (72) Inventor: **DRUBE, Tom**; 2200 Airport Industrial Drive, Suite 500, Ball Ground, GA 30107 (US).
- (74) Agents: **HERNANDEZ, Fred, C.** et al.; Mintz Levin Cohn Ferris Glovsky And Popeo, P.C., 3580 Carmel Mountain Road, Suite 300, San Diego, CA 92130-6768 (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, 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).

Published:

- with international search report (Art. 21(3))
- 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:
9 April 2015

(54) Title: LIQUID NATURAL GAS COOLING ON THE FLY

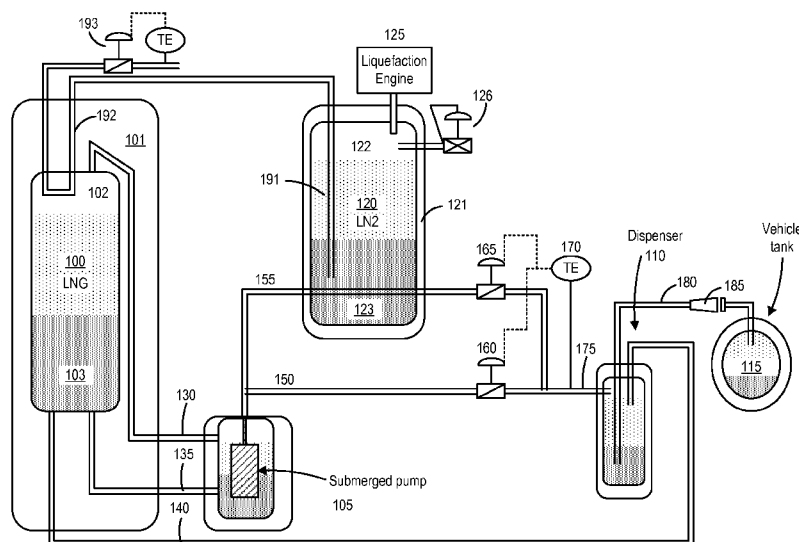


FIG. 1

(57) Abstract: Described herein are systems and methods for cryogenic fluid delivery to achieve the lowest reasonable saturation pressure while dispensing a cryogenic fluid such as liquefied natural gas to a holding tank on a use device. The systems and methods utilize a liquid nitrogen component and a liquefaction engine, very cold liquefied natural gas and a liquefaction engine, or a combination of both very cold liquefied natural gas and a liquid nitrogen component to deliver LNG to a holding tank on a use device.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/034970

A. CLASSIFICATION OF SUBJECT MATTER
INV. F17C5/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F17C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 771 946 A (KOOY RICHARD JOHN [US] ET AL) 30 June 1998 (1998-06-30) columns 6-13; figures 2,3 -----	1-16
A	DE 10 2009 037108 A1 (LINDE AG [DE]) 17 February 2011 (2011-02-17) the whole document -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 January 2015

Date of mailing of the international search report

04/02/2015

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Nicol, Boris

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/034970

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5771946	A	30-06-1998	NONE

DE 102009037108 A1	17-02-2011	DE 102009037108 A1	17-02-2011
		WO 2011018174 A1	17-02-2011
