

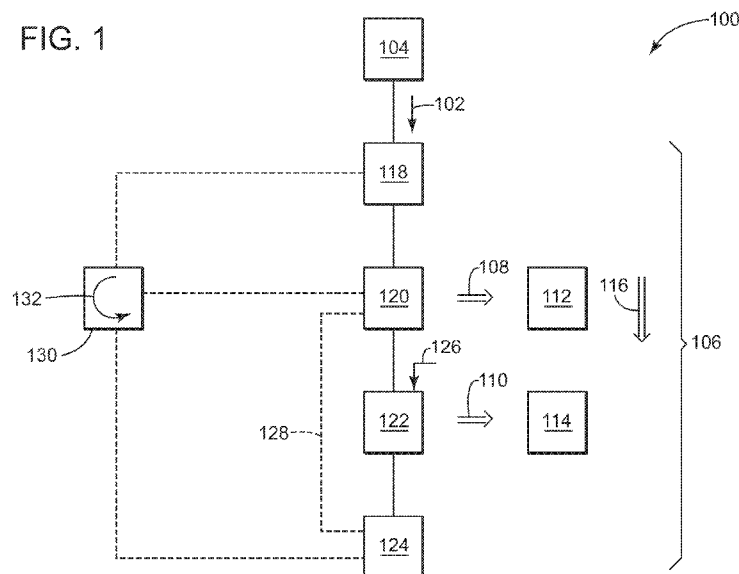


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- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, 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, 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.
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[Continued on next page]

(54) Title: PREPARING HYDROCARBON STREAMS FOR STORAGE

FIG. 1



(57) Abstract: A system and process that are configured to prepare incoming hydrocarbon feedstocks for storage. For incoming ethane gas, the embodiments can utilize a plurality of vessels to distill the incoming feedstock to vapor and liquid ethane that is suitable for storage. The embodiments can direct the vapor to a demethanizer column that is downstream of the vessels and other components. The process can include stages for distilling an incoming feedstock at a plurality of vessels to form a vapor and a liquid for storage; directing the vapor to a demethanizer column; and circulating liquid from the demethanizer column back to the plurality of vessels.

**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:

15 December 2016

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/026616

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/026616

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F25J3/02 F25J3/08
 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)
 F25J

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.
X	US 6 526 777 B1 (CAMPBELL ROY E [US] ET AL) 4 March 2003 (2003-03-04)	1,3
Y	column 14, lines 8-22; figure 6	2,4-10
X	US 2008/072620 A1 (RUNBALK DAVID B [NL]) 27 March 2008 (2008-03-27)	1,3,4
Y	figure	
Y	US 5 600 969 A (LOW WILLIAM R [US]) 11 February 1997 (1997-02-11)	2
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Y	figure 4	4,7,8
	figure 2	
	-/--	



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)

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"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

17 October 2016

Date of mailing of the international search report

03/11/2016

Name and mailing address of the ISA/

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Göritz, Dirk

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/026616

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 2006/004242 A1 (VERMA VIJENDER K [US] ET AL) 5 January 2006 (2006-01-05) figure 7 -----	11-16
X	US 5 675 054 A (MANLEY DAVID [US] ET AL) 7 October 1997 (1997-10-07) figure 2; table 2 -----	11-16
X	US 3 729 944 A (KELLEY C ET AL) 1 May 1973 (1973-05-01) column 2, line 38 - column 3, line 63; figure -----	11-16
A	EP 2 749 830 A1 (SHELL INT RESEARCH [NL]) 2 July 2014 (2014-07-02) figure 1 -----	11-16
A	US 2011/132033 A1 (PRIM ERIC [US]) 9 June 2011 (2011-06-09) figures -----	12
X	US 4 171 964 A (CAMPBELL ROY E [US] ET AL) 23 October 1979 (1979-10-23) figures 6,7 -----	17-20

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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EP 2749830	A1	02-07-2014	EP 2749830 A1 02-07-2014
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US 2011132033	A1	09-06-2011	NONE
US 4171964	A	23-10-1979	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10

A liquefaction process, comprising:
distilling an incoming feedstock at a plurality of vessels to form a vapor and a liquid for storage;
directing the vapor to a demethanizer column; and
circulating liquid from the demethanizer column back to the plurality of vessels.

2. claims: 11-16

A gas processing system, comprising:
a fluid circuit configured to process an incoming feedstock comprising predominantly ethane liquid into a liquid that meets specification for liquid ethane, the fluid circuit comprising:
a distillation unit comprising a plurality of vessels, the plurality of vessels configured to form an incoming feedstock into a vapor and a liquid that meets specification for liquid ethane; and
a demethanizer column coupled with the plurality of vessels, the demethanizer column configured to form liquid from the vapor,
wherein the fluid circuit is configured to direct the liquid from the demethanizer column to one of the plurality of vessels.

3. claims: 17-20

A fluid circuit, comprising:
a pre-cooling unit comprising a plurality of coolers;
a first vessel coupled downstream of the plurality of coolers;
a second vessel coupled downstream of the first vessel;
a third vessel coupled downstream of both the first vessel and the second vessel; and
a demethanizer column coupled with the second vessel,
wherein each of the first vessel, the second vessel, and the third vessel are configured to form a vapor top product and a liquid bottom product.
