



(51) International Patent Classification:

F01K 25/02 (2006.01) F01K 7/16 (2006.01)  
F01K 27/00 (2006.01) F01D 15/10 (2006.01)  
F01K 23/08 (2006.01)

(21) International Application Number:

PCT/US2011/055141

(22) International Filing Date:

6 October 2011 (06.10.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/390,397 6 October 2010 (06.10.2010) US

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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, 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, QA, RO, RS, RU, RW, 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, 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).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: UTILIZATION OF PROCESS HEAT BY-PRODUCT

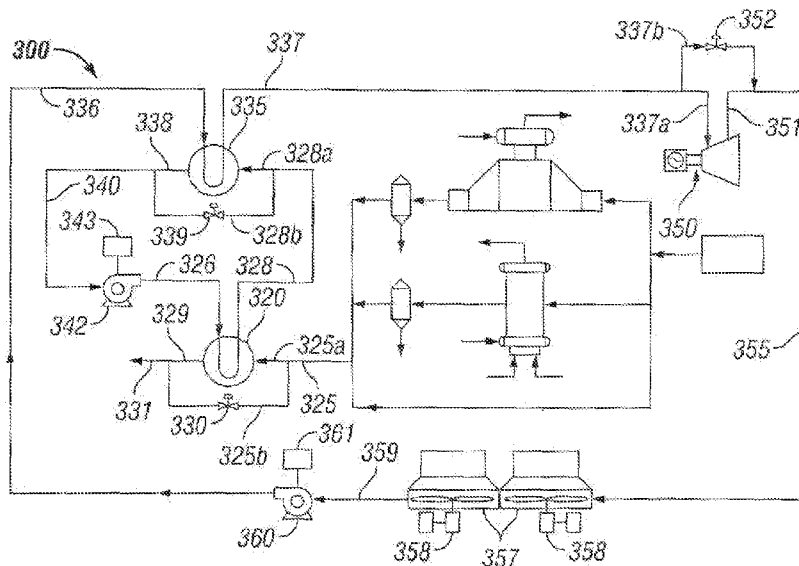


FIG. 3

(57) Abstract: Heat recovery systems and methods for producing electrical and/or mechanical power from a process heat by-product are provided. Sources of process heat by-product include hot flue gas streams, high temperature reactors, steam generators, gas turbines, diesel generators, and process columns. Heat recovery systems and methods include a process heat by-product stream for indirectly heating a working fluid of an organic Rankine cycle. The organic Rankine cycle includes a heat exchanger, a turbine-generator system for producing power, a condenser heat exchanger, and a pump for recirculating the working fluid to the heat exchanger.





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— *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))*

**Published:**

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

**(88) Date of publication of the international search report:**

19 July 2012

## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/US2011/055141****A. CLASSIFICATION OF SUBJECT MATTER****F01K 25/02(2006.01)i, F01K 27/00(2006.01)i, F01K 23/08(2006.01)i, F01K 7/16(2006.01)i, F01D 15/10(2006.01)i**

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)

F01K 25/02; F01K 25/06; F01K 23/10; F01K 23/06; F02C 3/28; F02C 6/18; F01K 25/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) &amp; Keywords: waste heat, organic rankine cycle, refinery, recovery, regeneration, supercritical

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0000299 A1 (AST, GABOR et al.) 01 January 2009 See paragraphs 0002, 0022, 0024 and figure 1.	1,2,10,11,13,14,21 ,22,24
Y		3-9,12,15,16-20,23
Y	US 2006-0010872 A1 (SINGH, R. R. et al.) 19 January 2006 See paragraph 0033 and figure 1, 2.	3-9,16-20
Y	US 05421157 A (ROSENBLATT, JOEL H.) 06 June 1995 See page4, column1, lines 44-60.	12,23
Y	US 6571548 B1 (BRONICKI, LUCIEN Y. et al.) 03 June 2003 See figure 1.	15

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

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"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

29 MAY 2012 (29.05.2012)

Date of mailing of the international search report

**30 MAY 2012 (30.05.2012)**

Name and mailing address of the ISA/KR

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Facsimile No. 82-42-472-7140

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

**PCT/US2011/055141**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0000299 A1	01.01.2009	EP 2203630 A2	07.07.2010
		WO 2009-006006 A2	08.01.2009
		WO 2009-006006 A3	22.07.2010
		WO 2009-006006 A3	08.01.2009
		WO 2009-006006 A9	10.02.2011
		WO 2009-006006 A9	08.01.2009
US 2006-0010872 A1	19.01.2006	CA 2573865 A1	09.02.2006
		CN 101018931 A	15.08.2007
		CN 101018931 B	27.10.2010
		CN 101018931 C0	15.08.2007
		EP 1773962 A2	18.04.2007
		EP 2063073 A2	27.05.2009
		EP 2282018 A1	09.02.2011
		IL 180705A	28.02.2011
		IL 180705D0	03.06.2007
		JP 2008-506819 A	06.03.2008
		JP 2008-506819 T	06.03.2008
		KR 10-2007-0042183 A	20.04.2007
		MX 2007000608 A	30.03.2007
		US 7428816 B2	30.09.2008
		WO 2006-014609 A2	09.02.2006
WO 2006-014609 A3	27.04.2006		
WO 2006-014609 A3	09.02.2006		
US 05421157 A	06.06.1995	None	
US 6571548 B1	03.06.2003	AT 307965 T	15.11.2005
		AU 1999-65470 A1	06.07.2000
		AU 1999-65470 B2	22.05.2003
		AU 6547099 A	06.07.2000
		AU 760676 B2	22.05.2003
		CA 2292488 A1	30.06.2000
		CA 2292488 C	26.05.2009
		DE 69927925 D1	01.12.2005
		DE 69927925 T2	27.07.2006
		EP 1016775 A2	05.07.2000
		EP 1016775 A3	17.10.2001
		EP 1016775 B1	26.10.2005
		ES 2251144 T3	16.04.2006
		IL 133657A	25.09.2005
		IL 133657D0	30.04.2001
		RU 2215165 C2	27.10.2003
		UA61957C2	15.03.2001