



(51) International Patent Classification:
G21C 15/24 (2006.01)

(21) International Application Number:
PCT/US2010/002602

(22) International Filing Date:
22 September 2010 (22.09.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/586,741 25 September 2009 (25.09.2009) US
12/653,656 15 December 2009 (15.12.2009) US
12/653,653 15 December 2009 (15.12.2009) US

(71) Applicant (for all designated States except US):
SEARETE, LLC [US/US]; 11235 S.E. 6th Street, Suite
200, Bellevue, Washington 98004 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): MCWHIRTER, Jon,
D. [US/US]; 7311 Coal Creek Pkwy. S.E. #E-307, New-
castle, Washington 98059 (US).

(74) Agents: TEGREENE, Clarence, T. et al.; 11235 S. E.
6th Street, Suite 200, Bellevue, Washington 98004 (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.

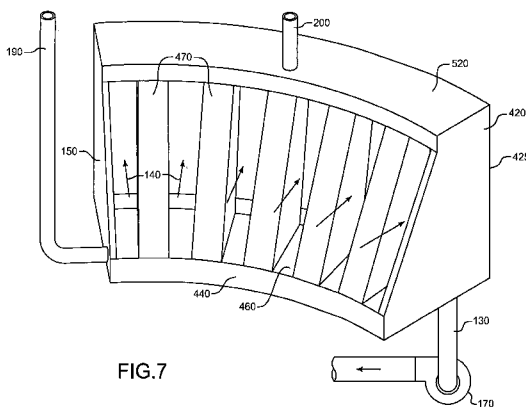
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, 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:
18 August 2011

(54) Title: A HEAT EXCHANGER, METHODS THEREFOR AND A NUCLEAR FISSION REACTOR SYSTEM



(57) Abstract: A heat exchanger, methods therefor and a nuclear fission reactor system. The heat exchanger comprises a heat exchanger body defining an exit plenum chamber therein shaped for uniform flow of a hot primary heat transfer fluid through the chamber. A plurality of adjacent heat transfer members are connected to the heat exchanger body and spaced apart by a predetermined distance for defining a plurality of flow passages between the heat transfer members. The flow passages open into the exit plenum chamber. Spacing of the heat transfer members by the predetermined distance evenly distributes flow of the primary heat transfer fluid through the flow passages, across the surfaces of the heat transfer members and into the exit plenum chamber. Each heat transfer member defines a flow channel therethrough for flow of a cooler secondary heat transfer fluid.

WO 2011/078870 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/02602

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G21C 15/24 USPC - 376/406 According to International Patent Classification (IPC) or to both national classification and IPC</p>																							
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) IPC(8): G21C 15/24 USPC: 376/406</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 376/404, 405</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST(PGPB, USPT, USOCR, EPAB, JPAB); Google Patents; Google Scholar Search Terms: nuclear, reactor, core, fission, exchange, transfer, heat, water, steam, pool, reservoir, inlet, intake, input, inward, outlet, output, outward, cross, counter, parallel, flow, manifold, surface, area, flange</p>																							
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>US 4,737,337 A (GARABEDIAN et al.) 12 April 1988 (12.04.1988) col 4, ln 18-22, 35-45; col 5, ln 1-4, 41-49; col 8, ln 36-40; col 10, ln 29-32; col 11, ln 52-63</td> <td>1-34</td> </tr> <tr> <td>Y</td> <td>US 2004/0247067 A1 (HATTORI et al.) 09 December 2004 (09.12.2004) para [0023], [0025], [0029], [0031], [0042], [0050]</td> <td>1-34</td> </tr> <tr> <td>Y</td> <td>US 5,499,277 A (HUNSBEDT) 12 March 1996 (12.04.1996) col 4, ln 26-28; col 5, ln 19-27; col 6, ln 45-48</td> <td>12, 19-21, 32-34</td> </tr> <tr> <td>A</td> <td>US 4,983,353 A (BOARDMAN et al.) 08 January 1991 (08.01.1991), entire document especially Fig 1, col 6, lns 6-22</td> <td>1-34</td> </tr> <tr> <td>A</td> <td>US 6,916,430 B1 (QU) 12 July 2005 (12.07.2005), entire document</td> <td>1-34</td> </tr> <tr> <td>A</td> <td>US 7,258,844 B1 (SYMONDS) 21 August 2007 (21.08.2007), entire document</td> <td>1-34</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	US 4,737,337 A (GARABEDIAN et al.) 12 April 1988 (12.04.1988) col 4, ln 18-22, 35-45; col 5, ln 1-4, 41-49; col 8, ln 36-40; col 10, ln 29-32; col 11, ln 52-63	1-34	Y	US 2004/0247067 A1 (HATTORI et al.) 09 December 2004 (09.12.2004) para [0023], [0025], [0029], [0031], [0042], [0050]	1-34	Y	US 5,499,277 A (HUNSBEDT) 12 March 1996 (12.04.1996) col 4, ln 26-28; col 5, ln 19-27; col 6, ln 45-48	12, 19-21, 32-34	A	US 4,983,353 A (BOARDMAN et al.) 08 January 1991 (08.01.1991), entire document especially Fig 1, col 6, lns 6-22	1-34	A	US 6,916,430 B1 (QU) 12 July 2005 (12.07.2005), entire document	1-34	A	US 7,258,844 B1 (SYMONDS) 21 August 2007 (21.08.2007), entire document	1-34
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																					
Y	US 4,737,337 A (GARABEDIAN et al.) 12 April 1988 (12.04.1988) col 4, ln 18-22, 35-45; col 5, ln 1-4, 41-49; col 8, ln 36-40; col 10, ln 29-32; col 11, ln 52-63	1-34																					
Y	US 2004/0247067 A1 (HATTORI et al.) 09 December 2004 (09.12.2004) para [0023], [0025], [0029], [0031], [0042], [0050]	1-34																					
Y	US 5,499,277 A (HUNSBEDT) 12 March 1996 (12.04.1996) col 4, ln 26-28; col 5, ln 19-27; col 6, ln 45-48	12, 19-21, 32-34																					
A	US 4,983,353 A (BOARDMAN et al.) 08 January 1991 (08.01.1991), entire document especially Fig 1, col 6, lns 6-22	1-34																					
A	US 6,916,430 B1 (QU) 12 July 2005 (12.07.2005), entire document	1-34																					
A	US 7,258,844 B1 (SYMONDS) 21 August 2007 (21.08.2007), entire document	1-34																					
<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>																							
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="vertical-align: top;"> <p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p> </td> </tr> </table>			<p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>																			
<p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>																						
<p>Date of the actual completion of the international search 25 May 2011 (25.05.2011)</p>		<p>Date of mailing of the international search report 10 JUN 2011</p>																					
<p>Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201</p>		<p>Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p>																					