

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 December 2005 (22.12.2005)

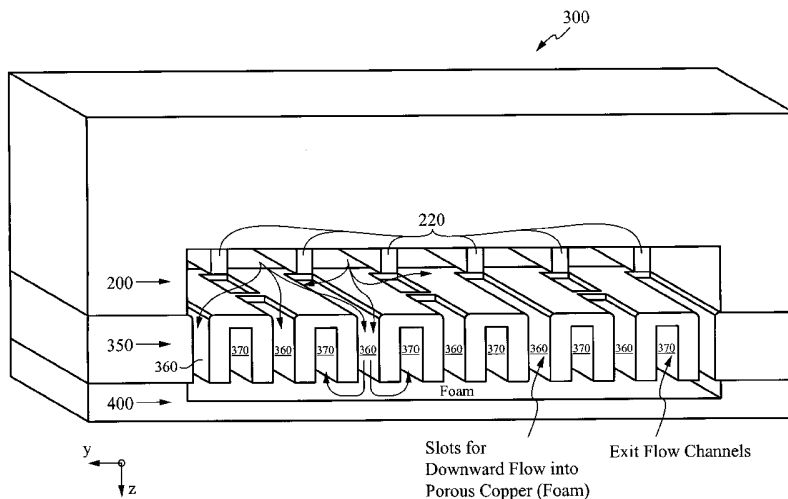
PCT

(10) International Publication Number
WO 2005/122661 A3

- (51) International Patent Classification:
F28F 7/00 (2006.01)
 - (21) International Application Number:
PCT/US2005/016680
 - (22) International Filing Date: 12 May 2005 (12.05.2005)
 - (25) Filing Language: English
 - (26) Publication Language: English
 - (30) Priority Data:
60/577,262 4 June 2004 (04.06.2004) US
11/049,313 1 February 2005 (01.02.2005) US
 - (71) Applicant (for all designated States except US):
COOLIGY, INC. [US/US]; 800 Maude Avenue, Mountain View, CA 94043 (US).
 - (72) Inventors; and
 - (75) Inventors/Applicants (for US only): **BREWER, Richard, G.** [US/US]; 39887 Cedar Boulevard #247, Newark, CA 94560 (US). **UPADHYA, Ginsh** [US/US]; 20800 Homestead Road #16B, Cupertino, CA 95014 (US). **ZHOU, Peng** [CN/US]; 1110 Jackson St. #918, Albany, CA 94706 (US). **MCMASTER, Mark** [US/US]; 1278 Santa Cruz Ave., Menlo Park, CA 94025 (US). **TSAO, Paul** [US/US]; 1816 Alford Avenue, Los Altos, CA 94024 (US).
 - (74) Agents: **HASTERSTOCK, Thomas, B.** et al.; Haverstock & Owens LLP, 162 North Wolfe Road, Sunnyvale, CA 94086 (US).
 - (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
 - (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report

[Continued on next page]

(54) Title: APPARATUS AND METHOD OF EFFICIENT FLUID DELIVERY FOR COOLING A HEAT PRODUCING DEVICE



(57) Abstract: A heat exchanger includes features for alleviating high pressure drops and controlling the expansion of fluid during freezing. The heat exchanger includes an interface layer in which heat is transferred from a heat source to a fluid. A manifold layer couples to the interface layer. The manifold layer includes a first set of substantially vertical fluid paths for directing the fluid to the interface layer. The manifold layer further includes a second set of substantially horizontal fluid paths, perpendicular to the first set of fluid paths, for removing the fluid from the interface layer. Preferably, the heat exchanger includes an upper layer for circulating the fluid to and from the manifold layer. The upper layer can include at least one of a plurality of protruding features and a porous structure. Preferably, a porous structure is disposed along the interface layer.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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

21 September 2006

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/16680

A. CLASSIFICATION OF SUBJECT MATTER
 IPC: **F28F 7/00(2006.01)**

 USPC: 165/80.4;361/699
 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)
 U.S. : 165/80.4,80.5,185;361/699

 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US ,5,145,001 A (VALENZUELA) 08 SEPTEMBER 1992 (08.09.1992), SEE FIGURES 1 AND 16, COLUMN 11, LINES 59-61; COLUMN 9, LINES 6-8; COLUMN 7, LINES 8-10.	1-2, 4,6,9-10,12-14,16,18,20,23-24,26-28,30,32-33,36,38-42,44,46,49,51-53 11,25,37,50
Y	US 6,196,307 B1 (OZMAT) 06 MARCH 2001 (06.03.2001), SEE COLUMN 2, LINES 25-29.	5,11,19,25,31,37,45,50
Y	US 6,508,301 B2 (MARSALA) 21 JANUARY 2003 (21.01.2003), SEE COLUMN 3, LINES 3-18.	7-8,21-22,34-35,47-48

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

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

Date of the actual completion of the international search 13 July 2006 (13.07.2006)	Date of mailing of the international search report 02 AUG 2006
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	Authorized officer Allen Shoap <i>A. Hurley for</i> Telephone No. (571) 272-4391