



(51) International Patent Classification:

F28F 21/06 (2006.01) B29C 70/68 (2006.01)

F28D 9/00 (2006.01) B29C 70/84 (2006.01)

(21) International Application Number:

PCT/US2020/016859

(22) International Filing Date:

05 February 2020 (05.02.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/801,149 05 February 2019 (05.02.2019) US

(71) Applicant: THE GOVERNMENT OF THE UNITED STATES OF AMERICA, AS REPRESENTED BY THE SECRETARY OF THE NAVY [US/US]; 875 North Randolph Street, Suite 1425, Arlington, VA 22203 (US).

(72) Inventor: POWELL, Brandon; 4555 Overlook Ave. SW, Washington, DC 20375 (US).

(74) Agent: BROOME, Kerry, L.; US Naval Research Laboratory, 4555 Overlook Ave, SW, Code 1008.2, Washington, DC 20375 (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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,

KR, KW, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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, ST, 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:

29 October 2020 (29.10.2020)

(54) Title: VASCULAR COMPOSITE HEAT EXCHANGER

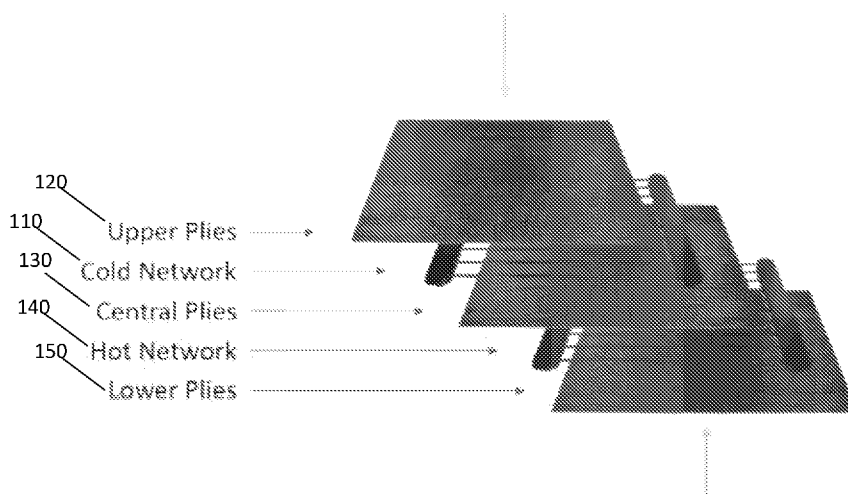


FIG. 1

(57) Abstract: A vascular composite heat exchanger includes a first fluid network sandwiched between upper and central plies; and a second fluid network fluidly isolated from the first fluid network sandwiched between the central and lower plies.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2020/016859**A. CLASSIFICATION OF SUBJECT MATTER****F28F 21/06(2006.01)i, F28D 9/00(2006.01)i, B29C 70/68(2006.01)i, B29C 70/84(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)

F28F 21/06; B23P 15/26; B23P 21/00; F28D 7/00; F28F 007/00; F28F 1/22; F28F 21/02; H01M 10/6557; F28D 9/00; B29C 70/68; B29C 70/84

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) & Keywords: heat exchanger, vascular composite, fluid network, plies, tool, network geometry, sacrificial material, film adhesive

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1285213 B1 (ROBERT BOSCH G.M.B.H.) 06 April 2005 paragraphs [0018]–[0023] and figures 1–3	1–5
Y	JP 5490265 B2 (MITSUBISHI ELECTRIC CORP.) 14 May 2014 paragraphs [0048]–[0049] and figure 10	1–5
Y	US 2004-0050532 A1 (YAMAGUCHI et al.) 18 March 2004 paragraphs [0042], [0047] and figure 1	2–3
Y	JP 2004-042247 A (DENSO CORP.) 12 February 2004 paragraphs [0054]–[0057] and figure 5	4
A	US 2016-0043454 A1 (GM GLOBAL TECHNOLOGY OPERATIONS L.L.C.) 11 February 2016 paragraphs [0019]–[0028] and figures 1–3	1–5



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

14 September 2020 (14.09.2020)

Date of mailing of the international search report

15 September 2020 (15.09.2020)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea



Facsimile No. +82-42-481-8578

Authorized officer

BAHNG SEUNG HOON

Telephone No. +82-42-481-5560



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2020/016859

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1285213 B1	06/04/2005	DE 10022972 A1 EP 1285213 A1 ES 2240457 T3 JP 2003-533057 A KR 10-0758836 B1 KR 10-2002-0037331 A WO 01-86221 A1	22/11/2001 26/02/2003 16/10/2005 05/11/2003 19/09/2007 18/05/2002 15/11/2001
JP 5490265 B2	14/05/2014	GB 2501413 A GB 2501413 B WO 2012-104944 A1	23/10/2013 07/06/2017 09/08/2012
US 2004-0050532 A1	18/03/2004	JP 2004-060986 A US 7243703 B2	26/02/2004 17/07/2007
JP 2004-042247 A	12/02/2004	JP 4026503 B2	26/12/2007
US 2016-0043454 A1	11/02/2016	CN 105375083 A DE 102015112683 A1 US 9871276 B2	02/03/2016 11/02/2016 16/01/2018