(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 February 2001 (08.02.2001)

PCT

(10) International Publication Number
WO 01/08463 A3

(51) International Patent Classification[7]: B64D 15/12, H05B 3/26

(21) International Application Number: PCT/US99/17640

(22) International Filing Date: 30 July 1999 (30.07.1999)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: NORTHCOAST TECHNOLOGIES [US/US]; 140 Parker Court, Chardon, OH 44024 (US).

(72) Inventors: RUTHERFORD, Robert, B.; 8833 Quail Circle, Kirtland, OH 44094 (US). DUDMAN, Richard, L.; 1705 East 238th Street, Euclid, OH 44117 (US).

(74) Agents: ARNDT, Barbara, E. et al.; Jones, Day, Reavis & Pogue, North Point, 901 Lakeside Avenue, Cleveland, OH 44114 (US).

(81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW.

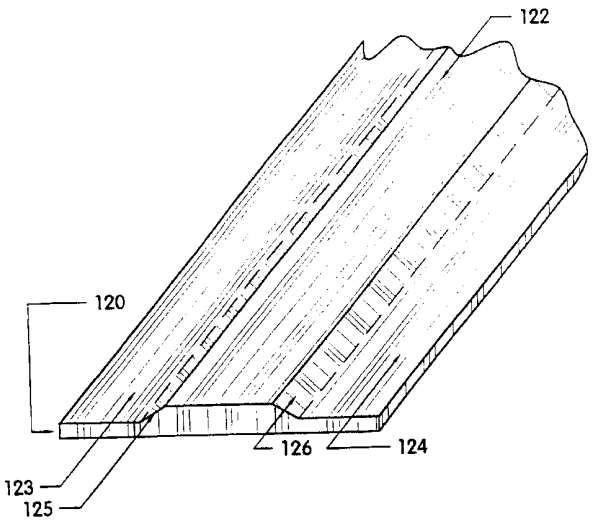
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

(88) Date of publication of the international search report:
28 February 2002

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.

(54) Title: AIRCRAFT DE-ICING SYSTEM



(57) Abstract: An electrothermal zoned de-icing system for an aircraft employs a heat-conducting tape bonded to the leading edge of an aircraft structure. The heat-conducting tape has a spanwise parting strip area (122), and first and second ice accumulation and shedding zones. The tape comprises a non-metallic electrical and heat conducting layer consisting of flexible expanded graphite foil laminated to an outer heat-conducting layer, in which the thickness of the flexible expanded graphite foil layer in the parting strip area (122) is always greater than the thickness of the foil layer in either of the ice accumulation and shedding zones (123, 124). Therefore, the parting strip area has a decreased electrical resistance, a greater flow of current, and becomes hotter than the zones in which the foil layer is thinner. Because the flexible expanded graphite foil is a monolithic structure that may be shaped, sculptured or layered to form different thicknesses in different areas, only a single control mechanism for a single set of electric terminals is necessary to produce desired watt densities and temperatures in the parting strip and ice accumulation and shedding zones.

WO 01/08463 A3

INTERNATIONAL SEARCH REPORT

Int. .ional Application No
PCT/US 99/17640

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B64D15/12 H05B3/26

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)
IPC 7 H05B B64D

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 practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 756 254 A (EUROCOPTER FRANCE) 29 May 1998 (1998-05-29) page 4, line 29 - line 34	1,54
A	GB 2 319 943 A (EUROCOPTER AEROPORT INTERNATIO) 3 June 1998 (1998-06-03) the whole document	1,54
A	DE 43 33 852 A (LUST HYBRID TECHNIK GMBH) 30 March 1995 (1995-03-30) column 1, line 55 - line 58 column 2, line 35 - line 36	54
E	WO 01 08973 A (NORTHCOAST TECHNOLOGIES) 8 February 2001 (2001-02-08) the whole document	1,54

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 document 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)

"O" document referring to an oral disclosure, use, exhibition or other means

"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	Date of mailing of the international search report
25 September 2001	02/10/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Hauglustaine, H

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ional Application No
PCT/US 99/17640

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2756254 A	29-05-1998	FR 2756254 A1	29-05-1998
		CA 2222469 A1	27-05-1998
		GB 2319942 A ,B	03-06-1998
		US 5947418 A	07-09-1999
GB 2319943 A	03-06-1998	FR 2756253 A1	29-05-1998
		CA 2222468 A1	27-05-1998
		US 5971323 A	26-10-1999
DE 4333852 A	30-03-1995	DE 4333852 A1	30-03-1995
WO 0108973 A	08-02-2001	US 6279856 B1	28-08-2001
		AU 1207400 A	19-02-2001
		WO 0108973 A1	08-02-2001
		US 6237874 B1	29-05-2001