

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 May 2008 (08.05.2008)

PCT

(10) International Publication Number
WO 2008/054876 A3

(51) **International Patent Classification:**
B64C 3/26 (2006.01) **B64C 21/10** (2006.01)

(21) **International Application Number:**
PCT/US2007/068986

(22) **International Filing Date:** 15 May 2007 (15.05.2007)

(25) **Filing Language:** English

(26) **Publication Language:** English

(30) **Priority Data:**
60/800,461 15 May 2006 (15.05.2006) US

(71) **Applicant:** **ALCOA INC.** [US/US]; Alcoa Corporate Center, 201 Isabella Street, Pittsburgh, PA 15212-5858 (US).

(71) **Applicants and**

(72) **Inventors:** **HEINIMANN, Markus, B.** [US/US]; 238 Shaw Court, New Alexandria, PA 15670 (US). **KULAK, Michael** [US/US]; 4300 Michel Court, Murrysville, PA 15668 (US). **CHU, Edmund, W.** [US/US]; 2211 Manordale Drive, Export, PA 15632 (US). **SIEMON, John, T.** [US/US]; 111 Dunedin Drive, Cheswilk, PA 15024 (US).

(74) **Agent:** **SCHINDLER, Barry, J.**; GreenbergTraurig, LLP, 200 Park Avenue, 34th FL, New York, NY 10166 (US).

(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, 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, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW

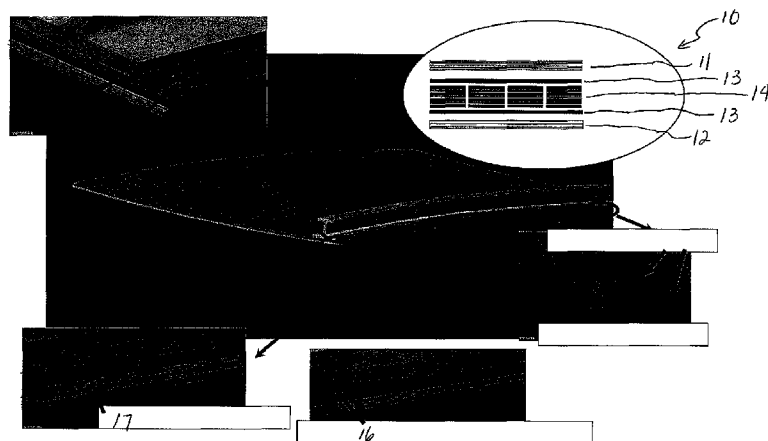
(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, 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
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) **Date of publication of the international search report:**
24 July 2008

(54) **Title:** REINFORCED HYBRID STRUCTURES AND METHODS THEREOF



(57) **Abstract:** The present invention discloses a method for producing a wing structure comprising producing a machined metallic bottom skin by pre-machining, preforming or combinations thereof, finishing the skin which serves as a mold, placing a plurality of straps on top of the skin, arranging a monolithic, fiber metal laminate, or non-reinforced metallic laminate skin on top of the plurality of straps to form a module, and curing the module, wherein the bottom skin is the load carrying element in the wing. The present invention also discloses a method for producing a wing structure comprising providing a mold, placing a first monolithic, fiber metal laminate, or non-reinforced metallic laminate skin on a lay-up mold, placing a plurality of straps on top of the skin, arranging a second monolithic, fiber metal laminate, or non-reinforced metallic laminate skin on top of the plurality of straps to form a module, and curing the module.

WO 2008/054876 A3

INTERNATIONAL SEARCH REPORT

International application No

PCT/US 07/68986

A CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B64C 3/26, B64C 21/10 (2008.04)

USPC - 244/200, 99 11

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)

USPC 2,4/200, 99 11

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

USPC All classes

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

PubWEST (PGPB, USPT, EPAB, JPAB), Google Scholar, Google Patents

Keywords Aircraft, wing, airfoil, hybrid, composite, structure, strap, strap, core, fiber, metal, laminate, skin, polymer, coat

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 6,114,050 A (WESTRE et al) 05 September 2000 (05 09 2000) col 6, ln 42-57, col 7, ln 1-3,	1, 3, 5
---	col 7, ln 8-11, col 9, ln 31-43, col 12, ln 2-5, col 12, ln 16-20, col 12, ln 28-37, col 12, ln 61 to col	---
Y	13, ln 4, Fig 4a	2, 4, 6-9
Y	US 4,502,092 A (BANNINK et al) 26 February 1985 (26 02 1985) col 2, ln 59 to col 3, ln 2	2, 4, 6, 8, 9
Y	US 2006/0060705 A1 (STULC et al) 23 March 2006 (23 03 2006) para [0026]	7, 8

☐ Further documents are listed in the continuation of Box C**D**

* 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 application or patent 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

10 April 2008 (10 04 2008)

Date of mailing of the international search report

22 MAY 2008

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

Lee W Young

PCT H01pdssk 571 272-4300
PCT OSP 571-272 7774