



- (51) International Patent Classification:
F01D 5/14 (2006.01)
- (21) International Application Number:
PCT/US2014/035002
- (22) International Filing Date:
22 April 2014 (22.04.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
13/870,723 25 April 2013 (25.04.2013) US
- (71) Applicant: **WETZEL ENGINEERING, INC.** [US/US];
1310 Wakarusa Drive, Lawrence, KS 66049 (US).
- (72) Inventors: **BARNHART, Ryan, Michael**; 10009 Millstone Drive, Lenexa, KS 66220 (US). **WETZEL, Kyle, K.**; 4757 Larkspur Circle, Lawrence, KS 66047 (US).
- (74) Agent: **URBAN, Camille, L.**; BrownWinick Law Firm, 666 Grand Avenue, Suite 2000, Des Moines, IA 50309 (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, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RW, SD, SL, 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).

Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

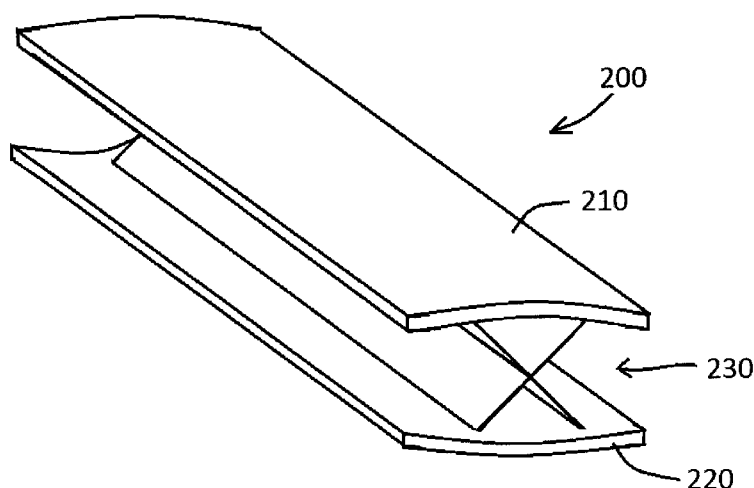
Published:

- *with international search report (Art. 21(3))*

[Continued on next page]

(54) Title: STRUCTURAL MEMBER WITH X-WEB

FIG. 5A



(57) Abstract: Disclosed is a structure that may include a first flange, a second flange, and a web connecting the first flange to the second flange. In example embodiments, the web may include at least one end with at least two angled members attaching to one of the first flange and the second flange and another end connecting to the other of the first flange and the second flange. Disclosed also is a wind turbine blade that includes the structure.



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

5 November 2015

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/35002

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F01D 5/14 (2015.01)

CPC - F01D 5/147

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(8) - F01D 5/14 (2015.01)

CPC - F01D 5/147

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

IPC(8) - F01D 5/14, F01D 5/18, B32B 3/00 (2015.01)

CPC - F01D 5/147, F01D 5/288, F01D 5/28, 5/286, F05B 2230/90, B32B 3/30, B31F 1/07 (search terms limited, see below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 PatBase, Google Scholar, Google Patents. Search Terms Used: i-beam web, structural member of wings, wing blade hollow web, wind turbine blade, wind turbine blade structure, wind turbine blade web member, wind turbine blade, x shape web, x-shaped web, x shape

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0092300 A1 (Jensen et al.) 15 April 2010 (15.04.2010), entire document, especially	1-11
--	Fig 4, Fig 8, Fig 10; para [0109]	-----
Y		1-11
Y	US 2009/0162206 A1 (Zirin et al.) 25 June 2009 (25.06.2009), entire document	1-11

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


* 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

04 February 2015 (04.02.2015)

Date of mailing of the international search report

23 MAR 2015

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 Helpdesk: 571-272-4300

PCT OSP: 571-272-7774