



(51) International Patent Classification:

F02K 3/072 (2006.01) F02C 7/00 (2006.01)

F02K 3/00 (2006.01) F01D 25/14 (2006.01)

(21) International Application Number:

PCT/US2013/027549

(22) International Filing Date:

25 February 2013 (25.02.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/408,178 29 February 2012 (29.02.2012) US

(71) Applicant: UNITED TECHNOLOGIES CORPORATION [US/US]; One Financial Plaza, Hartford, Connecticut 06101 (US).

(72) Inventors: SUCIU, Gabriel, L.; 27 Tanglewood Drive, Glastonbury, Connecticut 06033 (US). MERRY, Brian, D.; 220 Bear Swamp Road, Andover, Connecticut 06232 (US).

(74) Agent: GOTTSCHALK, William, S.; Carlson, Gaskey & Olds/Pratt & Whitney, c/o CPA Global, P.O. Box 52050, Minneapolis, Minnesota 55402 (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, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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, 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:

6 February 2014

(54) Title: COUNTER-ROTATING LOW PRESSURE TURBINE WITH GEAR SYSTEM MOUNTED TO MID TURBINE FRAME

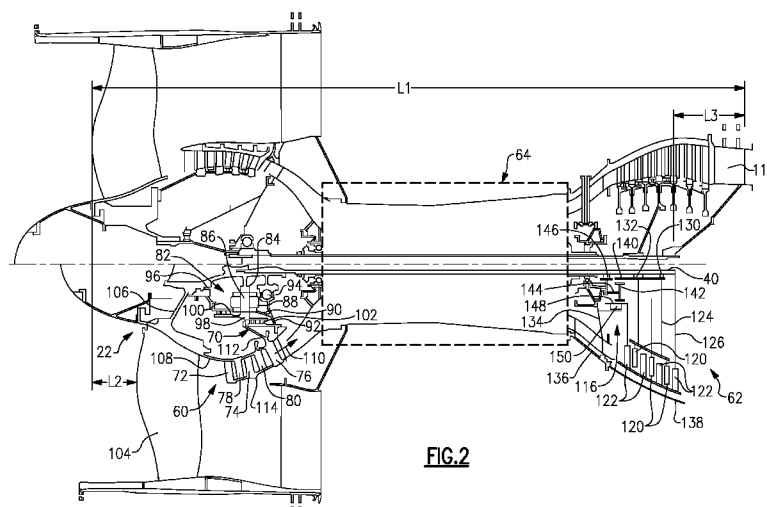


FIG. 2

(57) Abstract: A gas turbine engine includes a shaft defining an axis of rotation. An outer turbine rotor directly drives the shaft and includes an outer set of blades. An inner turbine rotor has an inner set of blades interspersed with the outer set of blades. The inner turbine rotor is configured to rotate in an opposite direction about the axis of rotation from the outer turbine rotor. A gear system couples the inner turbine rotor to the shaft and is configured to rotate the inner set of blades at a faster speed than the outer set of blades. The gear system is mounted to a mid-turbine frame.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/027549**A. CLASSIFICATION OF SUBJECT MATTER****F02K 3/072(2006.01)i, F02K 3/00(2006.01)i, F02C 7/00(2006.01)i, F01D 25/14(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)

F02K 3/072; F02K 3/00; F02C 3/10; F02C 3/04; F01D 1/26; F01D 1/24; F02C 7/00; F01D 25/14

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: gas turbine engine, shaft, inner rotor, outer rotor, low pressor turbine and gear**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010-0154384 A1 (SCHILLING, JAN CHRISTOPHER) 24 June 2010 See abstract; paragraphs [0015]–[0021]; claims 1-3 and figures 1-3.	1-19
Y	US 2006-0093464 A1 (MONIZ et al.) 04 May 2006 See abstract; paragraphs [0005], [0016], [0017], [0019], [0022]; claim 1 and figures 1-6.	1-19
A	US 2009-0151317 A1 (NORRIS et al.) 18 June 2009 See abstract; paragraphs [0010]–[0015]; figures 1-4.	1-19
A	US 2009-0191045 A1 (SUCIU et al.) 30 July 2009 See abstract; paragraphs [0002], [0010], [0013]; claims 1-3 and figures 1,2.	1-19
A	US 2010-0192595 A1 (ORLANDO et al.) 05 August 2010 See abstract; paragraphs [0014], [0018], [0020]–[0022]; figures 1-5.	1-19



Further documents are listed in the continuation of Box C.



See patent family 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 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 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

05 December 2013 (05.12.2013)

Date of mailing of the international search report

06 December 2013 (06.12.2013)

Name and mailing address of the ISA/KR

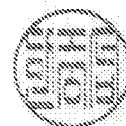
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City,
302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

HAN, Joong Sub

Telephone No. +82-42-481-5606



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/027549

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0154384 A1	24/06/2010	EP 2199568 A2 JP 2010-144724 A US 8191352 B2	23/06/2010 01/07/2010 05/06/2012
US 2006-0093464 A1	04/05/2006	US 7269938 B2	18/09/2007
US 2009-0151317 A1	18/06/2009	EP 2071153 A2 EP 2071153 A3 US 8015798 B2	17/06/2009 20/04/2011 13/09/2011
US 2009-0191045 A1	30/07/2009	EP 2085586 A2 EP 2085586 A3 US 8292570 B2	05/08/2009 21/11/2012 23/10/2012
US 2010-0192595 A1	05/08/2010	CA 2690665 A1 EP 2213866 A2 JP 2010-174887 A	30/07/2010 04/08/2010 12/08/2010