



- (51) International Patent Classification:
F02C 3/073 (2006.01) F02K 3/06 (2006.01)
- (21) International Application Number:
PCT/US2014/064490
- (22) International Filing Date:
7 November 2014 (07.11.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
14/107,169 16 December 2013 (16.12.2013) US
- (71) Applicant: UNITED TECHNOLOGIES CORPORATION [US/US]; One Financial Plaza, Hartford, Connecticut 06101 (US).
- (72) Inventors: SCHWARZ, Frederick M.; 121 Steep Hollow Drive, Glastonbury, Connecticut 06033 (US). STAUBACH, Joseph Brent; 15 Diane Lane, Colchester, Connecticut 06415 (US).
- (74) Agent: OLDS, Theodore W.; Carlson, Gaskey & Olds/Pratt & Whitney, 400 W. Maple Road, Ste. 350, Birmingham, Michigan 48009 (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, 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, 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))

- (88) Date of publication of the international search report:
12 November 2015

(54) Title: GEARED TURBOFAN WITH THREE TURBINE SECTIONS

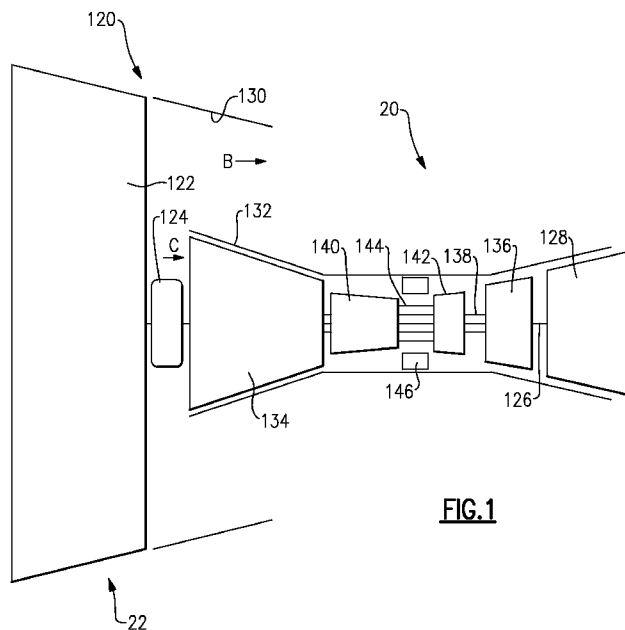
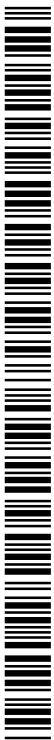


FIG. 1

(57) Abstract: A gas turbine engine comprises a fan rotor configured to be driven by a fan drive turbine through a first shaft and a gear reduction. The fan rotor is configured to deliver air into a bypass duct as bypass air and to deliver core air flow into a core engine where it reaches an upstream compressor rotor. The upstream compressor rotor is configured to be driven through a second shaft by an intermediate turbine rotor. A downstream compressor rotor is configured to be driven by an upstream turbine rotor through a third shaft. An overall pressure ratio across the upstream and downstream compressor rotors is greater than or equal to about 35.0 and less than or equal to about 75.0.



A. CLASSIFICATION OF SUBJECT MATTER**F02C 3/073(2006.01)i, F02K 3/06(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)

F02C 3/073; F02C 7/36; F02C 3/06; F02C 3/10; F02K 3/06; F02C 3/04; F02G 3/00; F01D 9/04; F01D 13/00

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, compressor, upstream, downstream and pressure ratio

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013-0318998 A1 (SCHWARZ et al.) 05 December 2013 See abstract, paragraphs [0008]-[0038] and figure 1.	1-20
Y	US 2012-0234017 A1 (STAUBACH et al.) 20 September 2012 See abstract, paragraphs [0010]-[0013] and figure 1.	1-20
A	EP 2592235 A2 (UNITED TECHNOLOGIES CORPORATION) 15 May 2013 See abstract, paragraphs [0020]-[0024] and figure 1.	1-20
A	WO 2013-115871 A1 (UNITED TECHNOLOGIES CORPORATION) 08 August 2013 See abstract, paragraphs [0032]-[0038] and figure 1.	1-20
A	US 2009-0293445 A1 (RESS, JR., ROBERT A.) 03 December 2009 See abstract, paragraphs [0013]-[0022] and figures 1, 2.	1-20

 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 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

12 August 2015 (12.08.2015)

Date of mailing of the international search report

13 August 2015 (13.08.2015)

Name and mailing address of the ISA/KR

International Application Division
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

LEE, Hun Gil

Telephone No. +82-42-481-8525



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/064490

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013-0318998 A1	05/12/2013	EP 2855875 A2 WO 2014-025441 A2 WO 2014-025441 A3	08/04/2015 13/02/2014 30/05/2014
US 2012-0234017 A1	20/09/2012	US 2012-0114479 A1 US 8337147 B2 US 8337148 B2	10/05/2012 25/12/2012 25/12/2012
EP 2592235 A2	15/05/2013	CA 2850225 A1 CN 103764952 A EP 2592235 A3 EP 2776677 A1 JP 2014-156861 A JP 2014-529707 A JP 5676825 B2 US 2012-0114479 A1 US 2012-0288366 A1 US 8337147 B2 US 8596965 B2 WO 2013-101805 A1	04/07/2013 30/04/2014 15/10/2014 17/09/2014 28/08/2014 13/11/2014 25/02/2015 10/05/2012 15/11/2012 25/12/2012 03/12/2013 04/07/2013
WO 2013-115871 A1	08/08/2013	EP 2809886 A1 US 2014-0202133 A1 US 8424313 B1 US 8561414 B1 US 8915090 B2	10/12/2014 24/07/2014 23/04/2013 22/10/2013 23/12/2014
US 2009-0293445 A1	03/12/2009	EP 2066896 A2 EP 2066896 A4 US 8209952 B2 WO 2008-105815 A2 WO 2008-105815 A3	10/06/2009 28/07/2010 03/07/2012 04/09/2008 04/12/2008