



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

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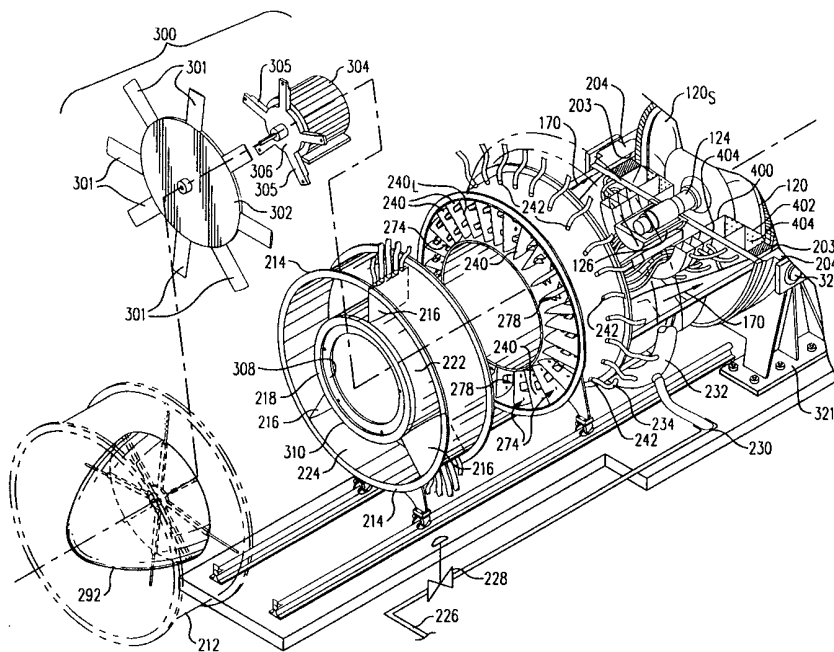
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(54) Title: RAMJET ENGINE WITH AXIAL AIR SUPPLY FAN

**(57) Abstract**

An axial fan for a ramjet engine prime mover. A ramjet engine power generator is provided with supersonic ramjets at the distal ends of a low aerodynamic drag rotor. The rotor is affixed at a central hub to a shaft, and rotates about an axis defined by the shaft. An axial fan, with output longitudinally along the inlet side of said shaft, supplies inlet air to the ramjet engine. Efficient mixing of the oxidant and fuel prior to entry into the ramjet combustor, and the short residence times in the combustion chamber, minimize the formation of undesirable oxides of nitrogen.

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# INTERNATIONAL SEARCH REPORT

International Application No

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**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 F02K7/00 F02K7/10 F23R3/28 F02C3/16 F02C6/20  
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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 F02K F02C F23R

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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages            | Relevant to claim No. |
|------------|-----------------------------------------------------------------------------------------------|-----------------------|
| Y          | US 4 887 425 A (VDOVIAK JOHN W)<br>19 December 1989 (1989-12-19)<br>the whole document<br>--- | 1-20                  |
| Y          | WO 98 27330 A (LAWLOR SHAWN P)<br>25 June 1998 (1998-06-25)<br>the whole document<br>---      | 1-20                  |
| Y          | US 2 770 501 A (H. COANDA)<br>13 November 1956 (1956-11-13)<br>the whole document<br>---      | 1-20                  |
| Y          | WO 96 41073 A (LAWLOR SHAWN P)<br>19 December 1996 (1996-12-19)<br>figures<br>---             | 1-20                  |
|            | -/--                                                                                          |                       |

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|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
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| Name and mailing address of the ISA<br>European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Authorized officer<br><br><p style="text-align: center;"><b>Argentini, A</b></p> |
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# INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 99/18745

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                          |                       |
|------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------|
| Category                                             | Citation of document, with indication, where appropriate, of the relevant passages       | Relevant to claim No. |
| A                                                    | DE 38 19 899 C (JUNGBAUER L. )<br>30 November 1989 (1989-11-30)<br>figures 1,2,2A<br>--- | 1                     |
| A                                                    | US 5 351 477 A (KRESS ERIC J ET AL)<br>4 October 1994 (1994-10-04)<br>figures<br>---     | 1                     |
| A                                                    | US 4 981 368 A (SMITH CHARLES R)<br>1 January 1991 (1991-01-01)<br>figures<br>-----      | 1                     |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/18745

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|----------------------------------------|------------------|-------------------------|------------------|
| US 4887425      A                      | 19-12-1989       | AU 3152589 A            | 21-09-1989       |
|                                        |                  | CA 1303369 A            | 16-06-1992       |
|                                        |                  | DE 3908165 A            | 28-09-1989       |
|                                        |                  | FR 2628791 A            | 22-09-1989       |
|                                        |                  | GB 2216999 A, B         | 18-10-1989       |
|                                        |                  | IT 1228662 B            | 03-07-1991       |
|                                        |                  | JP 2009918 A            | 12-01-1990       |
|                                        |                  | SE 466215 B             | 13-01-1992       |
|                                        |                  | SE 8900956 A            | 19-09-1989       |
|                                        |                  |                         |                  |
| WO 9827330      A                      | 25-06-1998       | AU 6237298 A            | 15-07-1998       |
|                                        |                  | EP 0958452 A            | 24-11-1999       |
|                                        |                  | NO 992945 A             | 10-08-1999       |
|                                        |                  | PL 334067 A             | 31-01-2000       |
|                                        |                  |                         |                  |
| US 2770501      A                      | 13-11-1956       | BE 522350 A             |                  |
|                                        |                  | CH 327202 A             |                  |
|                                        |                  | FR 1072328 A            | 10-09-1954       |
|                                        |                  | US 2907557 A            | 06-10-1959       |
|                                        |                  |                         |                  |
| WO 9641073      A                      | 19-12-1996       | US 5709076 A            | 20-01-1998       |
|                                        |                  | AU 696828 B             | 17-09-1998       |
|                                        |                  | AU 6104796 A            | 30-12-1996       |
|                                        |                  | EP 0830500 A            | 25-03-1998       |
|                                        |                  | PL 323857 A             | 27-04-1998       |
|                                        |                  |                         |                  |
| DE 3819899      C                      | 30-11-1989       | NONE                    |                  |
|                                        |                  |                         |                  |
| US 5351477      A                      | 04-10-1994       | NONE                    |                  |
|                                        |                  |                         |                  |
| US 4981368      A                      | 01-01-1991       | AT 177342 T             | 15-03-1999       |
|                                        |                  | AU 635214 B             | 18-03-1993       |
|                                        |                  | AU 3987689 A            | 19-02-1990       |
|                                        |                  | DE 68928945 D           | 15-04-1999       |
|                                        |                  | DE 68928945 T           | 07-10-1999       |
|                                        |                  | EP 0430973 A            | 12-06-1991       |
|                                        |                  | WO 9000929 A            | 08-02-1990       |
|                                        |                  | US 4929088 A            | 29-05-1990       |
|                                        |                  |                         |                  |