



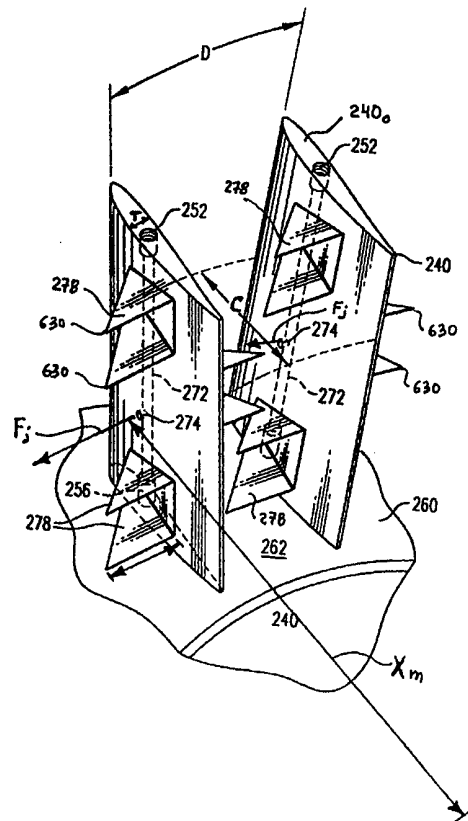
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<p>(21) International Application Number: PCT/US99/18698</p> <p>(22) International Filing Date: 17 August 1999 (17.08.99)</p> <p>(30) Priority Data: 60/096,831 17 August 1998 (17.08.98) US 09/149,728 8 September 1998 (08.09.98) US</p> <p>(71) Applicant (for all designated States except US): RAMGEN POWER SYSTEMS, INC. [US/US]; Suite W-190, 11808 Northup Way, Bellevue, WA 98005 (US).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): LAWLOR, Shawn, P. [US/US]; Suite W-190, 11808 Northup Way, Bellevue, WA 98005 (US).</p> <p>(74) Agent: GOODLOE, R., Reams, Jr.; Suite 3, 10725 S.E. 256th Street, Kent, WA 98031-6426 (US).</p>	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 20 July 2000 (20.07.00)</p>	

(54) Title: FUEL SUPPLY AND FUEL - AIR MIXING FOR A RAM JET COMBUSTOR

(57) Abstract

Fuel air mixing apparatus, and a method for design and operation of fuel-air mixing apparatus. An axial inlet air fan provides inlet air to an annular passageway having therein fuel supply structures through which fuel such as low pressure natural gas is injected. Vortex generators on the fuel supply structures create vortices to mix the inlet air with the injected fuel. Mixing is provided according to a pre-selected formula to control the ratio of transverse momentum to axial momentum, to thoroughly mix the fuel and the air, so as to provide a uniformly mixed inlet gas stream. This stream is fed to an unshrouded ramjet inlet which captures and compresses the mixed inlet gas stream by utilizing inlet structures and an adjacent housing sidewall structure. Fuel is oxidized in the combustion chamber(s) to produce expanding combustion gases. Such gases escape out through a ramjet nozzle, acting against outlet structures and an adjacent housing sidewall, rotating the ramjet at supersonic velocities, and producing shaft energy. 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

PCT/US 99/18698

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 F02K7/00 F02K7/10 F23R3/28 F02C3/16 F02C6/20  
F23R3/12

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**

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E	EP 0 936 406 A (GEN ELECTRIC) 18 August 1999 (1999-08-18) abstract; figures 2,3 ---	1-24
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Y		47-65
Y	WO 98 27330 A (LAWLOR SHAWN P) 25 June 1998 (1998-06-25) the whole document ---	47-65
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Date of the actual completion of the international search

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International Application No

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