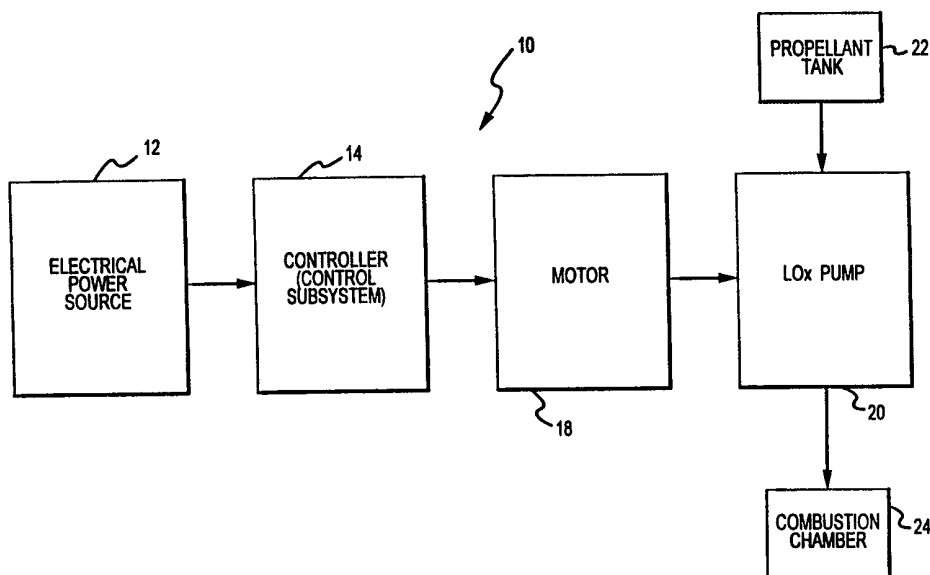




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US99/13477 <b>(22) International Filing Date:</b> 15 June 1999 (15.06.99) <b>(30) Priority Data:</b> 09/097,354 15 June 1998 (15.06.98) US <b>(71) Applicant (for all designated States except US):</b> LOCKHEED MARTIN CORPORATION [US/US]; 6801 Rockledge Drive, Bethesda, MD 20817 (US). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> VELEZ, Thomas, A. [US/US]; 2426 Autumn Ridge Drive S.W., Huntsville, AL 35803 (US). ABEL, Terry, M. [US/US]; 115 Jones Valley Drive, Huntsville, AL 35802 (US). <b>(74) Agent:</b> FISCHMANN, Kent, A.; Holme Roberts & Owen LLP, Suite 4100, 1700 Lincoln Street, Denver, CO 80203 (US).		<b>(81) Designated States:</b> 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).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>  <b>(88) Date of publication of the international search report:</b> 23 March 2000 (23.03.00)

**(54) Title:** ELECTRICAL DRIVE SYSTEM FOR ROCKET ENGINE PROPELLANT PUMPS

**(57) Abstract**

A liquid propellant supply system (10) according to the invention is electrical in nature and avoids the need for a gas generator and a turbine assembly. In particular, the system (10) includes an electrical power source (12), a controller (14) and a motor (18) for driving the pump (20). The electrical power source (12) provides electrical power sufficient for high power, limited duration applications such as for launch vehicle applications. For launch vehicle applications, the power source (12) is preferably capable of providing very high power for at least 60 seconds. A number of different types of electrical power sources may be employed in this regard. For example, the power source (12) may include high energy density batteries, supercapacitors, or counter rotating flywheels. Multiple counter rotating motors may be employed in order to minimize precessional forces. The invention thereby eliminates problematic high pressure plumbing, reduces overall mass and allows for convenient mass flow rate throttling, as well as save abort options.

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INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/13477

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(6) :FO2K 9/46; FO4B 17/03 US CL : 60/257; 417/423.6 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 60/257; 417/423.6 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 practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,077,073 A (KUHRT) 12 FEBRUARY 1963, SEE ENTIRE DOCUMENT.	1, 3-5, 7-13, 15, 17-19, 21-25, 27-33, 36, 38 ----- 2, 6, 14, 16, 20, 26, 34, 35, 37
X --- Y	US 3,229,459 (CERVENKA) 18 JANUARY 1966, SEE ENTIRE DOCUMENT.	1, 3-5, 7-10, 15, 24, 25, 27-29, ----- 2, 6, 14, 26,
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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/13477

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,021,671 A (WALLACH) 20 FEBRUARY 1962, SEE ENTIRE DOCUMENT.	17, 19, 21-25
Y	US 5,043,617 A (ROSTRON) 27 AUGUST 1991, SEE ENTIRE DOCUMENT.	2, 6, 14, 16, 20, 26
Y	US 5,407,331 A (ATSUMI) 18 APRIL 1995, SEE ENTIRE DOCUMENT.	34, 35
Y	US 5,624,245 A (DECLERCK ET AL.) 29 APRIL 1997, SEE ENTIRE DOCUMENT.	37