

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re U.S. Patent No. 8,678,743

Filed: February 4, 2013

Issued: March 25, 2014

Inventors: William G. Sheridan, Karl L. Hasel

Assignee: United Technologies Corporation

Title: Method for Setting a Gear Ratio of a Fan Drive Gear System of a Gas Turbine Engine

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I, Reza Abhari, make this declaration in connection with the petition for *inter partes* review submitted by Petitioner for U.S. Patent No. 8,678,743 (“the 743 Patent”). All statements made herein of my own knowledge are true, and all statements made herein based on information and belief are believed to be true. Although I am being compensated for my time in preparing this declaration, the opinions articulated herein are my own, and I have no stake in the outcome of this proceeding or any related litigation or administrative proceedings.

I. INTRODUCTION

1. I am making this declaration at the request of the General Electric Company in the matter of the *Inter Partes* Review of U.S. Patent No. 8,678,743 (the “743 Patent”) to William G. Sheridan et al.

2. In the preparation of this declaration, I have reviewed the relevant portions of the following documents:

GE-1001	U.S. Patent No. 8,678,743 to William G. Sheridan et al.
GE-1002	Prosecution File History of U.S. Patent No. 8,678,743.
GE-1005	Declaration of Raymond Drago
GE-1006	Curriculum Vitae of Raymond Drago
GE-1007	Bruce E. Wendus et al., <i>Follow-On Technology Requirement Study for Advanced Subsonic Transport</i> (August 2003).
GE-1009	Cesare A. Hall et al., <i>Engine Design Studies for a Silent Aircraft</i> , <i>Journal of Turbomachinery</i> (2007).
GE-1010	U.S. Patent No. 7,021,042 B2 to Law, <i>Geartrain Coupling for a Turbofan Engine</i> (issued April 4, 2006) (“Law”).
GE-1011	William S. Willis, Quiet Clean Short-Haul Experimental Engine (QCSEE) Final Report (August 1979).

GE-1012	Bill Sweetman et al., <i>Pratt & Whitney's surprise leap</i> , INTERAVIA (June 1998).
GE-1013	Gerald Brines, <i>The Turbofan of Tomorrow</i> , Mechanical Engineering (August 1990) ("Brines").
GE-1014	Excerpts from Jack D. Mattingly, <i>Elements of Gas Turbine Propulsion</i> (1996).
GE-1015	Bill Gunston, <i>Pratt & Whitney PW8000</i> , Jane's Aero-Engines Issue 7 (March 2000).
GE-1017	Richard Whitaker, <i>ALF502: plugging the turbofan gap</i> , Flight International (Jan. 30, 1982).
GE-1019	Excerpts from Prosecution File History of U.S. Patent Application No. 14/705,459.
GE-1020	Excerpts from Prosecution File History of U.S. Patent Application No. 14/179,827.
GE-1022	Joachim Kurzke, <i>Preliminary Design</i> , Aero-Engine Design: From State of the Art Turbofans Towards Innovative Architectures (March 3-7, 2008).

3. In forming my opinions expressed below, I have considered the documents listed above; and my knowledge and experience based upon my work in this area as described below.

4. The application that led to the issuance of the 743 Patent was filed on February 4, 2013. I am familiar with the technology at issue and am aware of the state of the art around this time. Based on the technology disclosed in the 743 Patent, a person of ordinary skill in the art (“POSITA”) would include someone who has a M.S. degree in Mechanical Engineering or Aerospace Engineering as well as at least 3-5 years of experience in the field of gas turbine engine design and analysis. My analyses and opinions below are given from the perspective of a POSITA in these technologies in this timeframe, unless stated otherwise.

II. QUALIFICATIONS AND COMPENSATION

5. I am currently a Full Professor of Aerothermodynamics at the Swiss Federal Institute of Technology (“ETH”) in Zurich, Switzerland, which is a position I have held since 1999. I am also the head of the Laboratory for Energy Conversion at ETH.

6. I received a BA degree in Engineering Science from Oxford University in 1984, and a PhD from the Aeronautical and Astronautical Engineering Department at the Massachusetts Institute of Technology (“MIT”) in 1991.

7. My research in the field of gas turbine technology began in 1984 at Oxford University and continued throughout my academic career at Oxford and at MIT. I began working with the relevant technology in the commercial industry in 1991. From 1991-1994, I was a Senior Research and Development Engineer for Textron Lycoming in Stratford CT, where I focused on research, development and design of engine components for next generation commercial and military gas turbine engines for aircraft propulsion. From 1994-1995, I was the Section Head of Propulsion and Energy Research at the Calspan Advanced Technology Center in Buffalo NY, where I was responsible for heading the group performing research and development of gas turbine technology related to turbine and combustor performance and reliability as well as overall engine operability in severe environments.

8. In 1995, I became an Assistant Professor in the Aeronautical Engineering Department at the Ohio State University in Columbus Ohio, with a joint appointment in the Mechanical Engineering Department. In 1997, I was promoted to Associate Professor with Tenure at the Ohio State University, where I remained until 1999 when I received my current position at ETH. From 1995-1999, I was also one of the two founders and the Associate Director of the Gas Turbine Laboratory at the Ohio State University.

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