

## EPA Patents: Vehicles and Fuel Emissions

Patent #	Patent Title	Issue Date
7,347,005	Opposing Pump/Motors	05/20/2008
7,337,869	Hydraulic hybrid vehicle with integrated hydraulic drive module and four-wheel-drive, and method of operation thereof	03/04/2008
7,305,915	Efficient Pump/Motor with Reduced Energy Loss	12/11/2007
7,305,914	Hydraulic Actuator Control Valve	12/11/2007
7,252,020	Vehicle Drive-Train Including a Clutchless Transmission and Method of Operation	08/07/2007
7,237,532	Methods of Operation for Controlled Temperature Combustion Engines using Gasoline-Like Fuel, Particularly Multi-cylinder Homogenous Charge Compression Ignition (HCCI) Engines	07/03/2007
7,121,304	Low permeation hydraulic accumulator	10/17/2006
7,108,016	Lightweight low permeation piston-in-sleeve accumulator	09/19/2006
7,104,349	Hybrid powertrain motor vehicle with homogenous charge compression ignition (HCCI) engine, and method of operation thereof	09/12/2006
7,047,933	Low Emission Fuel for Use with Controlled Temperature Combustion, Direct Injection, Compression Ignition Engines	05/23/2006
7,047,741	Methods for Low Emission, Controlled Temperature Combustion in Engines which Utilize Late Direct Cylinder Injection of Fuel	05/23/2006
7,032,385	Multi-Crankshaft, Variable-Displacement Engine	04/25/2006
7,025,042	Methods of Operation for Controlled Temperature Combustion Engines Using Gasoline-Like Fuel, Particularly Multicylinder Homogenous Charge Compression Ignition (HCCI) Engines	04/11/2006
7,024,858	Multi-Crankshaft, Variable-Displacement Engine	04/11/2006
7,014,429	High-Efficiency, Large Angle, Variable Displacement Hydraulic Pump/Motor	03/21/2006
6,998,727	Methods of Operating a Parallel Hybrid Vehicle Having an Internal Combustion Engine and a Secondary Power Source	02/14/2006
6,996,982	Method and Device for Switching Hydraulic Fluid Supplies, such as for a Hydraulic Pump/Motor	02/14/2006
6,910,459	HCCI Engine with Combustion-Tailoring Chamber	06/28/2005
6,876,098	Methods of Operating a Series Hybrid Vehicle	04/05/2005
6,857,263	Low Emission Diesel Combustion System with Low Charge-Air Oxygen Concentration Levels and High Fuel Injection Pressures	02/22/2005
6,820,417	Exhaust Aftertreatment System and Method for an Internal Combustion Engine	11/23/2004
6,810,838	Individual Cylinder Coolant Control System and Method	11/02/2004
6,786,205	Hydraulically Intensified High Pressure Fuel System for Common Rail Application	09/07/2004
6,779,339	Method for NOx Adsorber Desulfation in a Multi-Path Exhaust System	04/13/2004
6,752,105	Piston-In-Piston Variable Compression Ratio Engine	06/22/2004
6,719,080	Hydraulic Hybrid Vehicle	04/13/2004

## *EPA Patents - Vehicles and Fuel Emissions continued...*

<b>Patent #</b>	<b>Patent Title</b>	<b>Issue Date</b>
6,681,789	Fuel Tank Ventilation System and Method for Substantially Preventing Fuel Vapor Emissions	01/27/2004
6,652,247	Fully-Controlled, Free-Piston Engine	11/25/2003
6,651,432	Controlled Temperature Combustion Engine	11/25/2003
6,619,325	Hydraulic Hybrid Accumulator Shut-Off Valve	09/16/2003
6,582,204	Fully-Controlled, Free-Piston Engine	06/24/2003
6,578,533	Controlled Homogeneous-Charge, Compression-Ignition Engine	06/17/2003
6,470,732	Real-Time Exhaust Gas Modular Flowmeter and Emissions Reporting System for Mobile Apparatus	10/29/2002
6,470,682	Low Emission, Diesel-Cycle Engine	10/29/2002
6,415,607	High Efficiency, Air Bottoming Engine	07/09/2002
6,386,154	Pumped EGR System	05/14/2002
6,382,014	Real-Time On-Road Vehicle Exhaust Gas Modular Flowmeter and Emissions Reporting System	05/07/2002
6,301,888	Low Emission, Diesel-Cycle Engine	10/16/2001
6,202,416	Dual-Cylinder Expander Engine and Combustion Method with Two Expansion Strokes Per Cycle	03/20/2001
6,189,493	Torque Balanced Opposed-Piston Engine	02/20/2001
6,186,126	Phase Change Heat Engine	02/13/2001
6,170,524	Fast Valve and Actuator	01/09/2001
6,148,656	Real-Time On-Road Vehicle Exhaust Gas Modular Flowmeter and Emissions Reporting System	11/21/2000
5,887,674	Continuously Smooth Transmission	03/30/1999
5,617,823	Spark-Ignited Reciprocating Piston Engine Having a Subdivided Combustion Chamber	04/08/1997
5,611,300	Floating Piston, Piston-Valve Engine	03/18/1997
5,609,131	Multi-Stage Combustion Engine	03/11/1997
5,579,640	Accumulator Engine	12/03/1996
5,562,079	Low-Temperature, Near-Adiabatic Engine	10/08/1996
5,549,087	Combined Cycle Engine	08/27/1996
5,507,144	Lightweight, Safe Hydraulic Power System and a Method of Operation thereof	04/16/1996
5,505,527	Anti-Lock Regenerative Braking System	04/09/1996
5,495,912	Hybrid Powertrain Vehicle	03/05/1996
5,318,937	Ruthenium-Containing Perovskite Materials, Catalysts and Methods	06/07/1994