Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

This application is a continuation of United States Patent Application No. 10/991,774 filed on November 18, 2004.

Background of the Invention

This invention relates to spark ignition gasoline engines utilizing an antiknock agent which is a liquid fuel with a higher octane number than gasoline such as ethanol to improve engine efficiency.

It is known that the efficiency of spark ignition (SI) gasoline engines can be increased by high compression ratio operation and particularly by engine downsizing. The engine downsizing is made possible by the use of substantial pressure boosting from either turbocharging or supercharging. Such pressure boosting makes it possible to obtain the same performance in a significantly smaller engine. See, J. Stokes, *et al.*, "A Gasoline Engine Concept For Improved Fuel Economy – The Lean-Boost System," SAE Paper 2001-01-2902. The use of these techniques to increase engine efficiency, however, is limited by the onset of engine knock. Knock is the undesired detonation of fuel and can severely damage an engine. If knock can be prevented, then high compression ratio operation and high pressure boosting can be used to increase engine efficiency by up to twenty-five percent.

Octane number represents the resistance of a fuel to knocking but the use of higher octane gasoline only modestly alleviates the tendency to knock. For example, the difference between regular and premium gasoline is typically six octane numbers. That is significantly less than is needed to realize fully the efficiency benefits of high compression ratio or turbocharged operation. There is thus a need for a practical means for achieving a much higher level of octane enhancement so that engines can be operated much more efficiently.

It is known to replace a portion of gasoline with small amounts of ethanol added at the refinery. Ethanol has a blending octane number (ON) of 110 (versus 95 for premium gasoline) (see J.B. Heywood, "Internal Combustion Engine Fundamentals," McGraw Hill, 1988, p. 477) and is also attractive because it is a renewable energy, biomass-derived fuel, but the small

amounts of ethanol that have heretofore been added to gasoline have had a relatively small impact on engine performance. Ethanol is much more expensive than gasoline and the amount of ethanol that is readily available is much smaller than that of gasoline because of the relatively limited amount of biomass that is available for its production. An object of the present invention is to minimize the amount of ethanol or other antiknock agent that is used to achieve a given level of engine efficiency increase. By restricting the use of ethanol to the relatively small fraction of time in an operating cycle when it is needed to prevent knock in a higher load regime and by minimizing its use at these times, the amount of ethanol that is required can be limited to a relatively small fraction of the fuel used by the spark ignition gasoline engine.

Summary of the Invention

In one aspect, the invention is a fuel management system for efficient operation of a spark ignition gasoline engine including a source of an antiknock agent such as ethanol. An injector directly injects the ethanol into a cylinder of the engine and a fuel management system controls injection of the antiknock agent into the cylinder to control knock with minimum use of the antiknock agent. A preferred antiknock agent is ethanol. Ethanol has a high heat of vaporization so that there is substantial cooling of the air-fuel charge to the cylinder when it is injected directly into the engine. This cooling effect reduces the octane requirement of the engine by a considerable amount in addition to the improvement in knock resistance from the relatively high octane number of ethanol. Methanol, tertiary butyl alcohol, MTBE, ETBE, and TAME may also be used. Wherever ethanol is used herein it is to be understood that other antiknock agents are contemplated.

The fuel management system uses a fuel management control system that may use a microprocessor that operates in an open loop fashion on a predetermined correlation between octane number enhancement and fraction of fuel provided by the antiknock agent. To conserve the ethanol, it is preferred that it be added only during portions of a drive cycle requiring knock resistance and that its use be minimized during these times. Alternatively, the gasoline engine may include a knock sensor that provides a feedback signal to a fuel management microprocessor system to minimize the amount of the ethanol added to prevent knock in a closed loop fashion.

In one embodiment the injectors stratify the ethanol to provide non-uniform deposition within a cylinder. For example, the ethanol may be injected proximate to the cylinder walls and swirl can create a ring of ethanol near the walls.

In another embodiment of this aspect of the invention, the system includes a measure of the amount of the antiknock agent such as ethanol in the source containing the antiknock agent to control turbocharging, supercharging or spark retard when the amount of ethanol is low.

The direct injection of ethanol provides substantially a 13°C drop in temperature for every ten percent of fuel energy provided by ethanol. An instantaneous octane enhancement of at least 4 octane numbers may be obtained for every 20 percent of the engine's energy coming from the ethanol.

Brief Description of the Drawing

Fig. 1 is a block diagram of one embodiment of the invention disclosed herein.

Fig. 2 is a graph of the drop in temperature within a cylinder as a function of the fraction of energy provided by ethanol.

Fig. 3 is a schematic illustration of the stratification of cooler ethanol charge using direct injection and swirl motion for achieving thermal stratification.

Fig. 4 is a schematic illustration showing ethanol stratified in an inlet manifold.

Fig. 5 is a block diagram of an embodiment of the invention in which the fuel management microprocessor is used to control a turbocharger and spark retard based upon the amount of ethanol in a fuel tank.

Description of the Preferred Embodiment

With reference first to **Fig. 1**, a spark ignition gasoline engine **10** includes a knock sensor **12** and a fuel management microprocessor system **14**. The fuel management microprocessor system **14** controls the direct injection of an antiknock agent such as ethanol from an ethanol tank **16**. The fuel management microprocessor system **14** also controls the delivery of gasoline from a gasoline tank **18** into engine manifold **20**. A turbocharger **22** is provided to improve the torque and power density of the engine **10**. The amount of ethanol injection is dictated either by a predetermined correlation between octane number enhancement and fraction of fuel that is provided by ethanol in an open loop system or by a closed loop control system that uses a signal

from the knock sensor **12** as an input to the fuel management microprocessor **14**. In both situations, the fuel management processor **14** will minimize the amount of ethanol added to a cylinder while still preventing knock. It is also contemplated that the fuel management microprocessor system **14** could provide a combination of open and closed loop control.

As show in **Fig. 1** it is preferred that ethanol be directly injected into the engine **10**. Direct injection substantially increases the benefits of ethanol addition and decreases the required amount of ethanol. Recent advances in fuel injector and electronic control technology allows fuel injection directly into a spark ignition engine rather than into the manifold **20**. Because ethanol has a high heat of vaporization there will be substantial cooling when it is directly injected into the engine **10**. This cooling effect further increases knock resistance by a considerable amount. In the embodiment of **Fig. 1** port fuel injection of the gasoline in which the gasoline is injected into the manifold rather than directly injected into the cylinder is preferred because it is advantageous in obtaining good air/fuel mixing and combustion stability that are difficult to obtain with direct injection.

Ethanol has a heat of vaporization of 840kJ/kg, while the heat of vaporization of gasoline is about 350kJ/kg. The attractiveness of ethanol increases when compared with gasoline on an energy basis, since the lower heating value of ethanol is 26.9MJ/kg while for gasoline it is about 44MJ/kg. Thus, the heat of vaporization per Joule of combustion energy is 0.031 for ethanol and 0.008 for gasoline. That is, for equal amounts of energy the required heat of vaporization of ethanol is about four times higher than that of gasoline. The ratio of the heat of vaporization per unit air required for stoichiometric combustion is about 94 kJ/kg of air for ethanol and 24 kJ/kg of air for gasoline, or a factor of four smaller. Thus, the net effect of cooling the air charge is about four times lower for gasoline than for ethanol (for stoichiometric mixtures wherein the amount of air contains oxygen that is just sufficient to combust all of the fuel).

In the case of ethanol direct injection according to one aspect of the invention, the charge is directly cooled. The amount of cooling due to direct injection of ethanol is shown in **Fig. 2**. It is assumed that the air/fuel mixture is stoichiometric without exhaust gas recirculation (EGR), and that gasoline makes up the rest of the fuel. It is further assumed that only the ethanol contributes to charge cooling. Gasoline is vaporized in the inlet manifold and does not

contribute to cylinder charge cooling. The direct ethanol injection provides about 13°C of cooling for each 10% of the fuel energy provided by ethanol. It is also possible to use direct injection of gasoline as well as direct injection of ethanol. However, under certain conditions there can be combustion stability issues.

The temperature decrement because of the vaporization energy of the ethanol decreases with lean operation and with EGR, as the thermal capacity of the cylinder charge increases. If the engine operates at twice the stoichiometric air/fuel ratio, the numbers indicated in **Fig. 2** decrease by about a factor of 2 (the contribution of the ethanol itself and the gasoline is relatively modest). Similarly, for a 20% EGR rate, the cooling effect of the ethanol decreases by about 25%.

The octane enhancement effect can be estimated from the data in **Fig. 2**. Direct injection of gasoline results in approximately a five octane number decrease in the octane number required by the engine, as discussed by Stokes, *et al*. Thus the contribution is about five octane numbers per 30K drop in charge temperature. As ethanol can decrease the charge temperature by about 120K, then the decrease in octane number required by the engine due to the drop in temperature, for 100% ethanol, is twenty octane numbers. Thus, when 100% of the fuel is provided by ethanol, the octane number enhancement is approximately thirty-five octane numbers with a twenty octane number enhancement coming from direct injection cooling and a fifteen octane number enhancement coming from the octane number of ethanol. From the above considerations, it can be projected that even if the octane enhancement from direct cooling is significantly lower, a total octane number enhancement of at least 4 octane numbers should be achievable for every 20% of the total fuel energy that is provided by ethanol.

Alternatively the ethanol and gasoline can be mixed together and then port injected through a single injector per cylinder, thereby decreasing the number of injectors that would be used. However, the air charge cooling benefit from ethanol would be lost.

Alternatively the ethanol and gasoline can be mixed together and then port fuel injected using a single injector per cylinder, thereby decreasing the number of injectors that would be used. However, the substantial air charge cooling benefit from ethanol would be lost. The

volume of fuel between the mixing point and the port fuel injector should be minimized in order to meet the demanding dynamic octane-enhancement requirements of the engine.

Relatively precise determinations of the actual amount of octane enhancement from given amounts of direct ethanol injection can be obtained from laboratory and vehicle tests in addition to detailed calculations. These correlations can be used by the fuel management microprocessor system **14**.

An additional benefit of using ethanol for octane enhancement is the ability to use it in a mixture with water. Such a mixture can eliminate the need for the costly and energy consuming water removal step in producing pure ethanol that must be employed when ethanol is added to gasoline at a refinery. Moreover, the water provides an additional cooling (due to vaporization) that further increases engine knock resistance. In contrast the present use of ethanol as an additive to gasoline at the refinery requires that the water be removed from the ethanol.

Since unlike gasoline, ethanol is not a good lubricant and the ethanol fuel injector can stick and not open, it is desirable to add a lubricant to the ethanol. The lubricant will also denature the ethanol and make it unattractive for human consumption.

Further decreases in the required ethanol for a given amount of octane enhancement can be achieved with stratification (non-uniform deposition) of the ethanol addition. Direct injection can be used to place the ethanol near the walls of the cylinder where the need for knock reduction is greatest. The direct injection may be used in combination with swirl. This stratification of the ethanol in the engine further reduces the amount of ethanol needed to obtain a given amount of octane enhancement. Because only the ethanol is directly injected and because it is stratified both by the injection process and by thermal centrifugation, the ignition stability issues associated with gasoline direct injection (GDI) can be avoided.

It is preferred that ethanol be added to those regions that make up the end-gas and are prone to auto-ignition. These regions are near the walls of the cylinder. Since the end-gas contains on the order of 25% of the fuel, substantial decrements in the required amounts of ethanol can be achieved by stratifying the ethanol.

In the case of the engine **10** having substantial organized motion (such as swirl), the cooling will result in forces that thermally stratify the discharge (centrifugal separation of the regions at different density due to different temperatures). The effect of ethanol addition is to increase gas density since the temperature is decreased. With swirl the ethanol mixture will automatically move to the zone where the end-gas is, and thus increase the anti-knock effectiveness of the injected ethanol. The swirl motion is not affected much by the compression stroke and thus survives better than tumble-like motion that drives turbulence towards top-dead-center (TDC) and then dissipates. It should be pointed out that relatively modest swirls result in large separating (centrifugal) forces. A 3m/s swirl motion in a 5cm radius cylinder generates accelerations of about $200m/s^2$, or about 20g's.

Fig. 3 illustrates ethanol direct injection and swirl motion for achieving thermal stratification. Ethanol is predominantly on an outside region which is the end-gas region. **Fig. 4** illustrates a possible stratification of the ethanol in an inlet manifold with swirl motion and thermal centrifugation maintaining stratification in the cylinder. In this case of port injection of ethanol, however, the advantage of substantial charge cooling may be lost.

With reference again to **Fig. 2**, the effect of ethanol addition all the way up to 100% ethanol injection is shown. At the point that the engine is 100% direct ethanol injected, there may be issues of engine stability when operating with only stratified ethanol injection that need to be addressed. In the case of stratified operation it may also be advantageous to stratify the injection of gasoline in order to provide a relatively uniform equivalence ratio across the cylinder (and therefore lower concentrations of gasoline in the regions where the ethanol is injected). This situation can be achieved, as indicated in **Fig. 4**, by placing fuel in the region of the inlet manifold that is void of ethanol.

The ethanol used in the invention can either be contained in a separate tank from the gasoline or may be separated from a gasoline/ethanol mixture stored in one tank.

The instantaneous ethanol injection requirement and total ethanol consumption over a drive cycle can be estimated from information about the drive cycle and the increase in torque (and thus increase in compression ratio, engine power density, and capability for downsizing) that is desired. A plot of the amount of operating time spent at various values of torque and

engine speed in FTP and US06 drive cycles can be used. It is necessary to enhance the octane number at each point in the drive cycle where the torque is greater than permitted for knock free operation with gasoline alone. The amount of octane enhancement that is required is determined by the torque level.

A rough illustrative calculation shows that only a small amount of ethanol might be needed over the drive cycle. Assume that it is desired to increase the maximum torque level by a factor of two relative to what is possible without direct injection ethanol octane enhancement. Information about the operating time for the combined FTP and US06 cycles shows that approximately only 10 percent of the time is spent at torque levels above 0.5 maximum torque and less than 1 percent of the time is spent above 0.9 maximum torque. Conservatively assuming that 100 % ethanol addition is needed at maximum torque and that the energy fraction of ethanol addition that is required to prevent knock decreases linearly to zero at 50 percent of maximum torque, the energy fraction provided by ethanol is about 30 percent. During a drive cycle about 20 percent of the total fuel energy is consumed at greater than 50 percent of maximum torque since during the 10 percent of the time that the engine is operated in this regime, the amount of fuel consumed is about twice that which is consumed below 50 percent of maximum torque. The amount of ethanol energy consumed during the drive cycle is thus roughly around 6 percent (30 percent x 0.2) of the total fuel energy.

In this case then, although 100% ethanol addition was needed at the highest value of torque, only 6% addition was needed averaged over the drive cycle. The ethanol is much more effectively used by varying the level of addition according to the needs of the drive cycle. Because of the lower heat of combustion of ethanol, the required amount of ethanol would be about 9% of the weight of the gasoline fuel or about 9% of the volume (since the densities of ethanol and gasoline are comparable). A separate tank with a capacity of about 1.8 gallons would then be required in automobiles with twenty gallon gasoline tanks. The stored ethanol content would be about 9% of that of gasoline by weight, a number not too different from present-day reformulated gasoline. Stratification of the ethanol addition could reduce this amount by more than a factor of two. An on-line ethanol distillation system might alternatively be employed but would entail elimination or reduction of the increase torque and power available from turbocharging.

Because of the relatively small amount of ethanol and present lack of an ethanol fueling infrastructure, it is important that the ethanol vehicle be operable if there is no ethanol on the vehicle. The engine system can be designed such that although the torque and power benefits would be lower when ethanol is not available, the vehicle could still be operable by reducing or eliminating turbocharging capability and/or by increasing spark retard so as to avoid knock. As shown in **Fig. 5**, the fuel management microprocessor system **14** uses ethanol fuel level in the ethanol tank **16** as an input to control the turbocharger **22** (or supercharger or spark retard, not shown). As an example, with on-demand ethanol octane enhancement, a 4-cylinder engine can produce in the range of 280 horsepower with appropriate turbocharging or supercharging but could also be drivable with an engine power of 140 horsepower without the use of ethanol according to the invention.

The impact of a small amount of ethanol upon fuel efficiency through use in a higher efficiency engine can greatly increase the energy value of the ethanol. For example, gasoline consumption could be reduced by 20% due to higher efficiency engine operation from use of a high compression ratio, strongly turbocharged operation and substantial engine downsizing. The energy value of the ethanol, including its value in direct replacement of gasoline (5% of the energy of the gasoline), is thus roughly equal to 25% of the gasoline that would have been used in a less efficient engine without any ethanol. The 5% gasoline equivalent energy value of ethanol has thus been leveraged up to a 25% gasoline equivalent value. Thus, ethanol can cost roughly up to five times that of gasoline on an energy basis and still be economically attractive. The use of ethanol as disclosed herein can be a much greater value use than in other ethanol applications.

Although the above discussion has featured ethanol as an exemplary anti-knock agent, the same approach can be applied to other high octane fuel and fuel additives with high vaporization energies such as methanol (with higher vaporization energy per unit fuel), and other anti-knock agents such as tertiary butyl alcohol, or ethers such as methyl tertiary butyl ether (MTBE), ethyl tertiary butyl ether (ETBE), or tertiary amyl methyl ether (TAME).

It is recognized that modifications and variations of the invention disclosed herein will be apparent to those of ordinary skill in the art and it is intended that all such modifications and variations be included within the scope of the appended claims.

What is claimed is:

CLAIMS

1. A turbocharged or supercharged spark ignition engine system which uses port fuel injection of gasoline from a first source in addition to direct fuel injection of liquid ethanol from a second source comprising:

   a spark ignition engine;

   a turbocharger or supercharger;

   means for port fuel injection of gasoline from the first source;

   means for direct fuel injection of liquid ethanol from the second source;

   wherein during part of the engine operating time, the engine is powered both by gasoline that is port fuel injected and ethanol that is directly injected; and

   a fuel management system which increases the ethanol energy fraction with increasing torque so that it is sufficient to prevent knock

2. The engine system of claim 1 wherein the ethanol is denatured and further wherein during part of the operating time the instantaneous ethanol energy fraction is at least 20% and the engine is operated with a substantially stoichiometric fuel/air ratio

3. The engine system of claims 1 or 2 wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge by the directly injected ethanol combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

4. The engine system of claims 1 or 2 wherein the level of turbocharging or supercharging is reduced or the turbocharging or supercharging is eliminated if there is no ethanol in the second source and where the engine can be operated without knock without the use of ethanol

5. The engine system of claims 1 or 2 wherein the fuel management system controls ethanol use by employing information from a knock detector

6. The engine system of claims 1 or 2 wherein the fuel management system includes a microprocessor that provides open loop control of the fraction of the total engine power that is provided by ethanol

7. The engine system of claims 1 or 2 wherein both a knock detector and the open loop control are used to determine the ethanol fraction required to prevent knock.

8. The engine system of claims1 or 2 wherein spark retard is increased when the amount of ethanol in the second source is low or not available

9. The engine system of claims 1 or 2 wherein the ethanol is mixed with a lubricant

10. The engine system of claims 1 or 2 wherein the ethanol is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder

11. The engine system of claim 10 wherein the non-uniform distribution is obtained by direct injection in combination with charge swirl

12. The engine system of claims 1 or 2 wherein the amount of ethanol used for a given amount of octane enhancement is reduced when it is injected so that it is non uniformly distributed with greater amounts towards the walls of the cylinder

13. The engine system of claims 1 or 2 wherein the ethanol is separated from gasoline on board the vehicle

14. The engine system of claims1 or 2 wherein the fuel management system includes a microporcessor which uses ethanol fuel level in the second source to control the turbocharger or supercharger

15. The engine system of claims 1 or 2 wherein the fuel management system is used to minimize the amount of ethanol required over a drive cycle to prevent knock

16. The engine system of claims 1 or 2 wherein the ethanol is injected in such an amount so as to allow operation of a given engine at at least twice the knock free torque attainable when no ethanol is used

17. The engine system of claim 16 wherein by use of both a knock detector and open loop control the fuel management system limits the required ethanol energy fraction to less than 6 % over a drive cycle

18. The engine system of claims 1 or 2 wherein the maximum horsepower of a given size engine is at least doubled by ethanol octane enhancement

19. The engine system of claims 1 or 2 wherein downsizing and higher compression ratio are used to increase efficiency relative to a larger size engine which uses port fuel injection of gasoline alone and provides the same maximum horsepower

20. The engine system of claim1 wherein the ethanol energy fraction is at least 20 % and the engine is operated with a substantially stoichiometric fuel/air ratio

21. A turbocharged or supercharged spark ignition engine system which uses port fuel injection of gasoline from a first source in addition to direct fuel injection of liquid methanol from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of liquid methanol from the second source;

wherein during part of the engine operating time, the engine is powered both by gasoline that is port fuel injected and methanol that is directly injected; and

a fuel management system which increases the methanol energy fraction with increasing torque so that it is sufficient to prevent knock

22. The engine system of claim 21 wherein during part of the operating time the instantaneous methanol energy fraction is at least 20%.and the engine is operated with a substantially stoichiometric fuel/air ratio

23. The engine system of claim 21 wherein the fuel management system includes a micorprocessor which uses methanol fuel level in the second source to control the turbobocharger or supercharger

24. The engine system of claim 21 wherein the level of turbocharging or supercharging is reduced or the turbocharging or supercharging is eliminated if there is no methanol in the second source and where the engine can be operated without knock without the use of denatured methanol

25. The engine system of claim 21 wherein the fuel management system controls methanol use by employing information from a knock detector

26. The engine system of claim 21 wherein the fuel management system includes a microprocessor that provides open loop control of the fraction of the total engine power that is provided by methanol

27. The engine system of claim 21 wherein both a knock detector and the open loop control are used to determine the methanol fraction required to prevent knock.

28. The engine system of claim 21 wherein spark retard is increased when the amount of methanol in the second source is low or not available

29. The engine system of claim 21 wherein the methanol is mixed with a lubricant

30. The engine system of claim 21 wherein the methanol is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder

31. The engine system of claim 30 wherein the non-uniform distribution is obtained by direct injection in combination with charge swirl

32. The engine system of claim 21 wherein the amount of methanol used for a given amount of octane enhancement is reduced when it is injected so that it is non uniformly distributed with greater amounts towards the walls of the cylinder

33 The engine system of claim 21 wherein the methanol is separated from gasoline on board the vehicle

34. The engine system of claim 21 wherein the level of turbocharging or supercharging is determined by measurement of the amount of methanol in the second source

35. A turbocharged or supercharged, spark ignition engine system which uses fueling of gasoline from a first source in addition to direct fuel injection of liquid ethanol from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling the engine with gasoline from the first source;

means for direct fuel injection of liquid ethanol from the second source;

wherein during part of the engine operating time, the engine is powered both by gasoline that is direct fuel injected and ethanol that is directly injected; and

a fuel management system which increases the ethanol energy fraction with increasing torque so that it is sufficient to prevent knock.

36. The engine system of claim 35 wherein the ethanol is denatured and further wherein during part of the operating time the instantaneous ethanol energy fraction is at least 20%; and the engine is operated with a subsatnailly stoichiometric fuel/air ratio

37. The engine system of claim 36 wherein the the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge by the directly injected ethanol combined with the higher octane of number of the ethanol enhances the octane number by at least 20 octane numbers

38.The engine system of claim 36 wherein the level of turbocharging or supercharging is reduced or the turbocharging or supercharging is eliminated if there is no ethanol in the second source and where the engine can be operated without knock without the use of denatured ethanol

39.The engine system of claim 36 wherein the fuel management system includes a micrpocessor and controls ethanol use by employing information from a knock detector

40. The engine system of claim 36 wherein the fuel management system includes a microprocessor that provides open loop control of the fraction of the total engine power that is provided by ethanol

41. The engine system of claim 36 wherein both a knock detector and the open loop control are used to determine the ethanol fraction required to prevent knock.

42. The engine system of claim 36 wherein spark retard is increased when the amount of ethanol in the second source is low or not available

43.The engine system of claim 36 wherein the ethanol is mixed with a lubricant

44.The engine system of claim 36 wherein the ethanol is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder

45.The engine system of claim 44 wherein the non-uniform distribution is obtained by direct injection in combination with charge swirl

46. The engine system of claim 36 wherein the amount of ethanol used for a given amount of octane enhancement is reduced when it is injected so that it is non uniformly distributed with greater amounts towards the walls of the cylinder

47 The engine system of claim 36 wherein the ethanol is separated from gasoline on board the vehicle

48. The engine system of claim 36 wherein the fuel management system includes a turbocharger which uses ethanol fuel level in the second source to control the truvbocharger or supercharger

49. The engine system of claim 36 wherein the fuel management system is used to minimize the amount of ethanol required over a drive cycle to prevent knock

50.The engine system of claim 36 wherein the ethanol is injected in such an amount so as to allow operation of a given engine at at least twice the knock free torque attainable when no ethanol is used

51. The engine system of claim 50 wherein by use of both knock detector and open loop control the fuel management system limits the required ethanol energy fraction to less than 6 % over a drive cycle

52. The engine system of claim 36 wherein the maximum horsepower of a given size engine is at least doubled by ethanol octance enhancement .

53. The engine system of claim 36 wherein downsizing and higher compression ratio are used to increase efficiency relative to a larger size engine which uses port fuel injection of gasoline alone and provides the same maximum horsepower

54. The engine system of claim 36 wherein the the ethanol energy fraction is at least 20% and the engine is operated with a substantially stocihiometric fuel/air ratio

55. A turbocharged or supercharged spark ignition engine system which uses fuel injection of gasoline from a first source in addition to direct fuel injection of liquid methanol from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling the engine with gasoline from the first source;

means for direct fuel injection of liquid methanol from the second source;

wherein during part of the engine operating time, the engine is powered both by gasoline that is direct fuel injected and methanol that is directly injected; and

a fuel management system which increases the methanol energy fraction with increasing torque so that it is sufficient to prevent knock

56 The engine system of claim 55 wherein during part of the operating time the instantaneous methanol energy fraction is at least 20%;

57. The engine system of claim 56 wherein the turbocharged or supercharged direct injection spark ignition engine is operated with at substantially stoichiometric ratio of the gasoline plus methanol to air

58. The engine system of claim 57 wherein the level of turbocharging or supercharging is reduced or the turbocharging or supercharging is eliminated if there is no methanol in the second source and where the engine can be operated without knock without the use of methanol

59..The engine system of claim 57 wherein the fuel management system includes a microprocessor and controls methanol use by employing information from a knock detector

60. The engine system of claim 57 wherein the fuel management system includes a microprocessor that provides open loop control of the fraction of the total engine power that is provided by methanol

61.The engine system of claim 57 wherein both a knock detector and the open loop control are used to determine the methanol fraction required to prevent knock.

62..The engine system of claim 57 wherein spark retard is increased when the amount of methanol in the second source is low or not available

63. The engine system of claim 57 wherein the methanol is mixed with a lubricant

64.The engine system of claim 57 wherein the methanol is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder

65 .The engine system of claim 64 wherein the non-uniform distribution is obtained by direct injection in combination with charge swirl

66. The engine system of claim 57 wherein the amount of methanol used for a given amount of octane enhancement is reduced when it is injected so that it is non uniformly distributed with greater amounts towards the walls of the cylinder

67.The engine system of claim 57 wherein the methanol is separated from gasoline on board the vehicle

68..The engine system of claim 57 wherein the fuel management system uses methanol fuel level in the second source to control the turbocharger or supercharger

69. The engine system of claim 57 wherein the fuel management system minimizes the methanol required over a drive cycle to prevent knock

70. A turbocharged or supercharged spark igntion engine system which is partly or completely fueled with directly injected mixtures of gasoline with ethanol or methanol and wherein the directly injected fuel is non uniformly distributed with greater amounts towards the walls of the cylinder

71. The engine system of claim 70 wherein the engine has substantial organized motion such as swirl

72. The engine system of claims 70 or 71 wherein the directly injected fuel is injected proximate to the cylinder wall and swirl creates a ring of this fuel

72. The engine system of claims 70 or 71 where the ethanol or methanol energy fraction used for a given level of octane enhancement is reduced from the energy fraction that is required when the directly injected fuel is not non uniformly distributed with greater amounts toward the wall of the cylinder

73. The engine system of claims 70 or 71 where the level of turbocharging or supercharging is determined by the ethanol or methanol energy fraction

Abstract of the Disclosure

Fuel management system for efficient operation of a spark ignition gasoline engine. Injectors inject an anti-knock agent such as ethanol directly into a cylinder of the engine. A fuel management microprocessor system controls injection of the anti-knock agent so as to control knock and minimize that amount of the anti-knock agent that is used in a drive cycle. It is preferred that the anti-knock agent is ethanol. The use of ethanol can be further minimized by injection in a non-uniform manner within a cylinder. The ethanol injection suppresses knock so that higher compression ratio and/or engine downsizing from increased turbocharging or supercharging can be used to increase the efficiency of the engine.

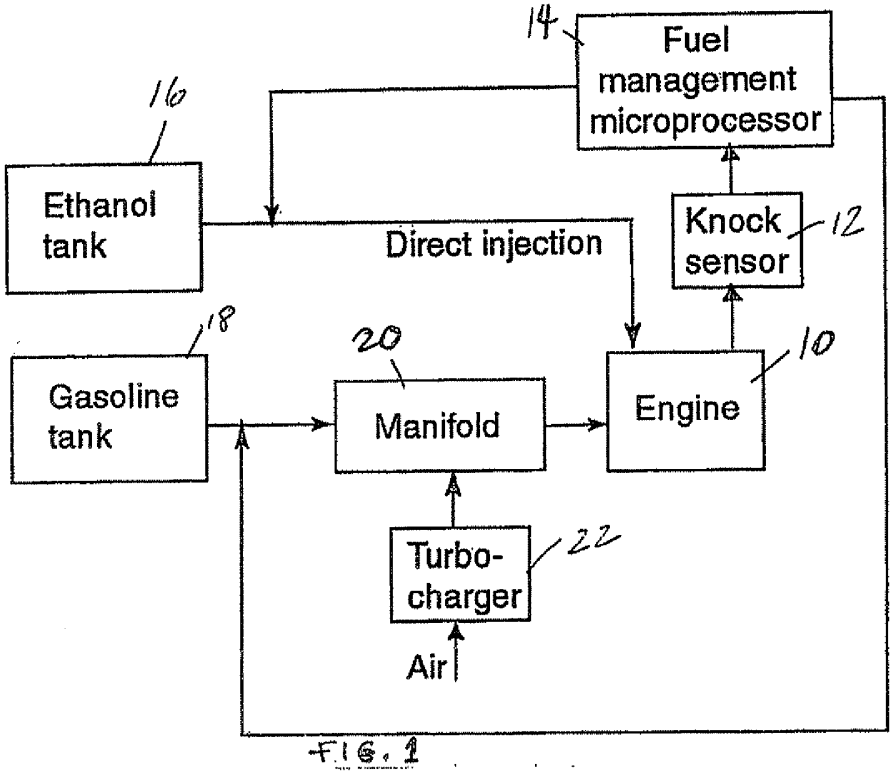
14
Fuel management microprocessor
16
Ethanol tank
Direct injection
Knock sensor
12
18
Gasoline tank
20
Manifold
Engine
10
Turbo-charger
22
Air

FIG. 1

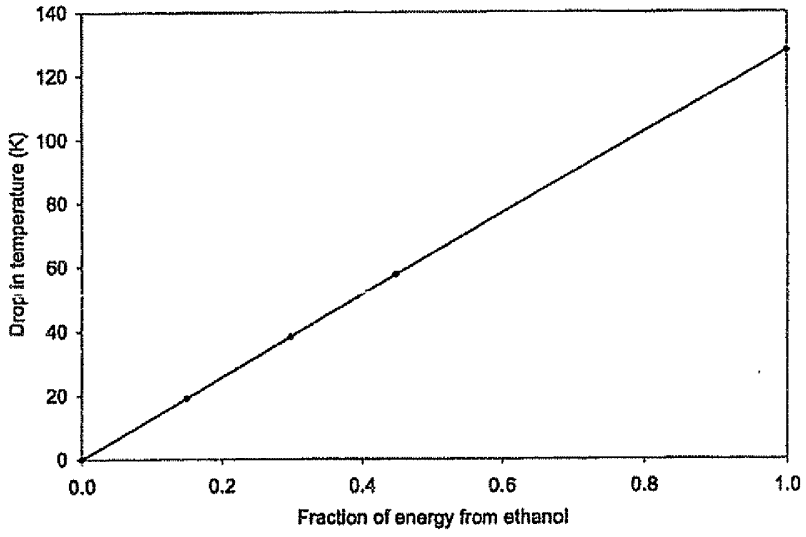
140
120
100
80
60
40
20
0
Drop in temperature (K)
0.0
0.2
0.4
0.6
0.8
1.0
Fraction of energy from ethanol

FIG. 2

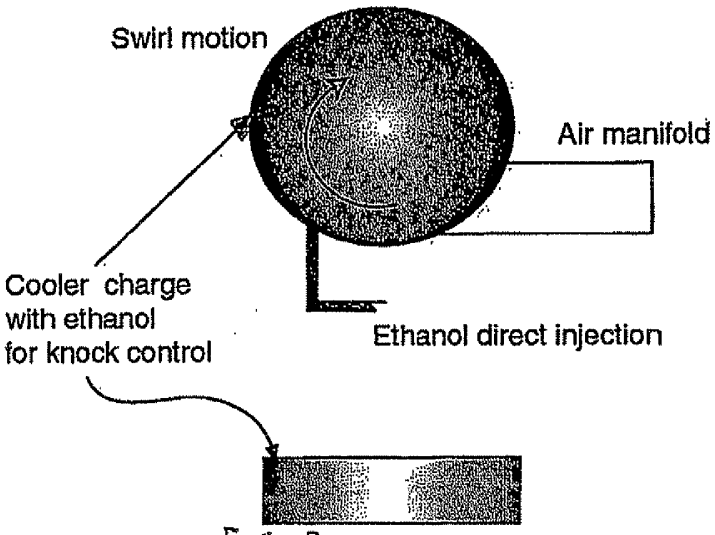
Swirl motion
Air manifold
Cooler charge
with ethanol
for knock control
Ethanol direct injection

FIG. 3

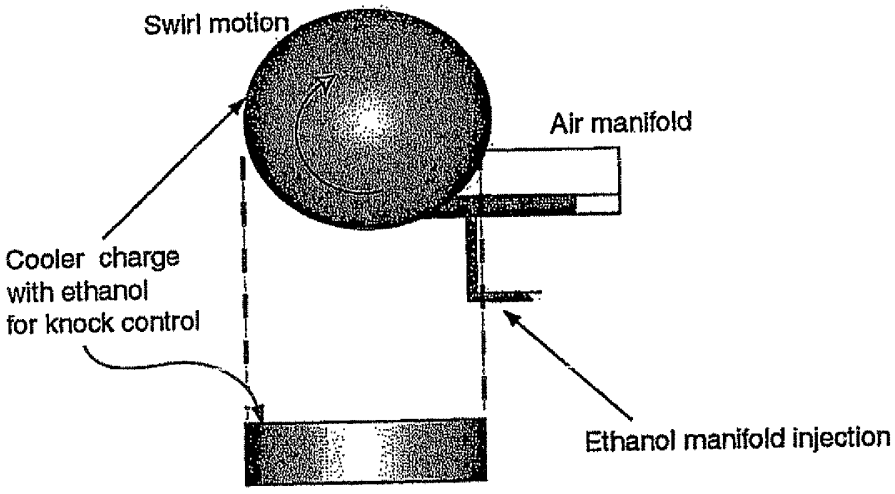
Swirl motion
Air manifold
Cooler charge
with ethanol
for knock control
Ethanol manifold injection

FIG. 4

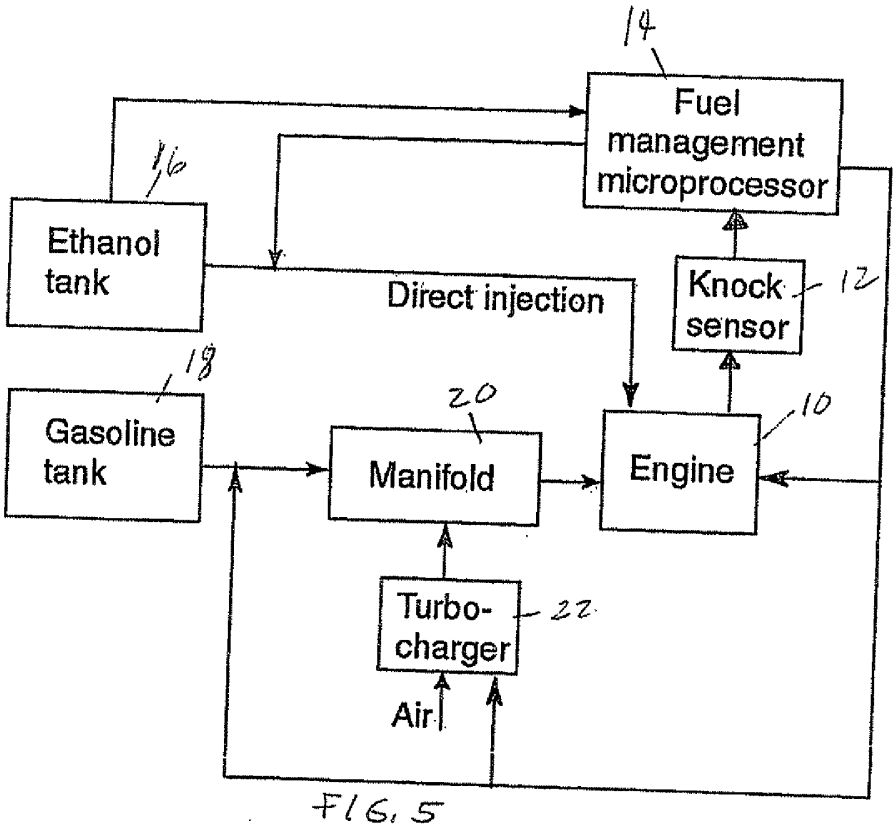
14
Fuel management microprocessor
16
Ethanol tank
Direct injection
Knock sensor
12
18
Gasoline tank
20
Manifold
Engine
10
Turbo-charger
22
Air

FIG. 5

PTO/SB/14 (07-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492611-07XX
	Application Number	
Title of Invention	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1 Remove

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Daniel	R.	Cohn	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Cambridge	State/Province	MA	Country of Residence i	US

Citizenship under 37 CFR 1.41(b) i: US

Mailing Address of Applicant:

Address 1	
Address 2	

City		State/Province	
Postal Code		Country i	

Applicant 2 Remove

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Leslie		Bromberg	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Sharon	State/Province	MA	Country of Residence i	US

Citizenship under 37 CFR 1.41(b) i: US

Mailing Address of Applicant:

Address 1	
Address 2	

City		State/Province	
Postal Code		Country i	

Applicant 3 Remove

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	John		Heywood	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Newtonville	State/Province	MA	Country of Residence i	US

PTO/SB/14 (07-07)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492611-07XX
	Application Number	
Title of Invention	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines	

Citizenship under 37 CFR 1.41(b) [i]	US		
Mailing Address of Applicant:			
Address 1			
Address 2			
City		**State/Province**	
Postal Code		**Country**[i]	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.			Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	24280		
Email Address	bo@choate.com	Add Email	Remove Email

Application Information:

Title of the Invention	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines		
Attorney Docket Number	0492611-07XX	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)		**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)

PTO/SB/14 (07-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492611-07XX
	Application Number	
Title of Invention	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines	

Customer Number	24280

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	10/991774	2004-11-18

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			◉ Yes ○ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove

If the Assignee is an Organization check here. ☒			
Organization Name	Massachusetts Institute of Technology		
Mailing Address Information:			
Address 1	77 Massachusetts Avenue		
Address 2			
City	Cambridge	**State/Province**	MA
Country [i] US		Postal Code	02139
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the **Add** button. Add

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

PTO/SB/14 (07-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492611-07XX
	Application Number	
Title of Invention	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines	

Signature	/SamPasternack/			Date (YYYY-MM-DD)	2007-08-17
First Name	Sam	Last Name	Pasternack	Registration Number	29576

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DECLARATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

the specification of which (I authorize Choate, Hall & Stewart to check one of the following three choices, and fill in the blanks, if applicable):

_____ is attached hereto

__X__ was filed on November 18, 2004 as Application Serial No. 10/991,774 ~~and amended on _____ (if applicable).~~

_____ was filed as PCT international application No. _____, on _____ and was amended under PCT Article 19 on_____ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledged the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):		Priority Claimed		
(Number)	(Country)	(Day/Month/Year/Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year/Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(filing date)	(status-patented, pending, abandoned)
(Application Serial No.)	(filing date)	(status-patented, pending, abandoned)

PCT Applications designating the United States:

(PCT Appl. No.)	(U.S.S.N.)	(status-patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national filing date of this application.

Provisional Application(s):

(Application Serial No.)	(filing date)	(status)
(Application Serial No.)	(filing date)	(status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United State Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Full name of first inventor Daniel R. Cohn

Inventor's signature Daniel R. Cohn Date: 2/7/05

Residence 26 Walnut St Chestnut Hill MA 02467

Citizenship

Post Office Address Technology Licensing Office, Massachusetts Institute of Technology, Five Cambridge Center, Kendall Square, Room NE25-230, Cambridge, MA 02142-1493

Full name of second inventor Leslie Bromberg

Inventor's signature Leslie Bromberg Date: 2/7/05

Residence 176 Wilshire Dr Sharon MA 02067

Citizenship US

Post Office Address Technology Licensing Office, Massachusetts Institute of Technology, Five Cambridge Center, Kendall Square, Room NE25-230, Cambridge, MA 02142-1493

Full name of third inventor John B. Heywood

Inventor's signature John B Heywood Date: 2/7/05

Residence 248 Mill Street, Newton MA 02460

Citizenship USA.

Post Office Address Technology Licensing Office, Massachusetts Institute of Technology, Five Cambridge Center, Kendall Square, Room NE25-230, Cambridge, MA 02142-1493

Electronic Acknowledgement Receipt	
EFS ID:	2097666
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Elizabeth Burke
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-07XX
Receipt Date:	17-AUG-2007
Filing Date:	
Time Stamp:	16:38:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		MIT11381CONSpec.pdf	145769 21cc789e50627ef4eb49245642123df7e892bf2d	yes	21

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	10	
	Claims		11	20	
	Abstract		21	21	
Warnings:					
Information:					
2	Drawings	MIT11381CONFigures.pdf	111155 636e6909d3b067463fa5eb3ae2ff30f5efb00b90	no	3
Warnings:					
Information:					
3	Application Data Sheet	MIT11381CONADS.pdf	1187093 4a89aa3b130a8ec0d4dbe6652efb19a8ce0b7939	no	5
Warnings:					
Information:					
4	Oath or Declaration filed	MIT11381CONDeclaration.pdf	122295 8cadc0e7860000df3f7e65c04f6a2634d6a9dee0	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	1566312		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

8/17/07

PTO/SB/06 (12-04)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

11/840,719

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)		OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))				75			
SEARCH FEE (37 CFR 1.16(k), (i), or (m))				250			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))				100			
TOTAL CLAIMS (37 CFR 1.16(i))	94 minus 20 =	74	X 25=	1850	OR	X 50=	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 =	2	X 100=	200		X 200=	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A	180		N/A	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	2655		TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDI-TIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDI-TIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDI-TIONAL FEE ($)	OR	RATE ($)	ADDI-TIONAL FEE ($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
11/840,719	08/17/2007	1714	0.00	0492611-07XX	74	5

CONFIRMATION NO. 1817

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA02110

FILING RECEIPT

Date Mailed: 08/28/2007

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;

Assignment For Published Patent Application

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 10/991,774 11/18/2004

Foreign Applications

If Required, Foreign Filing License Granted: 08/27/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/840,719**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

** SMALL ENTITY **

Title

Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

Preliminary Class

044

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/840,719	08/17/2007	Daniel R. Cohn	0492611-07XX

CONFIRMATION NO. 1817

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

FORMALITIES LETTER

Date Mailed: 08/28/2007

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  Applicant must submit $ **75** *to complete the basic filing fee for a small entity.*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **$2230** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee, or oath or declaration) as set forth in 37 CFR 1.16(f) of $65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **$2720** for a small entity

- **$75** Statutory basic filing fee.
- **$65** Surcharge.

- The application search fee has not been paid. Applicant must submit **$250** to complete the search fee.
- The application examination fee has not been paid. Applicant must submit **$100** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.

- Total additional claim fee(s) for this application is **$2230**
  - **$200** for **2** independent claims over 3.
  - **$1850** for **74** total claims over 20.
  - **$180** for multiple dependent claim surcharge.

Replies should be mailed to: Mail Stop Missing Parts
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Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
PART 3 - OFFICE COPY

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn, et al.	Examiner:	Not Yet Assigned
Serial No.:	11/840,719	Art Unit:	1714
Filed:	August 17, 2007	Customer Number:	24280

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

PRELIMINARY AMENDMENT

Please preliminarily amend the above identified application as follows.

Listing of Claims

Claims 1-73 (cancelled).

74. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio.

75. (New). The engine system of claim 74 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

76. (New). The engine of claim 75 where the liquid contained in the second source is an alcohol.

77. (New). The engine system of claim 74 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine and uses both closed loop control with a knock detector and open loop control with a look up table and;

where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

78. (New). The engine system of claim 77 where the anti-knock agent is an alcohol and is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

79. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

80. (New). The engine system of claim 79 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

81. (New). The engine system of claim 80 wherein the anti-knock agent is ethanol and is directly injected in such an amount so as to allow operation of a given engine at least twice the knock free torque attainable when no directly injected ethanol is used; and

where during some of the operating time the ethanol energy fraction is at least 20 % and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

82. (New). The engine system of claim 81 where the fuel management system limits the required ethanol energy fraction needed to prevent knock to less than 6% over a drive cycle; and

where the fuel management system uses both closed loop control which employs a knock detector and open loop control and a look up table.

83. (New). The engine system of claim 79 where the anti-knock agent is ethanol and is separated from an ethanol–gasoline mixture on board the vehicle.

84. (New). The engine system of claim 79 where the anti-knock agent is methanol.

85. (New). The engine system of claim 79 where the second source contains a mixture of alcohol and water.

86. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and alcohol that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein the turbocharging or supercharging is reduced or eliminated as a function of the amount of anti-knock agent in the second source.

87. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling the engine with gasoline from the first source;

means for direct fuel injection of the liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline and by the anti-knock agent that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

88. (New). The engine system of claim 87 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of gasoline.

89. (New). The engine system of claim 87 where the anti-knock agent is an alcohol and where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine fraction and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of alcohol that is used over a drive cycle.

90. (New). The engine system of claim 87 wherein the directly injected anti-knock agent is an alcohol which is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder and
where the alcohol energy fraction is sufficiently high to prevent knock and resulting in the alcohol energy fraction being reduced as compared to the situation using a uniform distribution.

91. (New). The engine system of claim 87 wherein the anti-knock agent is ethanol and is directly injected during some of the operating time the ethanol energy fraction is at least 20 %; and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

92. (New). The engine system of claim 87 where the anti-knock agent is ethanol and the ethanol is separated from a gasoline-ethanol mixture onboard the vehicle.

93. (New). The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and a lubricant.

94. (New). The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and water.

95. (New). A turbocharged or supercharged spark ignition engine system which uses fueling with gasoline from a first source in addition to direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling with gasoline from the first source;

means for direct fuel injection of liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline from the first source and by liquid anti-knock agent that is directly injected from the second source;

and a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and where the fuel management system controls the amount of anti-knock agent that is employed using closed loop control which utilizes a knock detector; and

wherein the turbocharging or supercharging is reduced or eliminated depending upon the amount of anti-knock agent in the second source.

96. (New). The engine system of claim 95 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent that is used in the engine and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

97. (New). The engine system of claim 95 where the turbocharging or supercharging is reduced or eliminated when the anti-knock agent is not available from the second source and the engine can be operated during a drive cycle without knock when there is no anti-knock agent available from the second source.

98. (New). The engine system of claim 97 where spark retard is also employed when the anti-knock agent from the second source is not available.

REMARKS

Claims 1-73 are cancelled herein. New claims 74-98 are being added to more particularly point out and distinctly claim the invention.

Respectfully submitted,

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

Date: November 2, 2007

Patent Department
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Boston, MA 02109-2804
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Fax: (617) 248-4000

Electronic Acknowledgement Receipt

EFS ID:	2418740
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Elisabeth Dunkle
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-07XX
Receipt Date:	02-NOV-2007
Filing Date:	17-AUG-2007
Time Stamp:	14:58:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	04962611_0806_preliminamend.pdf	367731 99d2abd9f0681363581a406dda41e29462de1869	no	8
Warnings:					

Information:	
Total Files Size (in bytes):	367731

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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn, et al.	Examiner:	Not Yet Assigned
Serial No.:	11/840,719	Art Unit:	1714
Filed:	August 17, 2007	Customer Number:	24280

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

PRELIMINARY AMENDMENT

Please preliminarily amend the above identified application as follows.

Listing of Claims

Claims 1-73 (cancelled).

74. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio.

75. (New). The engine system of claim 74 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

76. (New). The engine of claim 75 where the liquid contained in the second source is an alcohol.

77. (New). The engine system of claim 74 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine and uses both closed loop control with a knock detector and open loop control with a look up table and;

where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

78. (New). The engine system of claim 77 where the anti-knock agent is an alcohol and is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

79. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

80. (New). The engine system of claim 79 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

81. (New). The engine system of claim 80 wherein the anti-knock agent is ethanol and is directly injected in such an amount so as to allow operation of a given engine at least twice the knock free torque attainable when no directly injected ethanol is used; and

where during some of the operating time the ethanol energy fraction is at least 20 % and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

82. (New). The engine system of claim 81 where the fuel management system limits the required ethanol energy fraction needed to prevent knock to less than 6% over a drive cycle; and

where the fuel management system uses both closed loop control which employs a knock detector and open loop control and a look up table.

83. (New). The engine system of claim 79 where the anti-knock agent is ethanol and is separated from an ethanol–gasoline mixture on board the vehicle.

84. (New). The engine system of claim 79 where the anti-knock agent is methanol.

85. (New). The engine system of claim 79 where the second source contains a mixture of alcohol and water.

86. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and alcohol that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein the turbocharging or supercharging is reduced or eliminated as a function of the amount of anti-knock agent in the second source.

87. (New). A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling the engine with gasoline from the first source;

means for direct fuel injection of the liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline and by the anti-knock agent that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

88. (New). The engine system of claim 87 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of gasoline.

89. (New). The engine system of claim 87 where the anti-knock agent is an alcohol and where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine fraction and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of alcohol that is used over a drive cycle.

90. (New). The engine system of claim 87 wherein the directly injected anti-knock agent is an alcohol which is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder and
where the alcohol energy fraction is sufficiently high to prevent knock and resulting in the alcohol energy fraction being reduced as compared to the situation using a uniform distribution.

91. (New). The engine system of claim 87 wherein the anti-knock agent is ethanol and is directly injected during some of the operating time the ethanol energy fraction is at least 20 %; and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

92. (New). The engine system of claim 87 where the anti-knock agent is ethanol and the ethanol is separated from a gasoline-ethanol mixture onboard the vehicle.

93. (New). The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and a lubricant.

94. (New). The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and water.

95. (New). A turbocharged or supercharged spark ignition engine system which uses fueling with gasoline from a first source in addition to direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling with gasoline from the first source;

means for direct fuel injection of liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline from the first source and by liquid anti-knock agent that is directly injected from the second source;

and a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and where the fuel management system controls the amount of anti-knock agent that is employed using closed loop control which utilizes a knock detector; and

wherein the turbocharging or supercharging is reduced or eliminated depending upon the amount of anti-knock agent in the second source.

96. (New). The engine system of claim 95 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent that is used in the engine and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

97. (New). The engine system of claim 95 where the turbocharging or supercharging is reduced or eliminated when the anti-knock agent is not available from the second source and the engine can be operated during a drive cycle without knock when there is no anti-knock agent available from the second source.

98. (New). The engine system of claim 97 where spark retard is also employed when the anti-knock agent from the second source is not available.

REMARKS

Claims 1-73 are cancelled herein. New claims 74-98 are being added to more particularly point out and distinctly claim the invention.

Respectfully submitted,

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

Date: November 2, 2007

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PTO/SB/22 (11-07)
Approved for use through 11/30/2007. OMB 0651-0031
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2008** *(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)*	Docket Number (Optional) 0492611-0806
Application Number 11/840,719	Filed August 17, 2007
For Fuel Enhancement System for Variable Ethanol Octane Enhancement of Gasoline Engines	
Art Unit 1714	Examiner Not Yet Assigned

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$120	$60	$ 60.00
☐ Two months (37 CFR 1.17(a)(2))	$460	$230	$
☐ Three months (37 CFR 1.17(a)(3))	$1050	$525	$
☐ Four months (37 CFR 1.17(a)(4))	$1640	$820	$
☐ Five months (37 CFR 1.17(a)(5))	$2230	$1115	$

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 03-1721. I have enclosed a duplicate copy of this sheet.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 29,576

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/SamPasternack/ — Signature
November 28, 2007 — Date

Sam Pasternack — Typed or printed name
617-248-5000 — Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ATTORNEY'S DOCKET NUMBER: 04926111-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	D. Cohn et al.	Examiner:	Not Yet Assigned
Serial No.:	11/840,719	Art Unit:	1714
Filed:	August 17, 2007	Confirmation No.:	1817
For:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

Mail Stop Missing Parts
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE TO NOTICE TO FILE MISSING PARTS

In response to the Notice to File Missing Parts in the above-referenced application dated August 28, 2007, attached herewith is the following:

1. Payment in the amount of $895.00 via electronic credit card authorization for payment of the late submission fee, extension of time, and claims;
2. Copy of Preliminary Amendment filed November 2, 2007; and
3. Request for Extension of Time (One Month).

As this Response is electronically-filed, a copy of the Notice to File Missing Parts is not attached. Please charge any additional fees associated with this filing, or apply any credits, to our Deposit Account No. 03-1721.

Respectfully submitted,

/SamPasternack/
Sam Pasternack
Registration Number 29,576

CHOATE, HALL & STEWART LLP
Two International Place
Boston, MA 02110
(617) 248-5000
Dated: November 28, 2007

Docket No. 0492611-0806

4275648v1

Electronic Patent Application Fee Transmittal

Application Number:	11840719
Filing Date:	17-Aug-2007
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Filer:	Sam Pasternack/Elisabeth Dunkle
Attorney Docket Number:	0492611-07XX

Filed as Small Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	75	75
Utility Search Fee	2111	1	255	255
Utility Examination Fee	2311	1	105	105
Pages:				
Claims:				
Claims in excess of 20	2202	5	25	125
Independent claims in excess of 3	2201	2	105	210
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Late filing fee for oath or declaration	2051	1	65	65
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with $0 paid	2251	1	60	60
Miscellaneous:				
		Total in USD ($)		**895**

Electronic Acknowledgement Receipt

EFS ID:	2519081
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Elisabeth Dunkle
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-07XX
Receipt Date:	28-NOV-2007
Filing Date:	17-AUG-2007
Time Stamp:	15:13:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$895
RAM confirmation Number	545
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)

1	Applicant Response to Pre-Exam Formalities Notice	04962611_0806_prelimamend.pdf	367731 99d2abd9f0681363581a406dda41e29462de1869	no	8
Warnings:					
Information:					
2	Extension of Time	Ext.pdf	196184 8028a2e295552da7782f760426f9d24658ae0f0a	no	2
Warnings:					
Information:					
3	Applicant Response to Pre-Exam Formalities Notice	ResMP.pdf	55760 08d7cb07f7b16ff1a9b10705ac37c727adf66ee1	no	2
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8919 016f88ff874b5f9267ca938cf45960a0536031ca	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	628594	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
11/840,719	08/17/2007	1714	835	0492611-0806	25	5

CONFIRMATION NO. 1817

UPDATED FILING RECEIPT

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

OC000000027006439

Date Mailed: 12/03/2007

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;

Assignment For Published Patent Application

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 10/991,774 11/18/2004

Foreign Applications

If Required, Foreign Filing License Granted: 08/27/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 11/840,719**

Projected Publication Date: 03/13/2008

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

Preliminary Class

044

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/840,719	08/17/2007	Daniel R. Cohn	0492611-0806

CONFIRMATION NO. 1817

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA02110

Title: Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

Publication No. US-2008-0060612-A1
Publication Date: 03/13/2008

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Pre-Grant Publication Division, 703-605-4283

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	0492611-0806	1817

24280 7590 07/11/2008

CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

EXAMINER	
ALI, HYDER	

ART UNIT	PAPER NUMBER
3747	

NOTIFICATION DATE	DELIVERY MODE
07/11/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@choate.com

Office Action Summary	Application No.	Applicant(s)	
	11/840,719	COHN ET AL.	
	Examiner	Art Unit	
	HYDER ALI	3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *74-98* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *79-85 and 87-94* is/are allowed.

6)☒ Claim(s) *74-78,86 and 95-98* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 August 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Preliminary Amendment

Claims 74-98 are in the application.

Claims 1-73 been cancelled. See applicant arguments/remarks filed 11/28/2007.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 74-78, 86, 95-98 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4 of U.S. Patent No. 7,314,033. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between claims 74-78, 86, 97-98 and Patent No. 7,314,033 is that fuel from the second source is a liquid anti-knock agent in

lieu of ethanol. It is the view of the Examiner that ethanol that is a fuel is art recognized equivalent of liquid anti-knock agent that is a fuel.

Claims 74-78, 86, 95-98 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 7,225,787. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between claims 74-78, 86, 97-98 and claims 2-4 of Patent No. 7,225,787 is that fuel from the second source is a liquid anti-knock agent in lieu of ethanol. It is the view of the Examiner that ethanol that is a fuel is art recognized equivalent of liquid anti-knock agent that is a fuel. Further Patent No. 7,225,787 has fuel management system including a microprocessor that would have reduced engine timing in response to knocking.

Claims 74-78, 86, 95-98 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 117 of copending Application No. 11/229,755. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between claims 74-78, 86, 97-98 and claim 117 of copending Application No. 11/229,755 is that fuel from the second source is a liquid anti-knock agent in lieu of ethanol. It is the view of the Examiner that ethanol that is a fuel is art recognized equivalent of liquid anti-knock agent that is a fuel. Further claim 117 of copending Application No. 11/229,755 has fuel management system including a microprocessor that would have reduced engine timing in response to knocking.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

Claims 79-85 and 87-94 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HYDER ALI whose telephone number is (571)272-4836. The examiner can normally be reached on M-F (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Kirk Cronin can be reached on (571) 272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HYDER ALI/
Examiner, Art Unit 3747

/Stephen K. Cronin/
Supervisory Patent Examiner, Art Unit 3747

Notice of References Cited	Application/Control No. 11/840,719	Applicant(s)/Patent Under Reexamination COHN ET AL.	
	Examiner HYDER ALI	Art Unit 3747	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2006/0102146	05-2006	Cohn et al.	123/406.29
*	B	US-7,314,033	01-2008	Cohn et al.	123/198A
*	C	US-7,225,787	06-2007	Bromberg et al.	123/198A
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11840719	COHN ET AL.
	Examiner	Art Unit
	HYDER ALI	3747

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/01/2008								
	1	-								
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11840719	COHN ET AL.
	Examiner	Art Unit
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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CLAIM		DATE								
Final	Original	07/01/2008								
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	74	✓								
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	76	✓								
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11840719	COHN ET AL.
	Examiner	Art Unit
	HYDER ALI	3747

SEARCHED			
Class	Subclass	Date	Examiner
123	198A, 406.29, 406.47, 435, 559.1, 25C, 350, 406.24	7/1/08	HA

SEARCH NOTES		
Search Notes	Date	Examiner
east search history printout	7/1/08	ha

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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BIB DATA SHEET

CONFIRMATION NO. 1817

SERIAL NUMBER	FILING or 371(c) DATE / RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/840,719	08/17/2007	~~044~~ 123	3747	0492611-0806

APPLICANTS

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;

**** CONTINUING DATA ***************************

This application is a CON of 10/991,774 11/18/2004 PAT 7,314,033

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **

08/27/2007

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/HYDER ALI/ Examiner's Signature	☐ ha Initials	MA	3	25	5

ADDRESS

CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110
UNITED STATES

TITLE

Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

FILING FEE RECEIVED		
835	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	72	gasoline and port adj fuel adj injection and knock adj (sensor or detector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/01 16:43

7/1/2008 4:44:32 PM

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn — Confirmation No.: 1817
U.S. App. No.: 11/840,719 — Art Unit: 3747
Filing Date: August 17, 2007 — Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT (IDS)

Dear Madam:

Pursuant to 37 CFR § 1.56, § 1.97 and § 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08 form. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

CERTIFICATION STATEMENT

This Information Disclosure Statement (IDS) is filed in compliance with the following Rule(s), as far as is known to the undersigned:

37 CFR § 1.97 (c)(2) , i.e. before a final action or notice of allowance, and wherein the fee as set forth in § 1.17(p) is included with this IDS.

Copies of any cited foreign patent or non-patent literature documents not previously provided to the USPTO are enclosed herewith. Copies of non-patent literature documents numbered 1-5 were previously submitted to the USPTO in an IDS for application number 10/991,774, which is relied on for an earlier effective filing date under 35 U.S.C. § 120.

Additionally, the Applicant brings to the attention of the Examiner co-pending U.S. patent applications: App. No. 10/991,774 now issued as patent No. 7,314,033; App. No. 11/100,026 now issued as patent No. 7,225,787; App. No. 11/229,755 now issued as patent No. 7,444,987; App. No. 11/758,157; App. No. 11/871,384; and App. No. 12/020,285. Applicant also brings to the attention of the Examiner co-pending U.S. patent applications: App. No. 11/682,372; App. No. 11/782,050; App. No. 11/683,564; App. No. 11/684,100; and App. No. 12/167,534. Prosecution of these applications may have bearing on the above-identified application.

In accordance with 37 CFR § 1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR § 1.56(a) exists. In accordance with 37 CFR § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that any patent, publication or other information referred to therein is "prior art" for this invention unless specifically designated as such.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR § 1.98, and the Examiner is respectfully requested to consider the listed references. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 03-1721.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: November 25, 2008

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

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PTO/SB/08a (08-08)
Approved for use through 08/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	4	4031864		1977-06-28	Crothers, William T.	
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	7	4312310		1982-01-26	Chivilo' et al.	
	8	4402296		1983-09-06	Schwarz, Walter J.	

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	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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	First Named Inventor	Daniel R. Cohn
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	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

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	Attorney Docket Number	0492611-0806

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	A. MODAK and L.S. CARLETTO, "Engine Cooling by Direct Injection of Cooling Water," Society of Automotive Engineers, Inc., 700887.	☐
	2	JULIAN A. LoRUSSO and HARRY A. CIKANEK, "Direct Injection Ignition Assisted Alcohol Engine," Society of Automotive Engineers, Inc., 880495, International Contress and Exposition in Detroit, Michigan (February 29-March 5, 1998).	☐
	3	BORJE GRANDIN, et al., "Knock Suppression in a Turbocharged SI Engine by Using Cooled EGR," Society of Automotive Engineers, Inc., 982476, International Fall Fuels and Lubricants Meeting and Exposition in San Francisco, California (October 19-22, 1998).	☐
	4	BORJE GRANDIN and HANS-ERIK ANGSTROM, "Replacing Fuel Enrichment in a Turbo Charged SI Engine: Lean Burn or Cooled EGR," Society of Automotive Engineers, Inc., 1999-01-3505.	☐
	5	C. STAN, et al., "Internal Mixture Formation and Combustion - from Gasoline to Ethanol," Society of Automotive Engineers, Inc., 2001-01-1207.	☐
	6	USPTO Non-Final Office Action, Application No. 10/991,774, April 25, 2006.	☐
	7	USPTO Final Office Action, Application No. 10/991,774, September 27, 2006.	☐
	8	USPTO Non-Final Office Action, Application No. 10/991,774, May 25, 2007.	☐

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	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

	9	USPTO Non-Final Office Action, Application No. 11/100,026, August 3, 2006.	☐
	10	FIKRET YUKSEL and BEDRI YUKSEL, "The Use of Ethanol-Gasoline Blend as a Fuel in an SI Engine," Renewable Energy, Vol. 29 (2004) pp. 1181-1191.	☐
	11	USPTO Non-Final Office Action, Application No. 11/229,755, March 22, 2007.	☐
	12	USPTO Non-Final Office Action, Application No. 11/229,755, October 4, 2007.	☐
	13	USPTO Non-Final Office Action, Application No. 11/682,372, January 2, 2008.	☐
	14	USPTO Final Office Action, Application No. 11/682,372, October 17, 2008.	☐
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	16	PCT International Search Report and Written Opinion, Application No. PCT/IB07/03004, July 9, 2008.	☐
	17	PCT International Search Report and Written Opinion, Application No. PCT/US07/05777, March 24, 2008.	☐
	18	PCT International Search Report and Written Opinion, Application No. PCT/US07/74227, February 25, 2008.	☐
	19	PCT International Search Report and Written Opinion, Application No. PCT/US08/69171, October 3, 2008.	☐

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	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

If you wish to add additional non-patent literature document citation information please click the Add button	Add		
EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Sam Pasternack/	Date (YYYY-MM-DD)	2008-11-25
Name/Print	Sam Pasternack	Registration Number	29,576

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal	
Application Number:	11840719
Filing Date:	17-Aug-2007
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Filer:	Sam Pasternack/Marilyn Murphy
Attorney Docket Number:	0492611-0806
Filed as Small Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 2 months with $0 paid	2252	1	245	245

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**425**

Electronic Acknowledgement Receipt	
EFS ID:	4351439
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Marilyn Murphy
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-0806
Receipt Date:	25-NOV-2008
Filing Date:	17-AUG-2007
Time Stamp:	16:27:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$425
RAM confirmation Number	2265
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		RNFOA_0492611_0806.pdf	113865 d8678e3954fa44f63ea9ce39a29783833030a2f5	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment Copy Claims/Response to Suggested Claims		1	1	
	Applicant Arguments/Remarks Made in an Amendment		2	3	
Warnings:					
Information:					
2	Extension of Time	Petition_For_Extension_of_Time_0492611_0806.pdf	196613 e80acfc32a91ed62a3aa2ca70b969189ea1ec744	no	2
Warnings:					
Information:					
3	Terminal Disclaimer Filed	TD_0492611_0806.pdf	100424 49d9acda7a2f0f5b1d77f80b6f068961f196cdca	no	3
Warnings:					
Information:					
4	Information Disclosure Statement Letter	IDS_ltr_0492611_0806.pdf	78970 5ed1c1beda28524429887fc0f2085009043bc20c	no	2
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Filed (SB/08)	US_IDS_Form_SB_08a.pdf	2462701 6b69eae7a425a97041be0846fc686f2d6bc87a44	no	10
Warnings:					
Information:					
6	NPL Documents	OA_10991774_060425.pdf	367712 51e0a8dc46d919b7c3b420c17a76c9ef173ca8fc	no	10
Warnings:					
Information:					
7	NPL Documents	OA_10991774_060927.pdf	473418 bd9e9295b2cd925a9406d5615bf395539a6ba033	no	13
Warnings:					
Information:					
8	NPL Documents	OA_10991774_070525.pdf	200037 7a2a799afed5b316178446bafbc30c6bd15ca5c6	no	5

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Information:					
9	NPL Documents	OA_11100026_060803.pdf	255018 377cc950f21e2da320406c81bd008e69e2dca25e	no	7
Warnings:					
Information:					
10	NPL Documents	Yuksel_Renewable_Energy_2004.pdf	611425 571f176c622655fa28370c3f542143cce34d634d	no	9
Warnings:					
Information:					
11	NPL Documents	OA_11229755_070322.pdf	195371 42f650eaf513de40593d559c035aa5c7134ff2bc	no	5
Warnings:					
Information:					
12	NPL Documents	OA_11229755_071004.pdf	160109 e524417f7cb4ef20dd17a5e255a4606125dc2b54	no	4
Warnings:					
Information:					
13	NPL Documents	OA_11682372_080102.pdf	224282 22b91e17f637a0852a3c71df458fc11d3d681d15	no	6
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Information:					
14	NPL Documents	OA_11682372_081017.pdf	224290 a43b3f989531ed41309ab0b8786956867e012b25	no	7
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Information:					
15	NPL Documents	OA_11684100_080603.pdf	173736 77770bea940bccb062e999c50c5619b3b37ea294	no	5
Warnings:					
Information:					
16	NPL Documents	ISR_WO_PCTIB0703004.pdf	679100 16908fda10dae50c49e01269a4a5b48360c842cd	no	10
Warnings:					
Information:					
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Warnings:					
Information:					
18	NPL Documents	ISR_WO_PCTUS0774227.pdf	426322 b525a57242d868818b39c28e98568ffb2b3dea003	no	6
Warnings:					
Information:					
19	NPL Documents	ISR_WO_PCTUS0869171.pdf	923993 3ae57dd406fadef0dacd64932deba474b30b52c3	no	11
Warnings:					
Information:					
20	Fee Worksheet (PTO-06)	fee-info.pdf	32002 861682fe2b931e537a5fb3be78c060ce5c5ade6e	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	8818968	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 C.F.R. § 1.111

Applicant hereby submits the following Response ("this Response") to the Non-Final Office Action mailed July 11, 2008. Applicant respectfully requests consideration and entry of this Response.

Applicant additionally submits a two (2) month Petition for Extension of Time, and accompanying Petition fee under 37 CFR § 1.17(a)(2). Applicant believes no additional fees are due with this Response, but if Applicant is in error any fees due may be charged to deposit account 03-1721.

Contents:

Remarks . . . . . page 2.

REMARKS

Status of the Claims

Claims **74-98** were pending in the application. In the Office Action, claims 79-85 and 87-94 were indicated as allowed. Claims 74-78, 86 and 95-98 were rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claims 1-4 of U.S. Patent No. 7,314,033 to Cohn *et al*. and claims 1-9 of U.S. Patent No. 7,225,787 to Bromberg *et al*. Claims 74-78, 86 and 95-98 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claim 117 of copending Application No. 11/229,755 to Cohn *et al*. Applicant makes no amendments to the claims with this Response. Upon entry of this Response, claims **74-98** will be presented for examination.

Double Patenting Rejections: Claims 74-78, 86 and 95-98

In the Office Action, claims 74-78, 86 and 95-98 were rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claims 1-4 of U.S. Patent No. 7,314,033 to Cohn *et al*. and claims 1-9 of U.S. Patent No. 7,225,787 to Bromberg *et al*. Applicant submits herewith a Terminal Disclaimer which overcomes these obviousness-type double patenting rejections.

In the Office Action, claims 74-78, 86 and 95-98 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claim 117 of copending application No. 11/229,755 to Cohn *et al*. Applicant notes that application No. 11/229,755 has recently issued as U.S. patent No. 7,444,987. Applicant submits herewith a Terminal Disclaimer which overcomes these obviousness-type double patenting rejections.

CONCLUSION

In view of the above, Applicant submits that presently pending claims **74-98** are in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: November 25, 2008

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

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patentdocket@choate.com

PTO/SB/23 (10-08)
Approved for use through 11/30/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(b)	Docket Number (Optional) 0492611-0806

In re Application of Daniel R. Cohn	
Application Number 11/840,719	Filed 17 August 2007
For Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines	
Art Unit 3747	Examiner Ali, Hyder

This is a request for an extension of time of two (2) months (days), (weeks), (months) under 37 CFR 1.136(b) in this pending application. An extension of time is not available in this application under the provisions of 37 CFR 1.136(a); however, additional time to respond may still be granted under the patent statute. The petition fee under 37 CFR 1.17(g) is required. The reasons for requesting the extension of time are the following:

A two-month extension of time from October 11, 2008, up to and including December 11, 2008, is hereby respectfully requested to respond to the Non Final Office Action mailed July 11, 2008. The extension fee of $245.00 under 37 C.F.R. §1.17(a)(2) for a small entity is being paid via the U.S. Patent and Trademark Office's Electronic Filing System's credit card payment option. Applicant thus submits that the present Response is timely submitted on Tuesday, November 25, 2008.

/SamPasternack/	November 25, 2008
Signature	Date
Sam Pasternack	29,576
Typed or printed name	Registration Number
	(617) 248-5000
Title	Telephone Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ATTORNEY DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

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Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

TERMINAL DISCLAIMER

I, Sam Pasternack, represent that I am an attorney and am empowered to act on behalf of Massachusetts Institute of Technology.

Massachusetts Institute of Technology is the assignee of record of the subject application based on assignments that have been recorded with the U.S. Patent and Trademark Office as follows:

Assignments

Inventor	Assignee	Reel	Frame	Recorded
Cohn	Massachusetts Institute of Technology	021864	0406	11/20/2008
Bromberg	Massachusetts Institute of Technology	021864	0406	11/20/2008
Heywood	Massachusetts Institute of Technology	021864	0406	11/20/2008

Massachusetts Institute of Technology is also the assignee of record of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987 based on assignments that have been recorded with the U.S. Patent and Trademark Office as follows:

Assignments

Inventor	Assignee	Reel	Frame	Recorded
Cohn	Massachusetts Institute of Technology	016336	0049	03/07/2005
Bromberg	Massachusetts Institute of Technology	016336	0049	03/07/2005
Heywood	Massachusetts Institute of Technology	016336	0049	03/07/2005
Cohn	Massachusetts Institute of Technology	016751	0156	07/08/2005
Bromberg	Massachusetts Institute of Technology	016751	0156	07/08/2005
Heywood	Massachusetts Institute of Technology	016751	0156	07/08/2005
Cohn	Massachusetts Institute of Technology	021861	0139	11/20/2008
Bromberg	Massachusetts Institute of Technology	021861	0139	11/20/2008
Heywood	Massachusetts Institute of Technology	021861	0139	11/20/2008

On behalf of Massachusetts Institute of Technology, I hereby disclaim, except as otherwise provided herein, the terminal part of any patent granted on the subject application which would extend beyond the expiration date of the full statutory term, including statutory extensions thereof of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987, and hereby agree that any patent so granted on the subject application shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987, this agreement to run with any patent granted on the subject application and to be binding upon the grantee, its successors or assigns.

Massachusetts Institute of Technology, does not disclaim any terminal part of any patent granted on the subject application prior to the expiration date of the full statutory term of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 or U.S. Patent No. 7,444,987 in the event that such patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR § 1.321(a); has all claims cancelled by a reexamination certificate; is reissued; or is otherwise terminated prior to the expiration of its statutory term, except for the separation of legal title stated above.

Pursuant to 37 CFR § 3.73(b), I have reviewed all the recordation information above or all documents in the chain of title of the subject patent application and, to the best of my knowledge and belief, title is in the assignee identified above.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Please charge any fees that may be required, or credit any overpayment, to our Deposit Account No. 03-1721.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: November 25, 2008

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

CHOATE, HALL & STEWART LLP
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ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn — Confirmation No.: 1817
U.S. App. No.: 11/840,719 — Art Unit: 3747
Filing Date: August 17, 2007 — Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT (IDS) LETTER AND CERTIFICATION STATEMENT

Dear Madam:

Pursuant to 37 CFR § 1.56, § 1.97 and § 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08 form. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

CERTIFICATION STATEMENT

This Information Disclosure Statement (IDS) is filed in compliance with the following Rule(s), as far as is known to the undersigned:

37 CFR § 1.97 (c)(2) , i.e. before a final action or notice of allowance, and wherein the fee as set forth in § 1.17(p) is included with this IDS.

Copies of any cited foreign patent or non-patent literature documents not previously provided to the USPTO are enclosed herewith.

In accordance with 37 CFR § 1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR § 1.56(a) exists. In accordance with 37 CFR § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that any patent, publication or other information referred to therein is "prior art" for this invention unless specifically designated as such.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR § 1.98, and the Examiner is respectfully requested to consider the listed references. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 03-1721.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: December 12, 2008

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

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Phone: (617) 248-5000
Fax: (617) 502-5002
patentdocket@choate.com

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (08-08)
Approved for use through 08/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	J.B. Heywood, "Internal Combusion Engine Fundamentals," McGraw Hill, 1988, page 477.	☐
	2	J. Stokes et al., "A gasoline engine concept for improved fuel economy - the lean-boost system," SAE paper 2001-01-2902, pp. 1-12.	☐
	3	H. J. Curran et al., "A comprehensive modeling study of iso-octane oxidation," Combustion and Flame 129:263-280 (2002) pp. 253-280.	☐
	4	B. Lecointe and G. Monnier, "Downsizing a gasoline engine using turbocharging with direct injection" SAE paper 2003-01-0542.	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Sam Pasternack/	Date (YYYY-MM-DD)	2008-12-12
Name/Print	Sam Pasternack	Registration Number	29,576

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal	
Application Number:	11840719
Filing Date:	17-Aug-2007
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Filer:	Sam Pasternack/Elyse Pino
Attorney Docket Number:	0492611-0806
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	4443309
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Elyse Pino
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-0806
Receipt Date:	12-DEC-2008
Filing Date:	17-AUG-2007
Time Stamp:	10:41:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	7970
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Information Disclosure Statement Letter	IDS_ltr_0492611_0806.pdf	78303 0949851d0c30da9d344f834c71360077d16e5dea	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Filed (SB/08)	US_IDS_Form__SB_08a.pdf	787086 ef3e508865843ef2dccf656bc985c8749b688272b	no	4
Warnings:					
Information:					
A U.S. Patent Number Citation is required in the Information Disclosure Statement (IDS) form. You may remove the form to add the required data in order to correct the Informational Message or if you chose not to, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
3	NPL Documents	Heywood_1988.pdf	137182 15361cbd29422d427bd73a946f8ad82216bdc064	no	3
Warnings:					
Information:					
4	NPL Documents	Stokes_2000.pdf	1206260 a25bd86aeb6dedb75dd6be1adad10c150db16bf9	no	12
Warnings:					
Information:					
5	NPL Documents	Curran_2002.pdf	2621607 6e41ccaa2fd792b4f828ff4fa309c3bf432d3fbd	no	28
Warnings:					
Information:					
6	NPL Documents	Lecointe_2003.pdf	1359043 e1584f91a0bf4705bc3004cfcb061a426a6d46ee	no	12
Warnings:					
Information:					
7	Fee Worksheet (PTO-06)	fee-info.pdf	30005 485758c9b99fd5b87d74d8db961414fe5c52daa8	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	6219486	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn — Confirmation No.: 1817
U.S. App. No.: 11/840,719 — Art Unit: 3747
Filing Date: August 17, 2007 — Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT (IDS) LETTER AND CERTIFICATION STATEMENT

Madam:

Pursuant to 37 CFR § 1.56, § 1.97 and § 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08 form. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

CERTIFICATION STATEMENT

This Information Disclosure Statement (IDS) is filed in compliance with the following Rule(s), as far as is known to the undersigned:

37 CFR § 1.97 (c)(2) , i.e. before a final action or notice of allowance, and wherein the fee as set forth in § 1.17(p) is included with this IDS.

Copies of any cited foreign patent or non-patent literature documents not previously provided to the USPTO are enclosed herewith.

Additionally, the Applicant brings to the attention of the Examiner co-pending or prior U.S. patent applications: App. No. 10/991,774 now issued as patent No. 7,314,033; App. No. 11/100,026 now issued as patent No. 7,225,787; App. No. 11/229,755 now issued as patent No. 7,444,987; App. No. 11/758,157; App. No. 11/871,384; App. No. 12/020,285; and App. No. 12/329,729. Applicant also brings to the attention of the Examiner co-pending U.S. patent applications: App. No. 11/682,372; App. No. 11/683,564; App. No. 11/782,050; App. No. 11/684,100; App. No. 12/167,534 and App. No. 12/374,992. Prosecution of these applications may have bearing on the above-identified application.

In accordance with 37 CFR § 1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR § 1.56(a) exists. In accordance with 37 CFR § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that any patent, publication or other information referred to therein is "prior art" for this invention unless specifically designated as such.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR § 1.98, and the Examiner is respectfully requested to consider the listed references. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 03-1721.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: March 12, 2009

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

CHOATE, HALL & STEWART LLP
Intellectual Property
Two International Place
Boston, MA 02110

Phone: (617) 248-5000
Fax: (617) 502-5002
patentdocket@choate.com

PTO/SB/08a (08-08)
Approved for use through 08/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	11840719
Filing Date	2007-08-17
First Named Inventor	Daniel R. Cohn
Art Unit	3747
Examiner Name	Ali, Hyder
Attorney Docket Number	0492611-0806

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5497744		1996-03-12	Nagaosa et al.	
	2	5715788		1998-02-10	Tarr et al.	
	3	5983855		1998-02-10	Benedikt et al.	
	4	6073607		2000-06-13	Liber, Bruno	
	5	6340015		2002-01-22	Benedikt et al.	
	6	6536405		2003-03-25	Rieger et al.	
	7	6745744		2004-06-08	Suckewer et al.	
	8	6748918		2004-06-15	Rieger et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

	9	6755175		2004-06-29	McKay et al.	
	10	6955154		2005-10-18	Douglas, Denis	
	11	7077100		2006-06-18	Vogel et al.	
	12	4596277		1986-06-24	Djordjevic, Ilija	
	13	6321692		2001-11-27	Rayner, Bradford William	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	PCT International Search Report and Written Opinion, Appl. No. PCT/US05/041317, April 6, 2006.	☐
	2	PCT International Search Report and Written Opinion, Appl. No. PCT/US06/012750, June 28, 2007.	☐
	3	USPTO Notice of Allowance, Application No. 11/684,100, March 3, 2009.	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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OR

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☒ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Sam Pasternack/	Date (YYYY-MM-DD)	2009-03-12
Name/Print	Sam Pasternack	Registration Number	29,576

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

MIT

SPIN H/(Cw)

PATENT COOPERATION TREATY

Resp to Written Opinion
Docketed
Due 9.18.06

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
SAM PASTERNACK
CHOATE, HALL & STUART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

Amend Claims
Docketed
Due 6.06.06

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing (*day/month/year*) 06 APR 2006
Applicant's or agent's file reference 0492612-0406	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US05/41317	International filing date (*day/month/year*) 14 November 2005 (14.11.2005)
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70.

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer For HENRY YUEN Virginia Kirby Telephone No. (703) 308-0861

Form PCT/ISA/220 (January 2004)

(See notes on accompanying sheet)

RECEIVED
APR 10 2006
PATENT DEPARTMENT

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 0492612-0406	**FOR FURTHER ACTION** see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US05/41317	International filing date (*day/month/year*) 14 November 2005 (14.11.2005)	(Earliest) Priority Date (*day/month/year*) 18 November 2004 (18.11.2004)
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the Report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed.
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title**,
   ☐ the text is approved as submitted by the applicant.
   ☒ the text has been established by this Authority to read as follows:

Variable Ethanol Octane Enhancement of Gasoline Engines

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      ☐ as suggested by the applicant.
      ☒ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/41317

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8): **F02B 75/12**(2006.01)

USPC: 123/198A,575,1A,525
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)
U.S. : 123/ 198A, 575, 1A, 525

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,076,487 A (WULFF et al) 20 June 2000 (20.06.2000), column 4, lines 60-64 and column 5, lines 3-6.	1,4,54
A	US 4,495,930 A (NAKAJIMA) 29 January 1985 (29.01.1985), see entire document.	1-22,24-85
A	US 4,402,296 A (SCHWARZ) 06 September 1983 (06.09.1983), see entire document.	1-22,24-85

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 2006 (13.03.2006)	06 APR 2006
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer For HENRY YUEN Virginia Libby Telephone No. (703) 308-0861

Form PCT/ISA/210 (second sheet) (April 2005)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SAM PASTERNACK
CHOATE, HALL & STUART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*)	06 APR 2006
Applicant's or agent's file reference 0492612-0406	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US05/41317	14 November 2005 (14.11.2005)	18 November 2004 (18.11.2004)

International Patent Classification (IPC) or both national classification and IPC

IPC(8): **F02B 75/12**(2006.01)
USPC: 123/198A,575,1A,525

Applicant

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

1. This opinion contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis(b)* that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	13 March 2006 (13.03.2006)	For HENRY YUEN Virginia Libby Telephone No. (703) 308-0861

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/41317

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ on paper

☐ in electronic form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in electronic form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/41317

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 2,3,5-22,24-53,55-85	YES
	Claims 1,4,54	NO
Inventive step (IS)	Claims 2,3,5-22,24-53,55-85	YES
	Claims 1,4,54	NO
Industrial applicability (IA)	Claims 1-22,24-85	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1,4,54 lack novelty under PCT Article 33(2) as being anticipated by Wulff et al (US 6,076,487).

As to Claim 1, Wulff et al discloses fuel management system for operation of a spark ignition gasoline engine comprising: a gasoline engine; a source of an anti-knock agent; an injector 57 for direct injection of the anti-knock agent into a cylinder of the engine 14; and a fuel management control system 45 for controlling injection of the anti-knock agent into the cylinder to control knock.

As to Claim 4, Wulff et al discloses the anti-knock agent is selected from the group consisting of ethanol, methanol, tertiary butyl alcohol, MTBE, ETBE and TAME.

As to Claim 54, Wulff et al discloses fuel management system for operation of a spark ignition gasoline engine comprising: a gasoline engine; a source of an anti-knock agent; an injector 57 for direct injection of the anti-knock agent into a cylinder of the engine 14; and a fuel management control system 45 for controlling injection of the anti-knock agent into the cylinder to control knock; wherein the anti-knock agent is selected from the group consisting of methanol, tertiary butyl alcohol, MTBE, ETBE, and TAME.

Claims 2,3,5-22,24-53,55-85 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a measure of the amount of anti-knock agent in the source to control turbocharging, supercharging or spark retard when the amount of anti-knock agent is low.

Claims 1-22,24-85 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/41317

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 1 and 23 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: Regarding claim 1, currently there are two claims, which are numbered 1. Regarding claim 23, currently there is no claim 23 in the application.

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article," "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Volume I/A, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

What parts of the international application may be amended ?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Preliminary Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments ?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How ? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

SP1 RMD

Rep to Written Opinion Docketed Due 9.28.07

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
SAM PASTERNACK
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

Amend Claims Docketed Due 8.28.07

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 0492611-~~0617~~ 0433	Date of mailing (*day/month/year*) 28 JUN 2007 **FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US06/12750	International filing date (*day/month/year*) 06 April 2006 (06.04.2006)
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70.

   For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Stephen Kirk Cronin Telephone No. (703) 308-0861

Form PCT/ISA/220 (January 2004) (*See notes on accompanying sheet*)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 0492611-0617	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US06/12750	International filing date (*day/month/year*) 06 April 2006 (06.04.2006)	(Earliest) Priority Date (*day/month/year*) 06 April 2005 (06.04.2005)
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the Report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed.
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title**,
   ☐ the text is approved as submitted by the applicant.
   ☒ the text has been established by this Authority to read as follows:

DIRECT INJECTION ETHANOL ENHANCEMENT OF GASOLINE ENGINES

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 3
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US06/12750

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **F02B 77/04**(2006.01)

USPC: 123/198A,435,406.29,406.47,25C,559.1
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)
U.S. : 123/198A,435,406.29,406.47,25C,559.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,513,505 B2 (WATANABE et al) 04 February 2003 (04.02.2003), column 5, lines 45-66.	1,2,17,36
A	US 4,541,383 A (JESSEL) 17 September 1985 (17.09.1985), column 1, lines 10-20.	1-51
A	US 5,937,799 A (BINION) 17 August 1999 (17.08.1999), column 8, lines 20-35.	1-51

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2007 (31.05.2007)	28 JUN 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Stephen Kirk Cronin Telephone No. (703) 308-0861

Form PCT/ISA/210 (second sheet) (April 2005)

PATENT COOPERATION TREAT

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SAM PASTERNACK
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*)	28 JUN 2007
Applicant's or agent's file reference 0492611-0617	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US06/12750	06 April 2006 (06.04.2006)	06 April 2005 (06.04.2005)

International Patent Classification (IPC) or both national classification and IPC

IPC: **F02B 77/04**(2006.01)
USPC: 123/198A,406.29,406.47,435,559.1,25C

Applicant

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

1. This opinion contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis(b)* that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	31 May 2007 (31.05.2007)	Stephen Kirk-Cronin Telephone No. (703) 308-0861

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US06/12750

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ on paper

☐ in electronic form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in electronic form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US06/12750

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 3-16,18-35,37-51	YES
	Claims 1,2,17,36	NO
Inventive step (IS)	Claims 3-16,18-35,37-51	YES
	Claims 1,2,17,36	NO
Industrial applicability (IA)	Claims 1-51	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1.2,17.36 lacks novelty under PCT Article 33(2) as being anticipated by Watanabe et al (US 6,513,505).

As to Claim 1, Watanabe et al discloses fuel management system for operation of a spark ignition gasoline engine comprising: a spark ignition engine 1; a source of gasoline; a source of anti-knock agent 9 which is a fuel; an injector 2 for direct injection of the anti-knock agent 9 into a cylinder 1a of the engine 1; and a fuel management control system 30 for controlling injection of the anti-knock agent 9 into the cylinder 1a to control knock, wherein the antiknock agent 9 has a heat of vaporization per unit of combustion energy that is at least three times that of gasoline. See col. 2, lines 12-20, col. 5, lines 45-66 and col. 6, lines 1-27 and Figs. 1-6.

As to Claim 2, Watanabe et al discloses fuel management system for operation of a spark ignition gasoline comprising: a spark ignition engine 1; a source of gasoline; a source of an anti-knock agent 9 which is a fuel an injector 2 for direct injection of the anti-knock agent 9 into a cylinder of the engine; and a fuel management control system 30 for controlling injection of the anti-knock agent 9 into the cylinder when engine torque is above a selected value or fraction of maximum torque where the value or fraction of maximum torque is a function of engine speed.

As to Claim 17, Watanabe et al discloses wherein the anti-knock agent is ethanol and where the amounts of air, ethanol and gasoline per cylinder per cycle are controlled so as to achieve a substantially stoichiometric fuel/ air ratio.

As to Claim 36, Watanabe et al discloses fuel management system for efficient operation of a spark ignition gasoline engine comprising: a gasoline engine 1; a source of an anti-knock agent 9; an injector 2 for direct injection of both the anti-knock agent and the gasoline into a cylinder of the engine; and a fuel management control system 30 for controlling injection of the anti-knock agent into the cylinder to control knock.

Claims 3-16,18-35,37-51 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest wherein the maximum anti-knock agent energy fraction used during a drive cycle is between 30% and 100%.

Claims 1-51meets the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US06/12750

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 4,42,48 objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: The inlet valve of claim 4 lacks proper antecedent basis. The claim 42 is an improper multiple dependent claim (not in alternative format, and dependent upon other multiple dependent claims). The claim 48, "expandable pipe and funnel" is not shown in the drawings.

Electronic Patent Application Fee Transmittal	
Application Number:	11840719
Filing Date:	17-Aug-2007
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Filer:	Sam Pasternack/Elyse Pino
Attorney Docket Number:	0492611-0806
Filed as Small Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	4948453
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Kimberly Hutchins
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-0806
Receipt Date:	12-MAR-2009
Filing Date:	17-AUG-2007
Time Stamp:	17:43:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	3298
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Information Disclosure Statement Letter	IDS_ltr_03-12-09.pdf	91892 a783efec2c6187aa12b672afdd55a2673822246d	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Filed (SB/08)	US_IDS_Form__SB_08a.pdf	898181 776afcfe25a853ff34af1b97b698f3557bb38a72	no	5
Warnings:					
Information:					
3	NPL Documents	ISR_WO_pctus05041317.pdf	592173 89b76226212e5c99ba140d9a3591bde3a3f62c0f	no	8
Warnings:					
Information:					
4	NPL Documents	ISR_WO_pctus06012750.pdf	480648 cdab049aaa608ca1061757f1f12b6b66a9e63c09	no	7
Warnings:					
Information:					
5	NPL Documents	NOA_11684100_090303.pdf	323701 e5fe1cee0fc6d5cfca3b2f6be9b53ae18ed03a9b	no	7
Warnings:					
Information:					
6	Fee Worksheet (PTO-06)	fee-info.pdf	29982 48630290001d5a0ff00535a52e17d4b3c2ade56aa	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2416577		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/81 (01-09)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	11/840,719
Filing Date	August 17, 2007
First Named Inventor	Cohn, Daniel R.
Title	Fuel Management System for...
Art Unit	3741
Examiner Name	Ali, Hyder
Attorney Docket Number	0492611-0806 (MIT 11381)

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: 24280

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application to:

☐ The address associated with the above-mentioned Customer Number.

OR

☒ The address associated with Customer Number: 24280

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____.

SIGNATURE of Applicant or Assignee of Record

Signature	Daniel O'Brien	Date	28 April 2009
Name	DANIEL O'BRIEN	Telephone	617 253 6966
Title and Company	INTELLECTUAL PROPERTY MANAGER TECHNOLOGY LICENSING OFFICE		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (03-09)
Approved for use through 04/30/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Massachusetts Institute of Technology

Application No./Patent No.: 11/840,719 Filed/Issue Date: August 17, 2007

Titled: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Massachusetts Institute of Technology , a educational institution
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 021864, Frame 0406, or for which a copy therefore is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Daniel O'Brien — 28 APRIL 2009
Signature — Date

DANIEL O'BRIEN
INTELLECTUAL PROPERTY MANAGER
TECHNOLOGY LICENSING OFFICE

Printed or Typed Name — Title

Electronic Acknowledgement Receipt	
EFS ID:	6061683
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Christina Andrews
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-0806
Receipt Date:	13-SEP-2009
Filing Date:	17-AUG-2007
Time Stamp:	11:10:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA.pdf	153443 4254c696fe6886297c884287228e1008db0325a9	no	1
Warnings:					
Information:					

2	Assignee showing of ownership per 37 CFR 3.73(b).	373b.pdf	166797 78f2ffb5432aaea5f54b0a244784c4a580d4a1c3	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	320240

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	0492611-0806	1817

24280 7590 09/22/2009

CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

EXAMINER	
MCMAHON, MARGUERITE J	
ART UNIT	PAPER NUMBER
3741	

NOTIFICATION DATE	DELIVERY MODE
09/22/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@choate.com

Office Action Summary	Application No.	Applicant(s)	
	11/840,719	COHN ET AL.	
	Examiner	Art Unit	
	Marguerite J. McMahon	3741	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *74-98* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *74-98* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/25/08; 12/12/08; 3/12/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 74-76, 78, 80, 81, 83-88, 90-95, 87, and 98 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Cohn et al (2006/0102146).

Claims 74-76, 78, 80, 81, 83-88, 90-95, 87, and 98 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Cohn et al (2006/0102145).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 77, 79, 82, 89, and 96 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohn et al (2006/0102146) or Cohn et al (2006/0102145), In view of Bromberg et al (2006/0102136). Both Cohn et al references show everything except employing open loop control using a look-up map. Bromberg et al teach that it is old in the art to employ open loop control using a look-up map (as well as closed loop control using a knock sensor). It would have been obvious to one having ordinary skill in the art to modify the Cohn et al references by employing open loop control using a look-up

map, in order to provide increased safety and control over the use of the anti-knock additive.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marguerite J. McMahon whose telephone number is 571-272-4848. The examiner can normally be reached on Monday- Friday, 10am-6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cuff can be reached on 571-272-6778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Marguerite McMahon

Primary Examiner
Art Unit 3741

/Marguerite McMahon/
Primary Examiner, Art Unit 3741

Notice of References Cited	Application/Control No. 11/840,719	Applicant(s)/Patent Under Reexamination COHN ET AL.	
	Examiner Marguerite J. McMahon	Art Unit 3741	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2006/0102146	05-2006	Cohn et al.	123/406.29
*	B	US-2006/0102145	05-2006	Cohn et al.	123/406.29
*	C	US-2006/0102136	05-2006	Bromberg et al.	123/198.00A
*	D	US-7,461,628	12-2008	Blumberg et al.	123/304
*	E	US-7,581,528	09-2009	Stein et al.	123/431
*	F	US-2007/0119391	05-2007	Fried et al.	123/025.00A
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"6076487".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:04
L2	2	"6513505".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:15
L3	4	1 or 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:17
L4	0	3 and "closed loop"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:17
L5	0	3 and loop	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:17
L6	0	3 and (knock with (sensor or detector))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:19
L7	1	1 and "control mechanism" and "45"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:21

L8	48	3123/1a.ccls. antiknock and (knock with (sensor or detector))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 10:35
L9	0	3123/1a.ccls. and (knock with (sensor or detector)) and (alcohol or ethanol)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:03
L10	41	123/1a.ccls. and (knock with (sensor or detector)) and (alcohol or ethanol)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:03
L11	17	123/1a.ccls. and (knock with (sensor or detector) same (alcohol or ethanol))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:16
L12	78	"123"/$.ccls. and (knock with (sensor or detector) same (alcohol or ethanol))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:26
L13	61	12 not 11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:26
L14	75	"123"/$.ccls. and (knock near3 (sensor or detector) same (alcohol or ethanol))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:28
L15	0	14 not 12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:28

L16	59	14 not 11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 11:28
L17	2	"7225787".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:27
L18	143	("20060102146" | "2741230" | "3089470" | "3106194" | "3557763" | "4596277" | "4031864" | "4056087" | "4182278" | "4230072" | "4312310" | "4402296" | "4480616" | "4541383" | "4594201" | "4596277" | "4721081" | "4958598" | "4967714" | "4974416" | "4993386" | "5497744" | "5715788" | "5983855" | "5179923" | "5233944" | "5497744" | "5560344" | "5715788" | "5911210" | "5937799" | "5983855" | "6073607" | "6321692" | "6340015" | "6536405" | "6745744" | "6748918" | "6755175" | "6955154" | "6073607" |	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:32

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L19	31	18 and knock	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:33
L20	11	18 and (knock near4 (sensor or detector))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:34

L21	3	18 and ((knock near4 (sensor or detector)) with (alcohol or ethanol))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:41
L22	2	"7225787".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:43
L23	2	"20060102136".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:44
L24	5	18 and ((knock near4 (sensor or detector)) and (alcohol or ethanol))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:46
L25	2	"2958314".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:54
L26	3	"2958317".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 12:59
L27	1	"2958317".pn. and knock	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:01
L28	0	"2958317".pn. and (knock with (sensor or detector))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:02

L29	1	"20060102146".pn. and stoichiometric	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:15
L30	1	"20060102145".pn. and stoichiometric	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:16
L31	2	"20060102145".pn. and "spark ignition"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:16
L32	1	"20060102145".pn. and (turbocharged or supercharged)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:17
L33	0	"20060102145".pn. and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:23
L34	0	"20060102146".pn. and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:23
L35	1	"20060102136".pn. and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:23
L36	1	"20060102145".pn. and separated	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:26

L37	1	"20060102146".pn. and separated	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:26
L38	2	"20060102146".pn. and methanol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:27
L39	1	"20060102145".pn. and methanol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:27
L40	1	"20060102145".pn. and water	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:27
L41	1	"20060102146".pn. and water	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:27
L42	1	"20060102146".pn. and (reduced or eliminated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:28
L43	1	"20060102145".pn. and (reduced or eliminated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:29
L44	1	"20060102145".pn. and downsizing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:30

L45	1	"20060102146".pn. and downsizing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:30
L46	1	"20060102146".pn. and "octane numbers"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:32
L47	1	"20060102145".pn. and "octane numbers"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:34
L48	1	"20060102145".pn. and lubricant	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:34
L49	1	"20060102146".pn. and lubricant	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:35
L50	1	"20060102146".pn. and water	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:35
L51	1	"20060102145".pn. and water	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:35
L52	1	"20060102145".pn. and "spark retard"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:36

L53	1	"20060102146".pn. and "spark retard"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:36
L54	0	"20060102136".pn. and look	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:47
L55	1	"20060102136".pn. and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/09/17 13:47

9/17/09 3:23:48 PM

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/840,719	COHN ET AL.	
	Examiner	Art Unit	
	Marguerite J. McMahon	3741	

SEARCHED			
Class	Subclass	Date	Examiner
123	1A, 406.29, 190A, 304, 431, 25A	9/17/2009	MM

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	9/17/2009	MM

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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	Attorney Docket Number	0492611-0806

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/MM/	12	4596277		1986-06-24	Djordjevic, Ilija	
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
/MM/	1	PCT International Search Report and Written Opinion, Appl. No. PCT/US05/041317, April 6, 2006.	☐
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/MM/	3	USPTO Notice of Allowance, Application No. 11/684,100, March 3, 2009.	☐

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/MM/	10	4541383		1985-09-17	Jessel, Alfred J.	
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/MM/	22	6260525		2001-07-17	Moyer, David F.	
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/MM/	43	7320302		2008-01-22	Kobayashi, Tatsuo	
/MM/	44	3089470		1963-05-14	Payne, W.H.	
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/MM/	47	7013847		2006-03-21	Auer, Gerhard	

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	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11840719
	Filing Date	2007-08-17
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	Ali, Hyder
	Attorney Docket Number	0492611-0806

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
/MM/	1	J.B. Heywood, "Internal Combusion Engine Fundamentals," McGraw Hill, 1988, page 477.	☐
/MM/	2	J. Stokes et al., "A gasoline engine concept for improved fuel economy - the lean-boost system," SAE paper 2001-01-2902, pp. 1-12.	☐
/MM/	3	H. J. Curran et al., "A comprehensive modeling study of iso-octane oxidation," Combustion and Flame 129:263-280 (2002) pp. 253-280.	☐
/MM/	4	B. Lecointe and G. Monnier, "Downsizing a gasoline engine using turbocharging with direct injection" SAE paper 2003-01-0542.	☐

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EXAMINER SIGNATURE

Examiner Signature	/Marguerite Mcmahon/ (09/17/2009)	Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/840,719	08/17/2007	Daniel R. Cohn	0492611-0806 (MIT 11381)

CONFIRMATION NO. 1817

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

POA ACCEPTANCE LETTER

OC000000037891813

Date Mailed: 09/25/2009

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/13/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/snguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

ATTORNEY'S DOCKET NUMBER: 0492611-0806 (MIT-11381)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Marguerite McMahon

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 C.F.R. § 1.111

Applicant hereby submits the following Response to the Non-Final Office Action mailed September 22, 2009. Applicant respectfully requests consideration and entry of this Response.

Listing of Claims begin on page 2.

Remarks begin on page 10.

An **Appendix** including Response to Non-Final Office Action and a Terminal Disclaimer both dated November 25, 2008 are attached following page 11.

Listing of Claims

74. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio.

75. (Original) The engine system of claim 74 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

76. (Original) The engine of claim 75 where the liquid contained in the second source is an

alcohol.

77. (Original) The engine system of claim 74 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine and uses both closed loop control with a knock detector and open loop control with a look up table and; where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

78. (Original) The engine system of claim 77 where the anti-knock agent is an alcohol and is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

79. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of an anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and the anti-knock agent that is directly injected ; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

80. (Original) The engine system of claim 79 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of the gasoline.

81. (Original) The engine system of claim 80 wherein the anti-knock agent is ethanol and is directly injected in such an amount so as to allow operation of a given engine at least twice the knock free torque attainable when no directly injected ethanol is used; and
where during some of the operating time the ethanol energy fraction is at least 20 % and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

82. (Original) The engine system of claim 81 where the fuel management system limits the required ethanol energy fraction needed to prevent knock to less than 6% over a drive cycle; and

where the fuel management system uses both closed loop control which employs a knock detector and open loop control and a look up table.

83. (Original) The engine system of claim 79 where the anti-knock agent is ethanol and is separated from an ethanol–gasoline mixture on board the vehicle.

84. (Original) The engine system of claim 79 where the anti-knock agent is methanol.

85. (Original) The engine system of claim 79 where the second source contains a mixture of alcohol and water.

86. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for port fuel injection of gasoline from the first source;

means for direct fuel injection of a liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline that is port fuel injected and alcohol that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein the turbocharging or supercharging is reduced or eliminated as a function of the amount of anti-knock agent in the second source.

87. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling the engine with gasoline from the first source;

means for direct fuel injection of the liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline and by the anti-knock agent that is directly injected; and

a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock;

where the fuel management system uses closed loop control to control the amount of directly injected anti-knock agent that is used and employs information from a knock detector; and

where the engine is operated with a substantially stoichiometric fuel/air ratio; and

wherein engine downsizing is used to obtain a higher efficiency than a larger engine that uses port fuel injection of gasoline alone and produces the same maximum horsepower.

88. (Original) The engine system of claim 87 where the anti-knock agent is the sole or partial constituent of a liquid which is contained in the second source and where the liquid is a fuel which is suitable for operation of a spark ignition engine without simultaneous use of gasoline.

89. (Original) The engine system of claim 87 where the anti-knock agent is an alcohol and where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent in the engine fraction and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of alcohol that is used over a drive cycle.

90. (Original) The engine system of claim 87 wherein the directly injected anti-knock agent is an alcohol which is injected so it is non uniformly distributed with greater amounts towards the walls of the cylinder and
where the alcohol energy fraction is sufficiently high to prevent knock and resulting in the alcohol energy fraction being reduced as compared to the situation using a uniform distribution.

91. (Original) The engine system of claim 87 wherein the anti-knock agent is ethanol and is directly injected during some of the operating time the ethanol energy fraction is at least 20 %; and

wherein the ethanol is directly injected in such an amount that the evaporative cooling of the

fuel/air charge combined with the higher octane number of the ethanol enhances the octane number by at least 20 octane numbers.

92. (Original) The engine system of claim 87 where the anti-knock agent is ethanol and the ethanol is separated from a gasoline-ethanol mixture onboard the vehicle.

93. (Original) The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and a lubricant.

94. (Original) The engine system of claim 87 where the second tank contains a liquid that is a mixture of alcohol and water.

95. (Original) A turbocharged or supercharged spark ignition engine system which uses fueling with gasoline from a first source in addition to direct fuel injection of a liquid anti-knock agent that is a fuel from a second source comprising:

a spark ignition engine;

a turbocharger or supercharger;

means for fueling with gasoline from the first source;

means for direct fuel injection of liquid anti-knock agent that is a fuel from the second source;

wherein during part of the engine operating time, the engine is fueled both by gasoline from the first source and by liquid anti-knock agent that is directly injected from the second source;

and a fuel management system which increases the relative amount of anti-knock agent in the engine with increasing torque so as to prevent knock; and

where the engine is operated with a substantially stoichiometric fuel/air ratio;

and where the fuel management system controls the amount of anti-knock agent that is employed using closed loop control which utilizes a knock detector; and

wherein the turbocharging or supercharging is reduced or eliminated depending upon the amount of anti-knock agent in the second source.

96. (Original) The engine system of claim 95 where the fuel management system employs a microprocessor for control of the relative amount of anti-knock agent that is used in the engine and uses both closed loop control with a knock detector and open loop control with a look up table; and

where the fuel management system minimizes the amount of anti-knock agent that is used over a drive cycle.

97. (Original) The engine system of claim 95 where the turbocharging or supercharging is reduced or eliminated when the anti-knock agent is not available from the second source and the engine can be operated during a drive cycle without knock when there is no anti-knock agent available from the second source.

98. (Original) The engine system of claim 97 where spark retard is also employed when the anti-knock agent from the second source is not available.

REMARKS

Claims **74-98**, of which claims 1, 74, 79, 86, 87 and 95 are independent in form, are presented for examination. Applicant makes no amendments to the claims with this Response. Applicants respectfully request a timely Notice of Allowance.

Claim Rejections: Claims 74-76, 78, 80, 81, 83-88, 90-95, 87, and 98

Claims 74-76, 78, 80, 81, 83-88, 90-95, 87, and 98 were rejected under 35 U.S.C. 102(b) as anticipated by Cohn *et al*. (2006/0102146).

Claims 74-76, 78, 80, 81, 83-88, 90-95, 87, and 98 were rejected under 35 U.S.C. 102(b) as anticipated by Cohn et al (2006/0102145).

Claims 77, 79, 82, 89 and 96 were rejected under 35 U.S.C. 103(a) as being unpatentable over Cohn *et al.* ((2006/0102146) or Cohn *et al.* (2006/0102145), in view of Bromberg *et al.* (2006/0102136).

Examiner Interview

Applicants appreciate the Examiner's interview on October 13, 2009. As discussed during the interview, the present application and all three references cited in the Office Action, namely, 2006/0102146 (now patent 7444987); 2006/0102145 (now patent 7314033); and 2006/0102136 (now patent 7225787) (hereinafter "references") belong in the same family. In fact, the present application is a continuation of, and explicitly claims priority to, 2006/0102145 (now patent 7314033). Accordingly, these references are not valid anticipatory references.

Applicants draw attention to a response to non-final office action filed November 25, 2008, and attached herein, where the Applicants submitted a terminal disclaimer disclaiming the terminal part of any patent granted on the present application which would extend beyond the expiration date of the full statutory term of the references.

CONCLUSION

In view of the foregoing remarks, Applicants submit that all claims pending in this application, namely claims **74-98** are in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: October 19, 2008

/Sam Pasternack/
Sam Pasternack
Registration No. 29,576

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APPENDIX

ATTORNEY'S DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 C.F.R. § 1.111

Applicant hereby submits the following Response ("this Response") to the Non-Final Office Action mailed July 11, 2008. Applicant respectfully requests consideration and entry of this Response.

Applicant additionally submits a two (2) month Petition for Extension of Time, and accompanying Petition fee under 37 CFR § 1.17(a)(2). Applicant believes no additional fees are due with this Response, but if Applicant is in error any fees due may be charged to deposit account 03-1721.

Contents:

Remarks ..... page 2.

REMARKS

Status of the Claims

Claims **74-98** were pending in the application. In the Office Action, claims 79-85 and 87-94 were indicated as allowed. Claims 74-78, 86 and 95-98 were rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claims 1-4 of U.S. Patent No. 7,314,033 to Cohn *et al.* and claims 1-9 of U.S. Patent No. 7,225,787 to Bromberg *et al.* Claims 74-78, 86 and 95-98 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claim 117 of copending Application No. 11/229,755 to Cohn *et al.* Applicant makes no amendments to the claims with this Response. Upon entry of this Response, claims **74-98** will be presented for examination.

Double Patenting Rejections: Claims 74-78, 86 and 95-98

In the Office Action, claims 74-78, 86 and 95-98 were rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claims 1-4 of U.S. Patent No. 7,314,033 to Cohn *et al.* and claims 1-9 of U.S. Patent No. 7,225,787 to Bromberg *et al.* Applicant submits herewith a Terminal Disclaimer which overcomes these obviousness-type double patenting rejections.

In the Office Action, claims 74-78, 86 and 95-98 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being upatentable over claim 117 of copending application No. 11/229,755 to Cohn *et al.* Applicant notes that application No. 11/229,755 has recently issued as U.S. patent No. 7,444,987. Applicant submits herewith a Terminal Disclaimer which overcomes these obviousness-type double patenting rejections.

CONCLUSION

In view of the above, Applicant submits that presently pending claims **74-98** are in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: November 25, 2008

/Sam Pasternack/
Sam Pasternack
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ATTORNEY DOCKET NUMBER: 0492611-0806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Ali, Hyder

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

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P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

TERMINAL DISCLAIMER

I, Sam Pasternack, represent that I am an attorney and am empowered to act on behalf of Massachusetts Institute of Technology.

Massachusetts Institute of Technology is the assignee of record of the subject application based on assignments that have been recorded with the U.S. Patent and Trademark Office as follows:

Assignments

Inventor	Assignee	Reel	Frame	Recorded
Cohn	Massachusetts Institute of Technology	021864	0406	11/20/2008
Bromberg	Massachusetts Institute of Technology	021864	0406	11/20/2008
Heywood	Massachusetts Institute of Technology	021864	0406	11/20/2008

Massachusetts Institute of Technology is also the assignee of record of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987 based on assignments that have been recorded with the U.S. Patent and Trademark Office as follows:

Assignments

Inventor	Assignee	Reel	Frame	Recorded
Cohn	Massachusetts Institute of Technology	016336	0049	03/07/2005
Bromberg	Massachusetts Institute of Technology	016336	0049	03/07/2005
Heywood	Massachusetts Institute of Technology	016336	0049	03/07/2005
Cohn	Massachusetts Institute of Technology	016751	0156	07/08/2005
Bromberg	Massachusetts Institute of Technology	016751	0156	07/08/2005
Heywood	Massachusetts Institute of Technology	016751	0156	07/08/2005
Cohn	Massachusetts Institute of Technology	021861	0139	11/20/2008
Bromberg	Massachusetts Institute of Technology	021861	0139	11/20/2008
Heywood	Massachusetts Institute of Technology	021861	0139	11/20/2008

On behalf of Massachusetts Institute of Technology, I hereby disclaim, except as otherwise provided herein, the terminal part of any patent granted on the subject application which would extend beyond the expiration date of the full statutory term, including statutory extensions thereof of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987, and hereby agree that any patent so granted on the subject application shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 and U.S. Patent No. 7,444,987, this agreement to run with any patent granted on the subject application and to be binding upon the grantee, its successors or assigns.

Massachusetts Institute of Technology, does not disclaim any terminal part of any patent granted on the subject application prior to the expiration date of the full statutory term of U.S. Patent No. 7,314,033, U.S. Patent No. 7,225,787 or U.S. Patent No. 7,444,987 in the event that such patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR § 1.321(a); has all claims cancelled by a reexamination certificate; is reissued; or is otherwise terminated prior to the expiration of its statutory term, except for the separation of legal title stated above.

Pursuant to 37 CFR § 3.73(b), I have reviewed all the recordation information above or all documents in the chain of title of the subject patent application and, to the best of my knowledge and belief, title is in the assignee identified above.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Please charge any fees that may be required, or credit any overpayment, to our Deposit Account No. 03-1721.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: November 25, 2008

/Sam Pasternack/
Sam Pasternack
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Electronic Acknowledgement Receipt	
EFS ID:	6285760
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	24280
Filer:	Sam Pasternack/Adele E. Kalogeris
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	0492611-0806 (MIT 11381)
Receipt Date:	19-OCT-2009
Filing Date:	17-AUG-2007
Time Stamp:	15:53:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	MIT-0806-Transmittal.pdf	72013 1e4d241d42d2bbd76f78284c76ceb6c60792462b	no	1
Warnings:					
Information:					

2	Amendment/Req. Reconsideration-After Non-Final Reject	MIT-0806-Response.pdf	708952 1e9c6830cec092c2ea83a4178aa93aebe42f629c	no	18
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			Total Files Size (in bytes):	780965	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ATTORNEY'S DOCKET NUMBER: 0492611-0806 (MIT-11381)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn	Confirmation No.: 1817
Serial No: 11/840,719	Art Unit: 3747
Filed: August 17, 2007	Examiner: Marguerite McMahon

Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

TRANSMITTAL

Enclosed are the following documents:

1. Response to Non-Final Office Action and Appendix (**18** pages); and
2. This Transmittal (**1** page).

If any fees are required to be paid or if any overpayment has been made, please charge or credit same to Deposit Account No. 03-1721 referencing Attorney Docket Number 0492611-0806.

Respectfully submitted,
CHOATE, HALL & STEWART LLP

Date: October 19, 2008

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/840,719	Filing Date 08/17/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	10/19/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 94	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/ROLITA WIMBUSH/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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RWIMBUSH SALE #00000002 Mailroom Dt: 10/19/2009 031721 11840719
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Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/840,719	COHN ET AL.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed : 10/19/09	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

Janice Ford

percentage amount missing and legal title…not accepted must state commonly owned 37 CFR 1.321(c)(3)

U.S. Patent and Trademark Office

PTO/SB/81 (01-09)
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	11/840719
Filing Date	08/17/2007
First Named Inventor	Daniel R. Cohn et al.
Title	FUEL MANAGEMENT SYSTEM FOR VARIABLE...
Art Unit	3741
Examiner Name	MARGUERITE J. MCMAHON
Attorney Docket Number	11981. 105826

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: 91197

OR

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Practitioner(s) Name	Registration Number

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☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on herewith

SIGNATURE of Applicant or Assignee of Record

Signature	Daniel O'Brien	Date	12/29/2009
Name	Daniel O'Brien	Telephone	617.258.7148
Title and Company	IP Manager Massachusetts Institute of Technology		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Daniel R. Cohn et al.

Application No./Patent No.: 11/840719 Filed/Issue Date: 08/17/2007

Titled: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Massachusetts Institute of Technology , a Non-profit
(Name of Assignee) (Type of Assignee, e.g., corporation partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 021864, Frame 0406, or for which a copy therefore is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
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3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Daniel O'Brien — Signature

12/30/2009 — Date

Daniel O'Brien — Printed or Typed Name

IP Manager — Title

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Art Unit	3741
Examiner Name	MARGUERITE J. MCMAHON
Attorney Docket Number	11981.105826

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Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on herewith

SIGNATURE of Applicant or Assignee of Record

Signature	Daniel O'Brien	Date	12/30/2009
Name	Daniel O'Brien	Telephone	617.258.7143
Title and Company	IP Manager Massachusetts Institute of Technology		

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Daniel R. Cohn et al.

Application No./Patent No.: 11/840719 Filed/Issue Date: 08/17/2007

Titled: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Massachusetts Institute of Technology, a Non-profit
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

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1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

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The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

David O'Brien
Signature

12/30/2009
Date

Daniel O'Brien
Printed or Typed Name

IP Manager
Title

Five Cambridge Center, Kendall Square
Room NE25-230
Cambridge, Massachusetts

MIT
Technical Licensing Office

To:	Commissioner for Patents	From:	Maureen Joyce Patent Docket Manager
Fax:	571.273.8300	Pages:	Seventeen
Phone:	617.258.6729	Date:	December 30, 2009
Re:	Please reference below.	cc:	

Dear Sir:

Please process the Revocation of Power of Attorney document (PTO/SB/81) along with the required accompanying Statement Under 37 C.F.R. 3.73 (b) form (PTO/SB/96) for each of the following pending patent applications:

11/376994
11/057958
12/329729
12/130390
11/868174
12/105776
~~11/871384~~
11/840719

Thank you for your assistance with these filings. Please contact me with any questions.

Sincerely,

Maureen A. Joyce

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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	11/840719
Filing Date	08/17/2007
First Named Inventor	Daniel R. Cohn et al.
Title	FUEL MANAGEMENT SYSTEM FOR VARIABLE..
Art Unit	3741
Examiner Name	MARGUERITE J. MCMAHON
Attorney Docket Number	11381.105826

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

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Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

OR

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Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on herewith

SIGNATURE of Applicant or Assignee of Record

Signature	Daniel O'Brien	Date	12/30/2009
Name	Daniel O'Brien	Telephone	617.258.7748
Title and Company	IP Manager Massachusetts Institute of Technology		

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Daniel R. Cohn et al.

Application No./Patent No.: 11/840719 Filed/Issue Date: 08/17/2007

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(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

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The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Daniel O'Brien — Signature

12/30/2009 — Date

Daniel O'Brien — Printed or Typed Name

IP Manager — Title

Five Cambridge Center, Kendall Square
Room NE25-230
Cambridge, Massachusetts

MIT
Technical Licensing Office

To:	Commissioner for Patents	From:	Maureen Joyce Patent Docket Manager
Fax:	571.273.8300	Pages:	Seventeen
Phone:	617.258.6729	Date:	December 30, 2009
Re:	Please reference below.	cc:	

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Sincerely,

Maureen A. Joyce

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Applicant/Patent Owner: Daniel R. Cohn et al.

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Titled: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

Massachusetts Institute of Technology, a Non-profit
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 021864, Frame 0406, or for which a copy therefore is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Daniel O'Brien — 12/30/2009
Signature — Date

Daniel O'Brien — IP Manager
Printed or Typed Name — Title

Five Cambridge Center, Kendall Square
Room NE25-230
Cambridge, Massachusetts

MIT
Technical Licensing Office

To:	Commissioner for Patents	From:	Maureen Joyce Patent Docket Manager
Fax:	571.273.8300	Pages:	Seventeen
Phone:	617.258.6729	Date:	December 30, 2009
Re:	Please reference below.	cc:	

Dear Sir:

Please process the Revocation of Power of Attorney document (PTO/SB/81) along with the required accompanying Statement Under 37 C.F.R. 3.73 (b) form (PTO/SB/96) for each of the following pending patent applications:

11/376994
11/057958
12/329729
12/130390
11/868174
12/105776
11/871384
11/840719

Thank you for your assistance with these filings. Please contact me with any questions.

Sincerely,

Maureen A. Joyce

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/840,719	08/17/2007	Daniel R. Cohn	11981. 105826

CONFIRMATION NO. 1817

POA ACCEPTANCE LETTER

91197
Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

OC000000039575206

Date Mailed: 01/12/2010

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/30/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/vvan/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/840,719	08/17/2007	Daniel R. Cohn	0492611-0806 (MIT 11381)

CONFIRMATION NO. 1817

POWER OF ATTORNEY NOTICE

24280
CHOATE, HALL & STEWART LLP
TWO INTERNATIONAL PLACE
BOSTON, MA 02110

OC000000039575187

Date Mailed: 01/12/2010

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/30/2009.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/vvan/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/26 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 11381.105826

In re Application of: Daniel R. Cohn

Application No.: 11/840719

Filed: August 17, 2007

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ANTI-KNOCK AGENT OCTANE ENHANCEMENT OF GASOLINE ENGINES

The owner*, Massachusetts Institute of Technology, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7225787 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321,
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 29576

Signature — Date: 1/20/10

Sam Pasternack
Typed or printed name

617.258.7171
Telephone Number

☐ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

PTO/SB/26 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 11381.105826

In re Application of: Daniel R. Cohn

Application No.: 11/840719

Filed: August 17, 2007

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ANTI-KNOCK AGENT OCTANE ENHANCEMENT OF GASOLINE ENGINES

The owner*, Massachusetts Institute of Technology, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7444987 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued, or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 29576

Sam Pasternack — 1/20/10
Signature — Date

Sam Pasternack
Typed or printed name

617.258.7171
Telephone Number

☐ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/26 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 11381.105826

In re Application of: Daniel R. Cohn

Application No.: 11/840719

Filed: August 17, 2007

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ANTI-KNOCK AGENT OCTANE ENHANCEMENT OF GASOLINE ENGINES

The owner*, Massachusetts Institute of Technology, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7314033 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 29576

Sam Pasternack — Signature — 1/20/10 — Date

Sam Pasternack
Typed or printed name

617.258.7171
Telephone Number

☐ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

ATTORNEY DOCKET NO.: 11381.105826

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn et al.	Examiner: MARGUERITE J. MCMAHON
Serial No.:	11/840719	Art Unit: 3741
Filing Date:	August 17, 2007	Confirmation No.: 1817
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

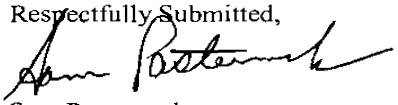
Transmittal of Replacement Terminal Disclaimers

Enclosed herewith are replacement terminal disclaimers requested by Examiner Marguerite J. McMahon. These terminal disclaimers remedy the defects in the originally filed terminal disclaimer.

The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in good standing.

If this communication is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this communication, including an extension fee, the Director is hereby authorized to charge any deficiency or credit any overpayment in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 192553, under Docket No. 11381.105826.

Respectfully Submitted,



Sam Pasternack

Registration No.: 29576
Massachusetts Institute of Technology
Five Cambridge Center
Room NE25-230
Cambridge, MA 02412-1493
617.258.7171

Date: January 20, 2010

Electronic Acknowledgement Receipt	
EFS ID:	6847123
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	91197
Filer:	Sam Pasternack/Anna Yem
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	11981. 105826
Receipt Date:	20-JAN-2010
Filing Date:	17-AUG-2007
Time Stamp:	16:02:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer Filed	11381105826ter.pdf	61684 afb58084191b5841a96dca88e01c28d5a92eed1c	no	3

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
2	Miscellaneous Incoming Letter	11381105826term.pdf	12723 ebe0fa0bee18c34ef9994a1ac51f539f0b6da102	no	1
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
			Total Files Size (in bytes):	74407	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

91197 7590 03/11/2010

Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

EXAMINER	
MCMAHON, MARGUERITE J	
ART UNIT	PAPER NUMBER
3741	

DATE MAILED: 03/11/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	11381.105826	1817

TITLE OF INVENTION: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	06/11/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

91197 7590 03/11/2010

Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	11381.105826	1817

TITLE OF INVENTION: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	06/11/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCMAHON, MARGUERITE J	3741	123-19800A

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	11381.105826	1817

91197 7590 03/11/2010

Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

EXAMINER	
MCMAHON, MARGUERITE J	
ART UNIT	PAPER NUMBER
3741	

DATE MAILED: 03/11/2010

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 49 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 49 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No.	Applicant(s)	
	11/840,719	COHN ET AL.	
	Examiner	Art Unit	
	Marguerite J. McMahon	3741	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *TD filed 1/20/10*.

2. ☒ The allowed claim(s) is/are *74-98*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Marguerite McMahon/
Primary Examiner, Art Unit 3741

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/840,719	COHN ET AL.	
	Examiner	Art Unit	
	Marguerite J. McMahon	3741	

SEARCHED			
Class	Subclass	Date	Examiner
123	1A, 406.29, 190A, 304, 431, 25A	2/5/2010	MM
	updated		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
123	**as above**	2/5/2010	**MM**

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	2/5/2010	MM

Issue Classification	Application/Control No. 11/840,719	Applicant(s)/Patent under Reexamination COHN ET AL.
	Examiner Marguerite J. McMahon	Art Unit 3741

ISSUE CLASSIFICATION

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
123	406.29	F	02	D	43	/00				/	
CROSS REFERENCES						/				/	
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)										
						/				/	
						/				/	
						/				/	
						/				/	
						/				/	

(Assistant Examiner) (Date)	/M. McMahon/ 2/5/10 (Primary Examiner) (Date)	Total Claims Allowed: 25	
(Legal Instruments Examiner) (Date)		O.G. Print Claim(s) 1	O.G. Print Fig. 1

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

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Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 1817

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/840,719	08/17/2007	044	3741	11381.105826

APPLICANTS

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;

**** CONTINUING DATA ***************************

This application is a CON of 10/991,774 11/18/2004 PAT 7,314,033

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **

08/27/2007

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /M. McMahon/ Examiner's Signature	☐ Met after Allowance mm Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		MA	3	25	5

ADDRESS

Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493
UNITED STATES

TITLE

Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

FILING FEE RECEIVED		
835	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	4	((turbocharger or supercharger or supercharged or turbocharged) and ("spark ignition" or sparkplug) and (anti-knock with (injector or injection or inject or injecting or injects)) and stoichiometric).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/02/05 13:21
L2	4	((turbocharger or supercharger or supercharged or turbocharged) and ("spark ignition" or sparkplug) and (anti-knock with (injector or injection or inject or injecting or injects)) and stoichiometric).clm.	US-PGPUB	OR	OFF	2010/02/05 13:22

2/5/10 1:23:09 PM

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

91197 7590 03/11/2010

Technology Licensing Office
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Kendall Square
Cambridge, MA 02142-1493

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Anna Yem	(Depositor's name)
	(Signature)
March 25, 2010	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	08/17/2007	Daniel R. Cohn	11381.105826	1817

TITLE OF INVENTION: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	~~YES~~ NO	$755	$300	$0	$1055	06/11/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCMAHON, MARGUERITE J	3741	123-19800A

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Massachusetts Institute of Technology
(B) RESIDENCE: (CITY and STATE OR COUNTRY): Cambridge, MA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
- ☒ Issue Fee
- ☒ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 192563 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☒ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Sam Pasternack Date March 25, 2010

Typed or printed name Sam Pasternack Registration No. 29576

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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PTO/SB/47 (03-09)
Approved for use through 03/31/2012. OMB 0651-0016
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

"FEE ADDRESS" INDICATION FORM

Address to:
Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

- OR -

Fax to:
571-273-6500

INSTRUCTIONS: The issue fee must have been paid for application(s) listed on this form. In addition, only an address represented by a Customer Number can be established as the fee address for maintenance fee purposes (hereafter, fee address). A fee address should be established when correspondence related to maintenance fees should be mailed to a different address than the correspondence address for the application. **When to check the first box below**: If you have a Customer Number to represent the fee address. **When to check the second box below**: If you have no Customer Number representing the desired fee address, in which case a completed Request for Customer Number (PTO/SB/125) must be attached to this form. For more information on Customer Numbers, see the Manual of Patent Examining Procedure (MPEP) § 403.

For the following listed application(s), please recognize as the "Fee Address" under the provisions of 37 CFR 1.363 the address associated with:

☑ Customer Number: 91197

OR

☐ The attached Request for Customer Number (PTO/SB/125) form.

PATENT NUMBER (if known)	APPLICATION NUMBER
	11/840719

Completed by (check one):

☐ Applicant/Inventor

☑ Attorney or Agent of record 29576 (Reg. No.)

☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☐ Assignee recorded at Reel _____ Frame_____

Signature

Sam Pasternack
Typed or printed name

617.258.7171
Requester's telephone number

March 25, 2010
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more that one signature is required, see below*

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.363. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 5 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Mail Stop M Correspondence, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	11840719
Filing Date:	17-Aug-2007
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES
First Named Inventor/Applicant Name:	Daniel R. Cohn
Filer:	Sam Pasternack/Anna Yem
Attorney Docket Number:	11381.105826

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1510	1510
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1810**

Electronic Acknowledgement Receipt	
EFS ID:	7281943
Application Number:	11840719
International Application Number:	
Confirmation Number:	1817
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES
First Named Inventor/Applicant Name:	Daniel R. Cohn
Customer Number:	91197
Filer:	Sam Pasternack/Anna Yem
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	11381.105826
Receipt Date:	25-MAR-2010
Filing Date:	17-AUG-2007
Time Stamp:	10:49:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1810
RAM confirmation Number	7917
Deposit Account	192553
Authorized User	O'BRIEN,DANIEL
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees) Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	**Document Description**	**File Name**	**File Size(Bytes)/ Message Digest**	**Multi Part /.zip**	**Pages (if appl.)**
1	Issue Fee Payment (PTO-85B)	11381105826fee.pdf	107181 1bbdab1963c9d1c68cfe8ad67c93b8a2c48f214f	no	1
Warnings:					
Information:					
2	Change of Address	11381105826add.pdf	58041 75a5439f93fd2f08f901698703a7516a9b7be6cc	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	32231 a8e0ecbdc5bed5b80707cf1cc309a3e68e62869a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	197453		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 1817

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/840,719	08/17/2007 RULE	123	3741	11381.105826

APPLICANTS

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;

**** CONTINUING DATA ***************************

This application is a CON of 10/991,774 11/18/2004 PAT 7,314,033

**** FOREIGN APPLICATIONS *********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 08/27/2007

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	MA	3	25	5
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS
91197

TITLE
FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

FILING FEE RECEIVED		
1135	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,719	06/22/2010	7740004	11381.105826	1817

91197 7590 06/02/2010

Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 49 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Daniel R. Cohn, Cambridge, MA;
Leslie Bromberg, Sharon, MA;
John B. Heywood, Newtonville, MA;