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Applicant: Daniel R. Cohn et al.
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Title: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

PRELIMINARY AMENDMENT

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Please preliminarily amend the application as follows.

In The Specification

Please amend paragraph [0001] on page 1 as follows:

This application is a continuation of United States Patent Application No. 12/329,729 filed on December 8, 2008 which is a continuation of United States Patent Application No. 11/840,719 filed on August 17, 2007, which is a continuation of United States Patent Application No. 10/991,774, which is now issued as United States Patent No. 7,314,033.

Listing of Claims

Claims 1 – 32 (cancelled)

33. (new) A spark ignition engine system for which fuel is introduced into the engine from a first source and a fuel is separately introduced into the engine from a second source by direct injection comprising:

a spark ignition engine;

a first means for introducing the fuel from the first source into the engine;

a second means for direct injection of the fuel from the second source into the engine, wherein during part of the engine operating time, the engine receives both the fuel from the first source and the fuel that is directly injected from the second source; and

a fuel management system which varies the relative amount of the fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system employs information from a knock detector and uses closed loop control to control the amount of directly injected fuel from the second source; and

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

34. (new) The engine system of claim 33, wherein the second source contains a liquid that could be employed to operate the engine without the addition of fuel from the first source.

35. (new) The engine system of claim 33 or 34 , wherein the fuel from the second source is alcohol.

36. (new) The engine system of claim 35, wherein the alcohol is methanol.

37. (new) The engine system of claim 35, wherein the alcohol is ethanol.

38. (new) The engine system of claim 33 where an alcohol–water mixture is directly injected into the engine from the second source

39. (new) The engine system of claim 33 or 34, wherein the engine is turbocharged or supercharged

40. (new) The engine system of claim 33 or 34, wherein the fuel from the first source is gasoline.

41. (new) The engine system of claim 33 or 34, wherein the fuel from the second source is injected so as to result in a non-uniform distribution in the engine cylinder.

42. (new) The engine system of claim 41, wherein the fuel from the second source is injected so as to be more concentrated near the periphery of the engine cylinder, and

the ratio of the energy of the fuel from the second source to fuel from the first source is sufficiently high to prevent knock but the alcohol energy fraction is reduced as compared to the situation using a uniform distribution.

43. (new) The engine system of claim 33 or 34, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is directly injected into the engine using information from a knock sensor, and

wherein the relative amount of the fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

44. (new) The engine system of claim 43 further including open loop control with a look up table.

45. (new) The engine system of claim 33, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

46. (new) A spark ignition engine system into which fuel is introduced into the engine from a first source and a fuel from a second source is introduced into the engine comprising:

a spark ignition engine;

a means for introducing fuel into the engine from the first source;

a second means for introducing the fuel from the second source into the engine wherein during part of the engine operating time, the engine receives both the fuel from the first source and the fuel from the second source; and

a fuel management system which varies the relative amount of the fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system uses closed loop control to control the amount of fuel from the second source and employs information from a knock detector, and

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

47. (new) The engine system of claim 46, wherein the second source contains a liquid which could be used to operate the engine without fuel from the first source

48. (new) The engine system of claim 46 or 47, wherein the fuel from the second source is alcohol.

49. (new) The engine system of claim 48, wherein the alcohol is methanol.

50. (new) The engine system of claim 48, wherein the alcohol is ethanol.

51. (new) The engine system of claims 46 or 47, wherein the second source contains a fuel which is an alcohol-water mixture.

52. (new) The engine system of claims 46 or 47, wherein the engine is turbocharged to supercharged.

53. (new) The engine system of claims 46 or 47, wherein the fuel from the first source is gasoline.

54. (new) The engine system of claims 46 or 47, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is introduced into the engine using information from a knock sensor, and wherein

the relative amount of fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

55. (new) The engine system of claim 54 further including open loop control with a look up table.

56. (new) The engine system of claims 46 or 47, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

Remarks

New claims 33 – 56 more particularly point out and distinctly claim the invention. No new matter is being introduced.

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Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines

[0001] This application is a continuation of United States Patent Application No. 11/840,719 filed on August 17, 2007, which is a continuation of United States Patent Application No. 10/991,774, which is now issued as United States Patent No. 7,314,033.

BACKGROUND

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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

[0006] 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.

[0007] 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.

[0008] 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.

[0009] 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.

[0010] 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 DRAWINGS

[0011] **FIG. 1** is a block diagram of one embodiment of the invention disclosed herein.

[0012] **FIG. 2** is a graph of the drop in temperature within a cylinder as a function of the fraction of energy provided by ethanol.

[0013] **FIG. 3** is a schematic illustration of the stratification of cooler ethanol charge using direct injection and swirl motion for achieving thermal stratification.

[0014] **FIG. 4** is a schematic illustration showing ethanol stratified in an inlet manifold.

[0015] **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.

DETAILED DESCRIPTION

[0016] 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.

[0017] 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.

[0018] 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).

[0019] 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.

[0020] 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%.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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**.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] **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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] 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).

[0040] 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.

CLAIMS

What is claimed is:

1. A spark ignition engine system for which fuel is introduced into the engine from a first source and a liquid is separately introduced into the engine from a second source by direct injection comprising:

a spark ignition engine;

a first means for introducing the fuel from the first source into the engine;

a second means for direct injection of the liquid from the second source into the engine, wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid that is directly injected from the second source; and

a fuel management system which varies the relative amount of the liquid from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system employs information from a knock detector and uses closed loop control to control the amount of directly injected liquid from the second source; and

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

2. The engine system of claim **1**, wherein the engine is turbocharged or supercharged.

3. The engine system of claim **1** or **2**, wherein the liquid from the second source is alcohol.

4. The engine system of claim **3**, wherein the alcohol is methanol.

5. The engine system of claim **3**, wherein the alcohol is ethanol.

6. The engine system of claim **1** or **2**, wherein the liquid from the second source is an alcohol–water mixture.

7. The engine system of claim **1** or **2**, wherein the liquid from the second source includes water.

8. The engine system of claim **1** or **2**, wherein the fuel from the first source is gasoline and the liquid from the second source includes water.

9. The engine system of claim **1** or **2**, wherein the liquid from the second source is injected so as to result in a non-uniform distribution in the engine cylinder.

10. The engine system of claim **9**, wherein the liquid from the second source is injected so as to be more concentrated near the periphery of the engine cylinder, and

wherein the liquid from the second source includes alcohol, and

wherein the alcohol energy fraction is sufficiently high to prevent knock but the alcohol energy fraction is reduced as compared to the situation using a uniform distribution.

11. The engine system of claim **1** or **2**, wherein the fuel management system employs a microprocessor for control of the relative amount of liquid from the second source that is directly injected into the engine using information from a knock sensor, and

wherein the relative amount of the liquid from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected liquid from the second source that is used over a drive cycle.

12. The engine system of claim **11** further including open loop control with a look up table.

13. The engine system of claims **1** or **2**, wherein spark retard is used and is varied according to the consumption of the liquid from the second tank.

14. A spark ignition engine system into which fuel is introduced into the engine from a first source using a first fuel injector and a liquid from a second source is introduced into the engine using a second fuel injector comprising:

a spark ignition engine;

a first fuel injector for introducing fuel into the engine from the first source;

a second fuel injector for introducing the liquid from the second source into the engine wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid from the second source; and

a fuel management system which varies the relative amount of the liquid from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management

system uses closed loop control to control the amount of liquid from the second source and employs information from a knock detector, and

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

15. The engine system of claim **14**, wherein the fuel from the first source is port fuel injected.

16. The engine system of claim **14** or **15**, wherein the liquid from the second source is alcohol.

17. The engine system of claim **16**, wherein the alcohol is methanol.

18. The engine system of claim **16**, wherein the alcohol is ethanol.

19. The engine system of claims **14** or **15**, wherein the liquid from the second source is an alcohol-water mixture.

20. The engine system of claims **14** or **15**, wherein the liquid from the second source includes water.

21. The engine system of claims **14** or **15**, wherein the fuel from the first source is gasoline and the liquid from the second source includes water.

22. The engine system of claims **14** or **15**, wherein the fuel management system employs a microprocessor for control of the relative amount of liquid from the second source that is directly injected into the engine using information from a knock sensor, and wherein

the relative amount of liquid from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected liquid from the second source that is used over a drive cycle.

23. The engine system of claim **22** further including open loop control with a look up table.

24. The engine system of claims **14** or **15**, wherein spark retard is used and is varied according to the consumption of the liquid from the second tank.

25. The engine system of claims **14** or **15**, wherein the engine is turbocharged.

26. The engine system of claims **14** or **15**, wherein the engine is supercharged.

27. 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 alcohol 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 alcohol 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 alcohol in the engine with increasing torque so as to prevent knock, wherein the fuel management system employs information from a knock detector and uses closed loop control to control the amount of directly injected alcohol, and

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

28. The engine system of claim **27**, wherein the alcohol is methanol.

29. The engine system of claim **27**, wherein the alcohol is ethanol.

30. The engine system of claim **27**, wherein the alcohol is mixed with water.

31. The engine system of claim **27**, wherein the fuel management system employs a microprocessor for control of the relative amount of alcohol from the second source that is directly injected into the engine using information from a knock sensor.

32. The engine system of claim **31**, wherein the fuel management system minimizes the amount of directly injected alcohol from the second source that is used over a drive cycle.

ABSTRACT

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.

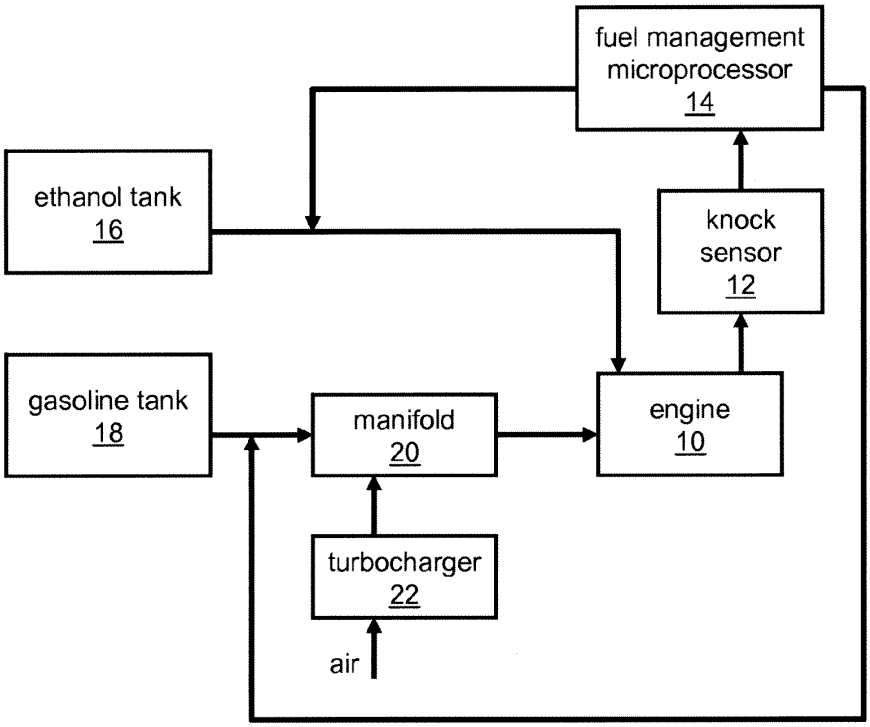
fuel management microprocessor 14
ethanol tank 16
knock sensor 12
gasoline tank 18
manifold 20
engine 10
turbocharger 22
air

FIG. 1

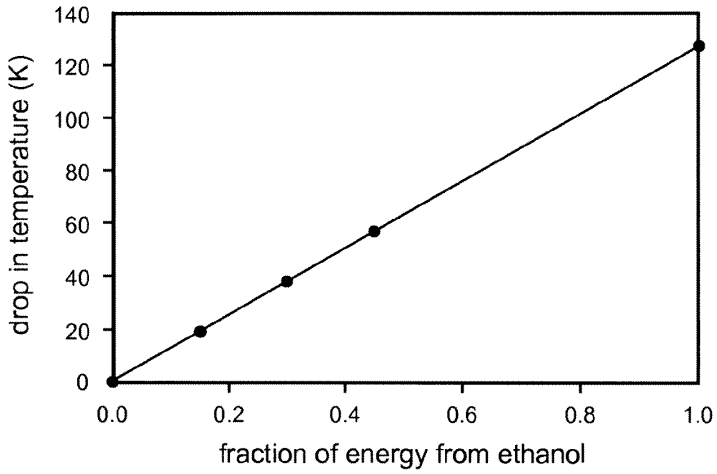
drop in temperature (K)
140
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
1.0
fraction of energy from ethanol

FIG. 2

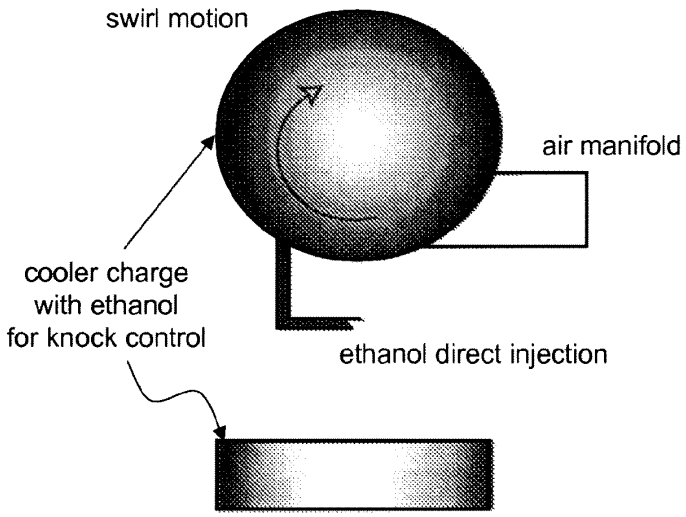
swirl motion
air manifold
cooler charge
with ethanol
for knock control
ethanol direct injection

FIG. 3

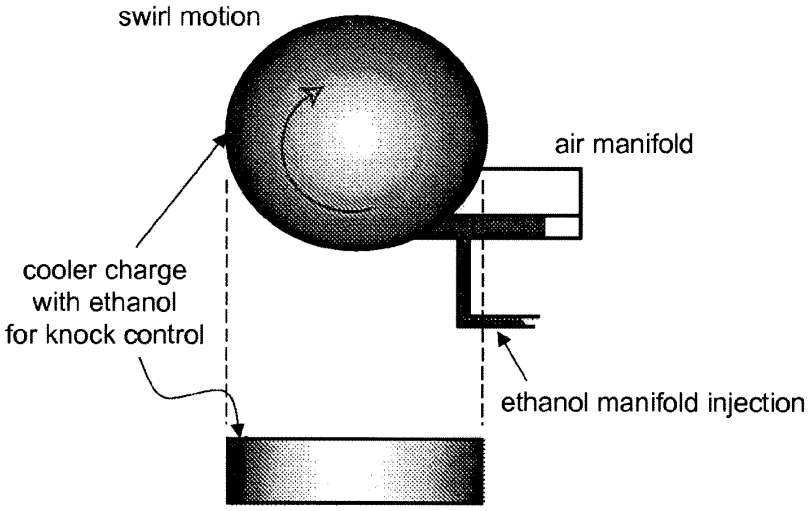
swirl motion
air manifold
cooler charge
with ethanol
for knock control
ethanol manifold injection

FIG. 4

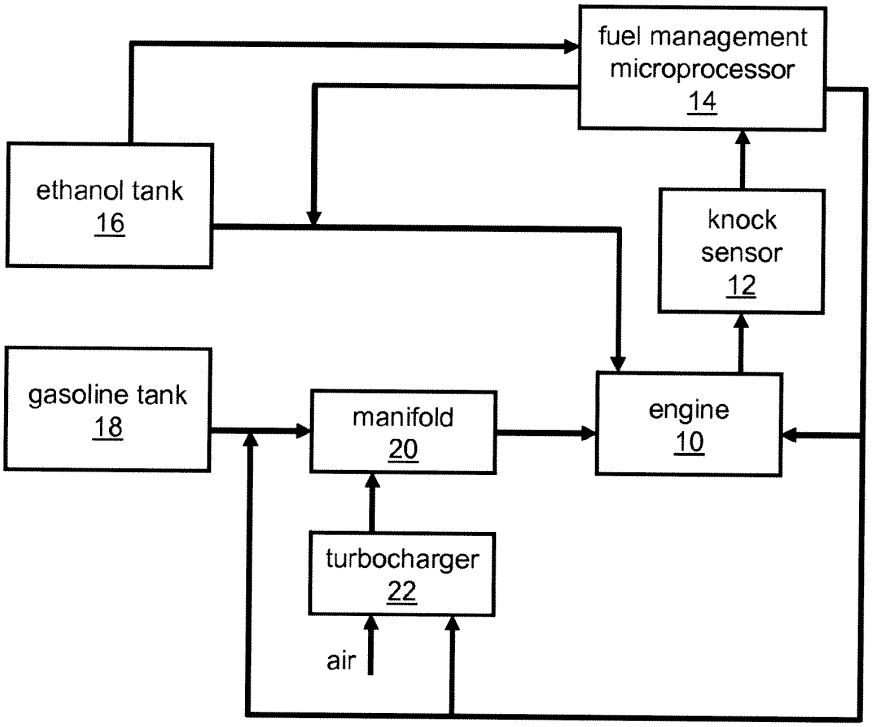
fuel management microprocessor 14
ethanol tank 16
knock sensor 12
gasoline tank 18
manifold 20
engine 10
turbocharger 22
air

FIG. 5

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 46 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 Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES
First Named Inventor/Applicant Name:	Daniel R. Cohn et al.
Filer:	Sam Pasternack/Anna Yem
Attorney Docket Number:	11381.109439
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	330	330
Utility Search Fee	1111	1	540	540
Utility Examination Fee	1311	1	220	220
Pages:				
Claims:				
Claims in excess of 20	1202	4	52	208
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	1298

Electronic Acknowledgement Receipt	
EFS ID:	7817297
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES
First Named Inventor/Applicant Name:	Daniel R. Cohn et al.
Customer Number:	91197
Filer:	Sam Pasternack/Anna Yem
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	11381.109439
Receipt Date:	15-JUN-2010
Filing Date:	
Time Stamp:	15:30:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1298
RAM confirmation Number	1960
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	Application Data Sheet	11381109439ads.pdf	297226 e21dcf81c08f30bed3d7dff755bc33d3a2ee9bc4	no	4
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
2	Preliminary Amendment	11381109439amend.pdf	105039 afe259e15a7405d5555d80e41eae10ab5daed94f	no	7
Warnings:					
Information:					
3		11381109439app.pdf	632403 7eba56fdcf25195a4b22f5473fb008c42ecf6ec7	yes	18
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	15	
	Drawings-only black and white line drawings		16	18	
Warnings:					
Information:					
4	Oath or Declaration filed	11381109439dec.pdf	107903 df1e234bea0dadb770168822643008d483cd7a09	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:					
5	Fee Worksheet (PTO-875)	fee-info.pdf	36733 ffa865cfc92e19ecdc5664bae236f12e3ec59982	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1179304		

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/14 (11-08)
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	11381.109439
	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

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	US

Citizenship under 37 CFR 1.41(b)	US

Mailing Address of Applicant:

Address 1	100 Memorial Drive Apt. 11-22 B
Address 2	

City	Cambridge	State/Province	MA
Postal Code	02142	Country	US

Applicant 2

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	US

Citizenship under 37 CFR 1.41(b)	US

Mailing Address of Applicant:

Address 1	176 Wilshire Drive
Address 2	

City	Sharon	State/Province	MA
Postal Code	02067	Country	US

Applicant 3

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	B.	Heywood	

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

City	Newtonville	State/Province	MA	Country of Residence	US

PTO/SB/14 (11-08)
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	11381.109439
	Application Number	
Title of Invention	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES	

Citizenship under 37 CFR 1.41(b)	US		
Mailing Address of Applicant:			
Address 1	218 Mill Street		
Address 2			
City	Newtonville	**State/Province**	MA
Postal Code	02460	**Country**	US

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	91197		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		
Attorney Docket Number	11381.109439	**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)	3	**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 (11-08)
Approved for use through 06/30/2010. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	11381.109439
	Application Number	
Title of Invention	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES	

Customer Number	91197

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	12/329729	2008-12-08
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
12/329729	Continuation of	11/840719	2007-08-17
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/840719	Continuation of	10/991774	2004-11-18	7314033	2008-01-01

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

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	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.

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

If the Assignee is an Organization check here. ☒

Organization Name	Massachusetts Institute of Technology

PTO/SB/14 (11-08)
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	11381.109439
	Application Number	
Title of Invention	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES	

Mailing Address Information:			
Address 1	77 Massachusetts Ave.		
Address 2			
City	Cambridge	**State/Province**	MA
Country	US	Postal Code	02139
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the **Add** button.			

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.

Signature				Date (YYYY-MM-DD)	2010-06-15
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.**

PTO/SB/06 (12-04)

Approved for use through 7/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Date: **6/15/2010**

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/815,842

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	330
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	540
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	220
TOTAL CLAIMS (37 CFR 1.16(i))	42 minus 20 =	* 22	X 26=		OR	X 52=	1144
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	X 110=			X 220=	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A			N/A	390
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2624

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.

PTO/SB/07 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET
Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
12/815,842	6/15/2010

Applicant(s)

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT		*					
	Indep	Depend	Indep	Depend	Indep	Depend		Indep	Depend	Indep	Depend	Indep	Depend
1							51		2				
2							52		2				
3							53		2				
4							54		2				
5							55		2				
6							56		2				
7							57						
8							58						
9							59						
10							60						
11							61						
12							62						
13							63						
14							64						
15							65						
16							66						
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29							79						
30							80						
31							81						
32							82						
33	1						83						
34		1					84						
35		2					85						
36		2					86						
37		2					87						
38		1					88						
39		2					89						
40		2					90						
41		2					91						
42		2					92						
43		2					93						
44		2					94						
45		1					95						
46	1						96						
47		1					97						
48		2					98						
49		2					99						
50		2					100						
Total Indep							Total Indep	2					
Total Depend							Total Depend	40					
Total Claims							Total Claims	42					

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.

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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/815,842	06/15/2010	1797	1298	11381.109439	24	2

CONFIRMATION NO. 2175

91197
Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

FILING RECEIPT

OC000000042254608

Date Mailed: 06/28/2010

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 submit a written request for a Filing Receipt Correction. 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 12/329,729 12/08/2008
which is a CON of 11/840,719 08/17/2007 PAT 7,740,004
which is a CON of 10/991,774 11/18/2004 PAT 7,314,033

Foreign Applications

If Required, Foreign Filing License Granted: 06/23/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/815,842**

Projected Publication Date: 10/07/2010

Non-Publication Request: No

Early Publication Request: No

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

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439

CONFIRMATION NO. 2175

91197
Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

FORMALITIES LETTER

OC000000042254609

Date Mailed: 06/28/2010

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).

- Additional claim fees of $**1326** as a non-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.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is $**1326** for a non-small entity
- Total additional claim fee(s) for this application is $**1326**
  - $**936** for **22** total claims over 20.
  - $**390** for multiple dependent claim surcharge.

Replies should be mailed to:

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

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/ttu/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

ATTORNEY DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn	Examiner:	Not Yet Assigned
Serial No.:	12/815842	Art Unit:	1797
Filing Date:	June 15, 2010	Confirmation No.:	2175
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

RESPONSE TO NOTICE TO FILE MISSING PARTS

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

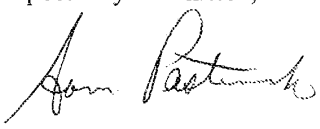
Sir:

Enclosed herewith in response to the Notice to File Missing Parts of a Nonprovisional Application mailed June 28, 2010 is the following document:

1. The fee of $1,534.00 is being electronically paid herewith.

If there is a fee occasioned by this communication, the director 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. 11381.109439.

Respectfully Submitted,



Sam Pasternack
Registration No.: 29576
Massachusetts Institute of Technology
Five Cambridge Center
Room NE25-230
Cambridge, MA 02412-1493
617.258.7171

ATTORNEY DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn	Examiner:	Not Yet Assigned
Serial No.:	12/815842	Art Unit:	1797
Filing Date:	June 15, 2010	Confirmation No.:	2175
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

RESPONSE TO NOTICE TO FILE MISSING PARTS

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

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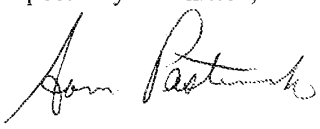
1. The fee of $1,534.00 is being electronically paid herewith.

If there is a fee occasioned by this communication, the director 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. 11381.109439.

Respectfully Submitted,



Sam Pasternack
Registration No.: 29576
Massachusetts Institute of Technology
Five Cambridge Center
Room NE25-230
Cambridge, MA 02412-1493
617.258.7171

Electronic Patent Application Fee Transmittal	
Application Number:	12815842
Filing Date:	15-Jun-2010
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:	11381.109439
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:				
Claims in excess of 20	1202	22	52	1144
Multiple dependent claims	1203	1	390	390
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1534**

Electronic Acknowledgement Receipt	
EFS ID:	7935638
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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:	11381.109439
Receipt Date:	01-JUL-2010
Filing Date:	15-JUN-2010
Time Stamp:	11:38:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1534
RAM confirmation Number	10372
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 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	11381109439rspntfmp.pdf	38333 57c486283e88b40afd441c4fe0fc0107e9bcc7a9	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	31894 a926f66d33dba79f8b9bd88b449bcb537f78049a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	70227		

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
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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	12/815842
Filing Date	June 15, 2010
First Named Inventor	Daniel R. Cohn et al.
Title	FUEL MANAGEMENT SYSTEM...
Art Unit	1797
Examiner Name	Not Yet Assigned
Attorney Docket Number	11381.109439

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

☐ 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:

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		Date	July 8, 2010
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.

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.

Electronic Acknowledgement Receipt	
EFS ID:	7972180
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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:	11381.109439
Receipt Date:	08-JUL-2010
Filing Date:	15-JUN-2010
Time Stamp:	08:37:37
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		11381109439poa.pdf	123660 543725d02b13f099cd25c318f07793dcfdb2f053	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Assignee showing of ownership per 37 CFR 3.73(b).	1	1
	Power of Attorney	2	2
Warnings:			
Information:			
	Total Files Size (in bytes):	123660	

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/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Daniel R. Cohn et al.

Application No./Patent No.: 12/815842 Filed/Issue Date: June 15, 2010

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 024550, Frame 0568, 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.

Signature	July 8, 2010 Date
Daniel O'Brien Printed or Typed Name	IP Manager Title

ATTORNEY DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn	Examiner:	Not Yet Assigned
Serial No.:	12/815842	Art Unit:	1797
Filing Date:	June 15, 2010	Confirmation No.:	2175
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

RESPONSE TO NOTICE TO FILE MISSING PARTS

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

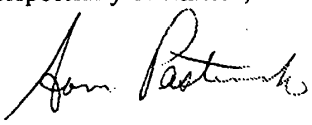
Sir:

Enclosed herewith in response to the Notice to File Missing Parts of a Nonprovisional Application mailed June 28, 2010 is the following document:

1. The fee of $1,534.00 is being electronically paid herewith.

If there is a fee occasioned by this communication, the director 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. 11381.109439.

Respectfully Submitted,



Sam Pasternack
Registration No.: 29576
Massachusetts Institute of Technology
Five Cambridge Center
Room NE25-230
Cambridge, MA 02412-1493
617.258.7171

Adjustment date: 07/15/2010 VVAN11
07/01/2010 INTEFSW 00010372 12815842
01 FC:1202 -1144.00 DP

07/15/2010 VVAN11 00000018 12815842

01 FC:1202 936.00 DP

Refund Ref:
07/15/2010 0030086192

Credit Card Refund Total: $208.00

VISA....: XXXXXXXXXXX9903

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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/815,842	06/15/2010	1797	2624	11381.109439	24	2

CONFIRMATION NO. 2175

UPDATED FILING RECEIPT

91197
Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

OC000000042596672

Date Mailed: 07/16/2010

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 submit a written request for a Filing Receipt Correction. 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: The patent practitioners associated with Customer Number 91197

Domestic Priority data as claimed by applicant

This application is a CON of 12/329,729 12/08/2008 PAT 7,762,233
which is a CON of 11/840,719 08/17/2007 PAT 7,740,004
which is a CON of 10/991,774 11/18/2004 PAT 7,314,033

Foreign Applications

If Required, Foreign Filing License Granted: 06/23/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/815,842**

Projected Publication Date: 10/21/2010

Non-Publication Request: No

Early Publication Request: No

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

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
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439

CONFIRMATION NO. 2175

POA ACCEPTANCE LETTER

91197
Technology Licensing Office
Masachusetts Institute of Technology
Five Cambridge Center
Kendall Square
Cambridge, MA 02142-1493

OC000000042490563

Date Mailed: 07/16/2010

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/08/2010.

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.

/nbekele/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/08a (01-10)
Approved for use through 07/31/2012 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	12815842
Filing Date	2010-06-15
First Named Inventor	Daniel R. Cohn et al.
Art Unit	3747
Examiner Name	Not Yet Assigned
Attorney Docket Number	11381.109439

U.S.PATENTS

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	6990956		2006-01-31	Niimi	
	2	4480601		1984-11-06	Takeda	
	3	3106194		1963-10-08	Cantwell et al.	
	4	4721081		1988-01-26	Krauja et al.	
	5	6508233		2003-01-21	Suhre, B. et al.	
	6	6076487		2000-06-20	Wulff, J. et al.	
	7	6575147		2003-06-10	Wulff, J. et al.	
	8	6513505		2003-02-04	Watanabe et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn et al.
	Art Unit	3747
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	11381.109439

	9	4541383		1985-09-17	Jessel, A. J.	
	10	6799551		2004-10-05	Nakakita et al.	
	11	6892691		2005-05-17	Uhl et al.	
	12	4958598		1990-09-25	Fosseen, D.	

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

U.S.PATENT APPLICATION PUBLICATIONS

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.

FOREIGN PATENT DOCUMENTS

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]
	1							☐

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

NON-PATENT LITERATURE DOCUMENTS

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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn et al.
	Art Unit	3747
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	11381.109439

	1	MODAK, A. et al., Engine Cooling by Direct Injection of Cooling Water, Society of Automotive Engineers, Inc., 1970, SAE World Headquarters, Warrendale, PA.	☐
	2	LoRUSSO, J.A. et al., Direct Injection Ignition Assisted Alcohol Engine, Society of Automotive Engineers, Inc., 29 Feb-5 Mar 1998, International Contress and Exposition in Detroit, MI, SAE World Headquarters, Warrendale, PA.	☐
	3	GRANDIN, B. et al., Knock Suppression in a Turbocharged SI Engine by Using Cooled EGR, Society of Automotive Engineers, Inc., 19-22 Oct 1998, International Fall Fuels & Lubricants Meeting and Exposition in San Francisco, CA, SAE World Headquarters, Warrendale, PA.	☐
	4	GRANDIN, B. et al., Replacing Fuel Enrichment in a Turbo Charged SI Engine: Lean Burn or Cooled EGR, Society of Automotive Engineers, Inc., 1999, SAE World Headquarters, Warrendale, PA.	☐
	5	STAN, C. et al., Internal Mixture Formation and Combustion-from Gasoline to Ethanol, Society of Automotive Engineers, Inc., 2001, SAE World Headquarters, Warrendale, PA.	☐

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

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	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn et al.
	Art Unit	3747
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	11381.109439

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).

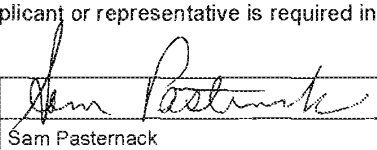
☒ See attached certification statement.

☐ 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		Date (YYYY-MM-DD)	2010-08-06
Name/Print	Sam Pasternack	Registration Number	29576

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.**

Electronic Acknowledgement Receipt	
EFS ID:	8168452
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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:	11381.109439
Receipt Date:	06-AUG-2010
Filing Date:	15-JUN-2010
Time Stamp:	11:34:45
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		11381109439ids.pdf	203489 cb125f19f718d18f3f3da12d9416aaacd41c34be	yes	6

	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Miscellaneous Incoming Letter		1	2	
	Information Disclosure Statement (IDS) Filed (SB/08)		3	6	
Warnings:					
Information:					
2	NPL Documents	grandin_b1.pdf	200381 ddb2a28b98413d3df7ff0438ca474887af4c3f34	no	11
Warnings:					
Information:					
3	NPL Documents	grandin_b.pdf	123850 f5d6939802bb49b73f2a43c9a5669d5814d02ab5	no	11
Warnings:					
Information:					
4	NPL Documents	loRusso_j.pdf	1808858 684d08626ed326f0b26f37539ee8c22f251fd39f	no	21
Warnings:					
Information:					
5	NPL Documents	modak_a.pdf	1322225 42a63e77617ab0c362ca7bc69c19871e0743e4b6	no	7
Warnings:					
Information:					
6	NPL Documents	stan_c.pdf	828707 761949e0cdc4d298c7b810858513d486ca421bac	no	13
Warnings:					
Information:					
Total Files Size (in bytes):			4487510		

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 DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn et al.	Examiner:	Not Yet Assigned
Serial No.:	12/815842	Art Unit:	3747
Filing Date:	June 15, 2010	Confirmation No.:	2175
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

INFORMATION DISCLOSURE STATEMENT

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

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/08a. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue there from.

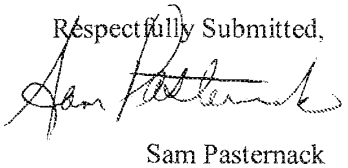
In accordance with 37 CFR 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of non-patent literature in accordance with 37 CFR 1.98(a)(2).

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.

If there is a fee occasioned by this communication, the director 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. 11381.109439.

Respectfully Submitted,



Sam Pasternack
Registration No.: 29576
Massachusetts Institute of Technology
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Room NE25-230
Cambridge, MA 02412-1493
617.258.7171

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439

CONFIRMATION NO. 2175

91197
MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

PUBLICATION NOTICE

OC000000044111780

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

Publication No.US-2010-0263625-A1
Publication Date:10/21/2010

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.

Office of Data Managment, 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
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

91197 7590 12/13/2010

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
HUYNH, HAI H	
ART UNIT	PAPER NUMBER
3747	

NOTIFICATION DATE	DELIVERY MODE
12/13/2010	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):

mitdocket@mit.edu
mjoyce@mit.edu

Office Action Summary	Application No.	Applicant(s)	
	12/815,842	COHN ET AL.	
	Examiner	Art Unit	
	Hai H. Huynh	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 *15 June 2010*.

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) *33-56* 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) *33-56* 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 *08-06-10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Inventorship

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Double Patenting

2. 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).

3. Claims 33-56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-32 of U.S. Patent No. 7,762,233. Although the conflicting claims are not identical, they are not patentably distinct from each other because they have the same scope.

4. Claims 33-56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-25 of U.S. Patent No. 7,740,004. Although the conflicting claims are not identical, they are not patentably distinct from each other because they have the same scope.

Claim Rejections - 35 USC § 102

5. 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.

6. Claims 33-56 are rejected under 35 U.S.C. 102(b) as being anticipated by Cohn et al (6,655,324).

Cohn et al teach a first means for introducing the fuel from the first source into the engine; a second means for direct injection of the fuel from the second source into the engine, wherein during part of the engine operating time, the engine receives both the fuel from the first source and the fuel that is directly injected from the second source; and a fuel management system which varies the relative amount of the fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system employs information from a knock detector 26 and uses closed loop control to control the amount of directly injected fuel from the second source; and wherein the engine is operated with a substantially stoichiometric fuel/air ratio.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai H. Huynh whose telephone number is (571) 272-4844. The examiner can normally be reached on Monday through Thursday from 7:30 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen 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.

/Hai H. Huynh/
Primary Examiner, Art Unit 3747

Notice of References Cited	Application/Control No. 12/815,842	Applicant(s)/Patent Under Reexamination COHN ET AL.	
	Examiner Hai H. Huynh	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-6,655,324 B2	12-2003	Cohn et al.	123/1A
*	B	US-7,178,503 B1	02-2007	Brehob, Diana D.	123/304
*	C	US-7,314,033 B2	01-2008	Cohn et al.	123/198A
*	D	US-7,740,004 B2	06-2010	Cohn et al.	123/406.29
*	E	US-7,762,233 B2	07-2010	Cohn et al.	123/431
*	F	US-2009/0308367 A1	12-2009	Glugla, Chris Paul	123/575
	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
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	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	11/24/2010								
	1	-								
	2	-								
	3	-								
	4	-								
	5	-								
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	30	-								
	31	-								
	32	-								
	33	✓								
	34	✓								
	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	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	11/24/2010								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
	44	✓								
	45	✓								
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	52	✓								
	53	✓								
	54	✓								
	55	✓								
	56	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

SEARCHED			
Class	Subclass	Date	Examiner
123	1A, 431, 198A, 575, 435, 299, 300, 305, 559.1	11/24/10	HHH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	11/24/10	HHH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
above	search	11/24/10	HHH

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BIB DATA SHEET

CONFIRMATION NO. 2175

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/815,842	06/15/2010	123	3747	11381.109439

APPLICANTS

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

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

This application is a CON of 12/329,729 12/08/2008 PAT 7,762,233
which is a CON of 11/840,719 08/17/2007 PAT 7,740,004
which is a CON of 10/991,774 11/18/2004 PAT 7,314,033

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

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

06/23/2010

Foreign Priority claimed	☐ Yes ☑ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☑ No					
Verified and Acknowledged	/HAI H HUYNH/ Examiner's Signature	Initials	MA	3	24	2

ADDRESS

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493
UNITED STATES

TITLE

FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES

FILING FEE RECEIVED		
2624	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	3	(("7762233") or ("7740004") or ("7314033")).PN.	USPAT	OR	OFF	2010/11/24 09:17
L2	9	(first or primary or main) same (second$3 or auxiliary) same (direct$2 near inject $3) same knock$3 same (closed near loop)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/11/24 09:34
L3	1	("6655324").PN.	USPAT	OR	OFF	2010/11/24 09:40
L4	0	("7762233").URPN.	USPAT	OR	OFF	2010/11/24 09:43
L5	76	("20040065274" | "20080060612" | "20080228382" | "20090043478" | "20090076705" | "20090308367" | "2741230" | "3089470" | "3106194" | "3557763" | "4031864" | "4056087" | "4182278" | "4230072" | "4312310" | "4402296" | "4480616" | "4541383" | "4594201" | "4721081" | "4958598" | "4967714" | "4974416" | "4993386" | "5179923" | "5233944" | "5497744" | "5560344" | "5715788" | "5911210" | "5937799" | "5983855" | "6073607" | "6076487" | "6260525" | "6287351" | "6298838" | "6332448" | "6340015" | "6358180" | "6508233" | "6513505" |	US-PGPUB; USPAT; USOCR	OR	OFF	2010/11/24 09:43

		"6536405" | "6543423" | "6561157" | "6575147" | "6622663" | "6655324" | "6668804" | "6725827" | "6745744" | "6748918" | "6755175" | "6799551" | "6892691" | "6951202" | "6955154" | "6959693" | "6981487" | "6990956" | "7013847" | "7021277" | "7077100" | "7086376" | "7107942" | "7156070" | "7178503" | "7188607" | "7201136" | "7314033" | "7320302" | "7444987" | "7581528").PN.				
L6	6053	((123/1A) or (123/431) or (123/198A) or (123/575) or (123/435) or (123/299) or (123/300) or (123/305) or (123/559.1)).CCLS.	US-PGPUB; USPAT	OR	OFF	2010/11/24 10:01
L9	6	l2 and l6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/11/24 10:01

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	26	((123/1A) or (123/431) or (123/198A) or (123/575) or (123/435) or (123/299) or (123/300) or (123/305) or (123/559.1)).CCLS.	UPAD	OR	OFF	2010/11/24 10:01

L8	4	(first or primary or main) same (second $3 or auxiliary) same (direct$2 near inject $3) same knock$3 same (closed near loop)	USPAT; UPAD	OR	OFF	2010/11/24 10:01

11/24/10 10:02:28 AM
C:\Documents and Settings\hhuynh\My Documents\EAST\Workspaces\ - new text.wsp

PTO/SB/08a (01-10)
Approved for use through 07/31/2012 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	12815842
Filing Date	2010-06-15
First Named Inventor	Daniel R. Cohn et al.
Art Unit	3747
Examiner Name	Not Yet Assigned
Attorney Docket Number	11381.109439

U.S.PATENTS						
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	6990956		2006-01-31	Niimi	
	2	4480601		1984-11-06	Takeda	
	3	3106194		1963-10-08	Cantwell et al.	
	4	4721081		1988-01-26	Krauja et al.	
	5	6508233		2003-01-21	Suhre, B. et al.	
	6	6076487		2000-06-20	Wulff, J. et al.	
	7	6575147		2003-06-10	Wulff, J. et al.	
	8	6513505		2003-02-04	Watanabe et al.	

/Hai Huynh/ (11/24/2010)

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /HHH/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn et al.
	Art Unit	3747
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	11381.109439

	9	4541383		1985-09-17	Jessel, A. J.	
	10	6799551		2004-10-05	Nakakita et al.	
	11	6892691		2005-05-17	Uhl et al.	
	12	4958598		1990-09-25	Fosseen, D.	

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U.S.PATENT APPLICATION PUBLICATIONS

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					

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FOREIGN PATENT DOCUMENTS

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							☐

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NON-PATENT LITERATURE DOCUMENTS

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]

/Hai Huynh/ (11/24/2010)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn et al.
	Art Unit	3747
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	11381.109439

	1	MODAK, A. et al., Engine Cooling by Direct Injection of Cooling Water, Society of Automotive Engineers, Inc., 1970, SAE World Headquarters, Warrendale, PA.	☐
	2	LoRUSSO, J.A. et al., Direct Injection Ignition Assisted Alcohol Engine, Society of Automotive Engineers, Inc., 29 Feb-5 Mar 1998, International Contress and Exposition in Detroit, MI, SAE World Headquarters, Warrendale, PA.	☐
	3	GRANDIN, B. et al., Knock Suppression in a Turbocharged SI Engine by Using Cooled EGR, Society of Automotive Engineers, Inc., 19-22 Oct 1998, International Fall Fuels & Lubricants Meeting and Exposition in San Francisco, CA, SAE World Headquarters, Warrendale, PA.	☐
	4	GRANDIN, B. et al., Replacing Fuel Enrichment in a Turbo Charged SI Engine: Lean Burn or Cooled EGR, Society of Automotive Engineers, Inc., 1999, SAE World Headquarters, Warrendale, PA.	☐
	5	STAN, C. et al., Internal Mixture Formation and Combustion-from Gasoline to Ethanol, Society of Automotive Engineers, Inc., 2001, SAE World Headquarters, Warrendale, PA.	☐

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

EXAMINER SIGNATURE

Examiner Signature	/Hai Huynh/ (11/24/2010)	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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /HHH/

ATTORNEY DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Daniel R. Cohn et al.	Examiner: Hai H. Huynh
Serial No.: 12/815842	Art Unit: 3747
Filing Date: June 15, 2010	Confirmation No.: 2175

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

AMENDMENT

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the office action mailed December 13, 2010, please amend the application as follows.

Listing of Claims

Claims 1 – 32 (cancelled)

33. (Currently Amended) A spark ignition engine system for which fuel is introduced into the engine from a first source and a liquid fuel is separately introduced into the engine from a second source by direct injection comprising:

a spark ignition engine;

a first means for introducing the fuel from the first source into the engine;

a second means for direct injection of the liquid fuel from the second source into the engine, wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid fuel that is directly injected from the second source; and

a fuel management system which varies the relative amount of the liquid fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system employs information from a knock detector and uses closed loop control to control the amount of directly injected liquid fuel from the second source; and

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

34. (Previously Presented) The engine system of claim 33, wherein the second source contains a liquid that could be employed to operate the engine without the addition of fuel from the first source.

35. (Previously Presented) The engine system of claim 33 or 34 , wherein the fuel from the second source is alcohol.

36. (Previously Presented) The engine system of claim 35, wherein the alcohol is methanol.

37. (Previously Presented) The engine system of claim 35, wherein the alcohol is ethanol.

38. (Previously presented) The engine system of claim 33 where an alcohol–water mixture is directly injected into the engine from the second source

39. (Previously Presented) The engine system of claim 33 or 34, wherein the engine is turbocharged or supercharged

40. (Previously Presented) The engine system of claim 33 or 34, wherein the fuel from the first source is gasoline.

41. (Currently Amended) The engine system of claim 33 or 34, wherein the liquid fuel from the second source is injected so as to result in a non-uniform distribution in the engine cylinder.

42. (Previously Presented) The engine system of claim 41, wherein the fuel from the second source is injected so as to be more concentrated near the periphery of the engine cylinder, and

the ratio of the energy of the fuel from the second source to fuel from the first source is sufficiently high to prevent knock but the alcohol energy fraction is reduced as compared to the situation using a uniform distribution.

43. (Previously Presented) The engine system of claim 33 or 34, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is directly injected into the engine using information from a knock sensor, and

wherein the relative amount of the fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

44. (Previously Presented) The engine system of claim 43 further including open loop control with a look up table.

45. (Previously Presented) The engine system of claim 33, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

46. (Currently Amended) A spark ignition engine system into which fuel is introduced into the engine from a first source and a liquid fuel from a second source is introduced into the engine comprising:

a spark ignition engine;

a means for introducing fuel into the engine from the first source;

a second means for introducing the liquid fuel from the second source into the engine wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid fuel from the second source; and

a fuel management system which varies the relative amount of the liquid fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system uses closed loop control to control the amount of fuel from the second source and employs information from a knock detector, and

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

47. (Previously Presented) The engine system of claim 46, wherein the second source contains a liquid which could be used to operate the engine without fuel from the first source

48. (Previously Presented) The engine system of claim 46 or 47, wherein the fuel from the second source is alcohol.

49. (Previously Presented) The engine system of claim 48, wherein the alcohol is methanol.

50. (Previously Presented) The engine system of claim 48, wherein the alcohol is ethanol.

51. (Previously Presented) The engine system of claims 46 or 47, wherein the second source contains a fuel which is an alcohol-water mixture.

52. (Previously Presented) The engine system of claims 46 or 47, wherein the engine is turbocharged to supercharged.

53. (Previously Presented) The engine system of claims 46 or 47, wherein the fuel from the first source is gasoline.

54. (Previously Presented) The engine system of claims 46 or 47, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is introduced into the engine using information from a knock sensor, and wherein

the relative amount of fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

55. (Previously Presented) The engine system of claim 54 further including open loop control with a look up table.

56. (Previously Presented) The engine system of claims 46 or 47, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

Remarks

Reexamination and reconsideration of the rejections are hereby requested.

Claims 33-56 are pending in this application and stand rejected based non-statutory obviousness type double patenting over US patent number 7,762,233 and United States patent number 7,740,004. In response to this rejection, enclosed herewith is a terminal disclaimer disclaiming the terminal portion of the two cited patents. It is submitted that the accompanying terminal disclaimer will overcome the double patenting rejection.

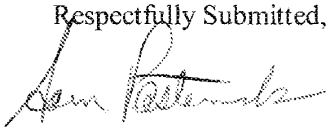
Claims 33-56 also stand rejected under 35 USC section 102(b) as being anticipated by US patent number 6,655,324. In response to this rejection, independent claims 33 and 46 have been amended to recite that the fuel from the second source is a liquid fuel. Support for this amendment may be found throughout the specification and in several of the originally filed claims.

The 6,655,324 patent that has been cited in rejecting the pending claims is directed to a hydrogen-enhanced gasoline engine system in which hydrogen gas is injected into the engine. In particular, the '324 patent teaches a gasoline engine system in which both gasoline and hydrogen gas are utilized. The hydrogen gas is used to control knock permitting a higher compression ratio to be used. It is important to recognize that this patent teaches only the introduction of gaseous hydrogen as the second fuel. There is absolutely no disclosure of anything other than a gaseous fuel. Because the independent claims have now been amended to recite that the second fuel is a liquid fuel, it is submitted that the 35 USC section 102(b) rejection is not sustainable and should be removed.

In view of the terminal disclaimer enclosed herewith and in view of the fact that the claims have been amended to eliminate the '324 patent as a proper anticipatory reference, it is

submitted that the pending claims are in condition for allowance and early favorable action is requested.

Respectfully Submitted,



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Cambridge, MA 02412
617.258.7171

PTO/SB/26 (07-09)
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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 11381.109439

In re Application of: Daniel R. Cohn et al.

Application No.: 12/815842

Filed: June 15, 2010

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL 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. 7762233 & 7740004 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:

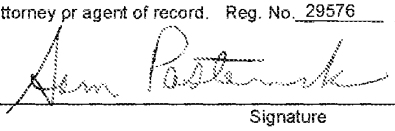
expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated 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 — January 14, 2011 (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.

Electronic Patent Application Fee Transmittal	
Application Number:	12815842
Filing Date:	15-Jun-2010
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:	11381.109439
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($)
Miscellaneous:				
Statutory or terminal disclaimer	1814	1	140	140
		Total in USD ($)		**140**

Electronic Acknowledgement Receipt	
EFS ID:	9231390
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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:	11381.109439
Receipt Date:	14-JAN-2011
Filing Date:	15-JUN-2010
Time Stamp:	10:41:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$140
RAM confirmation Number	8029
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 1.19 (Document supply 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	Amendment/Req. Reconsideration-After Non-Final Reject	11381109439amend.pdf	290175 a5335957ad1a4b8f97c9ae3364baef9f78c2fef5	no	7
Warnings:					
Information:					
2	Terminal Disclaimer Filed	11381109439termdisc.pdf	107641 f52bc7f4358a19422efdc236ec91c5ae4a0f2ef1	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	30240 abb144cd2b1d0bb599ddd18a19c8f3a527fc6012	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	428056		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
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/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/815,842	Filing Date 06/15/2010	☐ 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

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	01/14/2011	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 42	Minus	** 42	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $ =		OR	X $220=	0
	☐ 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	**0**

		(Column 1)		(Column 2)	(Column 3)					
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	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:
/STELLA LITTLE/

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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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

91197 7590 01/28/2011

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
HUYNH, HAI H	
ART UNIT	PAPER NUMBER
3747	

NOTIFICATION DATE	DELIVERY MODE
01/28/2011	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):

mitdocket@mit.edu
mjoyce@mit.edu

Office Action Summary	Application No.	Applicant(s)	
	12/815,842	COHN ET AL.	
	Examiner	Art Unit	
	Hai H. Huynh	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 *14 January 2011*.

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) *33-56* 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) *33-56* 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 _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Double Patenting

1. 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).

2. Claims 33-56 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 68-105 of copending Application No. 12/844,168. Although the conflicting claims are not identical, they are not patentably distinct from each other because they have the same scope.

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

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai H. Huynh whose telephone number is (571) 272-4844. The examiner can normally be reached on Monday through Thursday from 7:30 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen 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.

/Hai H. Huynh/
Primary Examiner, Art Unit 3747

Notice of References Cited	Application/Control No. 12/815,842	Applicant(s)/Patent Under Reexamination COHN ET AL.	
	Examiner Hai H. Huynh	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-2010/0288232 A1	11-2010	Bromberg et al.	123/445
	B	US-			
	C	US-			
	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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	7	(first or primary or main) same (second$3 or auxiliary) same fuel same knock$3 same liquid same (close$1 near loop)	US-PGPUB; USPAT	OR	OFF	2011/01/19 14:46
L2	0	(first or primary or main) same (second$3 or auxiliary) same fuel same knock$3 same liquid same (closed$1loop)	US-PGPUB; USPAT	OR	OFF	2011/01/19 14:46
L3	0	(first or primary or main) same (second$3 or auxiliary) same fuel same knock$3 same liquid same (close$1loop)	US-PGPUB; USPAT	OR	OFF	2011/01/19 14:46
L4	6111	((123/431) or (123/575) or (123/198A) or (123/435) or (123/1A) or (123/299) or (123/300) or (123/305) or (123/559.1)).CCLS.	US-PGPUB; USPAT	OR	OFF	2011/01/19 14:57
L7	4	l1 and l4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/01/19 14:58

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp

L5	13	((123/431) or (123/575) or (123/198A) or (123/435) or (123/1A) or (123/299) or (123/300) or (123/305) or (123/559.1)).CCLS.	UPAD	OR	OFF	2011/01/19 14:57
L6	4	(first or primary or main) same (second $3 or auxiliary) same fuel same knock$3 same liquid same (close$1 near loop)	USPAT; UPAD	OR	OFF	2011/01/19 14:57

1/19/11 2:59:10 PM
C:\Documents and Settings\hhuynh\My Documents\EAST\Workspaces\ - new text.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	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	11/24/2010	01/24/2011							
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
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	32	-	-							
	33	✓	✓							
	34	✓	✓							
	35	✓	✓							
	36	✓	✓							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	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	11/24/2010	01/24/2011							
	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
	40	✓	✓							
	41	✓	✓							
	42	✓	✓							
	43	✓	✓							
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	45	✓	✓							
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	47	✓	✓							
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	50	✓	✓							
	51	✓	✓							
	52	✓	✓							
	53	✓	✓							
	54	✓	✓							
	55	✓	✓							
	56	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

SEARCHED			
Class	Subclass	Date	Examiner
123	1A, 431, 198A, 575, 435, 299, 300, 305, 559.1	11/24/10	HHH
update	search	1/19/11	HHH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	11/24/10	HHH
	1/19/11	HHH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
above	search	11/24/10	HHH
		1/19/11	HHH

ATTORNEY DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Daniel R. Cohn et al. Examiner: Hai H. Huynh

Serial No.: 12/815842 Art Unit: 3747

Filing Date: June 15, 2010 Confirmation No.: 2175

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

AMENDMENT

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the office action mailed January 28, 2011, please consider the following remarks.

Remarks

Reexamination and reconsideration of the rejections are hereby requested.

Claims 33-56 are pending in this application and stand provisionally rejected based non-statutory obviousness type double patenting over claims 68-105 of copending Application number 12/844,168. In response to this rejection, enclosed herewith is a terminal disclaimer disclaiming the terminal portion of any patent issuing on Application number 12/844,168. It is submitted that the accompanying terminal disclaimer will overcome the double patenting rejection.

In view of the terminal disclaimer enclosed herewith it is submitted that the pending claims are in condition for allowance and early favorable action is requested.

Respectfully Submitted,

Sam Pasternack
Registration No.: 29576
Massachusetts Institute of Technology
One Cambridge Center, NE18-501
Cambridge, MA 02412
617.258.7171

PTO/SB/25 (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 PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION	Docket Number (Optional) 11381.109439

In re Application of: Daniel R. Cohn et al.

Application No.: 12/815842

Filed: June 15, 2010

For: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL 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 of any patent granted on pending **reference** Application Number 12/844168, filed on July 27, 2010, as such term is defined in 35 U.S.C. 154 and 173, and as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application. 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 any patent granted on the **reference** application 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 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 any patent granted on said **reference** application, "as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application," in the event that: any such patent: granted on the pending **reference** application: 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 shortened by any terminal disclaimer filed prior to its grant.

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 — February 24, 2011 (Date)

Sam Pasternack
Typed or printed name

617.258.7171
Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) is 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 statement. See MPEP § 324.

Electronic Patent Application Fee Transmittal	
Application Number:	12815842
Filing Date:	15-Jun-2010
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:	11381.109439
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($)
Miscellaneous:				
Statutory or terminal disclaimer	1814	1	140	140
		Total in USD ($)		**140**

Electronic Acknowledgement Receipt	
EFS ID:	9520400
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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:	11381.109439
Receipt Date:	24-FEB-2011
Filing Date:	15-JUN-2010
Time Stamp:	09:55:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$140
RAM confirmation Number	8672
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 1.19 (Document supply 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	Amendment/Req. Reconsideration-After Non-Final Reject	11381109439amend2.pdf	250155 926115200b6c769dba89ecdd13132673fa8a8f63	no	6
Warnings:					
Information:					
2	Terminal Disclaimer Filed	11381109439termdisc.pdf	104793 12be06b825857e500626523f35efd669c0ebd5e7	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	30240 304f5b083990293358ae5e756a6507aa4643e0f6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	385188		

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/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/815,842	06/15/2010	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ 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	02/24/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 42	Minus	** 42	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $ =		OR	X $220=	0
	☐ 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	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	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:
/JAMES MASON/

Listing of Claims

Claims 1 – 32 (cancelled)

33. (Previously Presented) A spark ignition engine system for which fuel is introduced into the engine from a first source and a liquid fuel is separately introduced into the engine from a second source by direct injection comprising:

a spark ignition engine;

a first means for introducing the fuel from the first source into the engine;

a second means for direct injection of the liquid fuel from the second source into the engine, wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid fuel that is directly injected from the second source; and

a fuel management system which varies the relative amount of the liquid fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system employs information from a knock detector and uses closed loop control to control the amount of directly injected liquid fuel from the second source; and

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

34. (Previously Presented) The engine system of claim 33, wherein the second source contains a liquid that could be employed to operate the engine without the addition of fuel from the first source.

35. (Previously Presented) The engine system of claim 33 or 34 , wherein the fuel from the second source is alcohol.

36. (Previously Presented) The engine system of claim 35, wherein the alcohol is methanol.

37. (Previously Presented) The engine system of claim 35, wherein the alcohol is ethanol.

38. (Previously presented) The engine system of claim 33 where an alcohol–water mixture is directly injected into the engine from the second source

39. (Previously Presented) The engine system of claim 33 or 34, wherein the engine is turbocharged or supercharged

40. (Previously Presented) The engine system of claim 33 or 34, wherein the fuel from the first source is gasoline.

41. (Previously Presented) The engine system of claim 33 or 34, wherein the liquid fuel from the second source is injected so as to result in a non-uniform distribution in the engine cylinder.

42. (Previously Presented) The engine system of claim 41, wherein the fuel from the second source is injected so as to be more concentrated near the periphery of the engine cylinder, and

the ratio of the energy of the fuel from the second source to fuel from the first source is sufficiently high to prevent knock but the alcohol energy fraction is reduced as compared to the situation using a uniform distribution.

43. (Previously Presented) The engine system of claim 33 or 34, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is directly injected into the engine using information from a knock sensor, and

wherein the relative amount of the fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

44. (Previously Presented) The engine system of claim 43 further including open loop control with a look up table.

45. (Previously Presented) The engine system of claim 33, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

46. (Previously Presented) A spark ignition engine system into which fuel is introduced into the engine from a first source and a liquid fuel from a second source is introduced into the engine comprising:

a spark ignition engine;

a means for introducing fuel into the engine from the first source;

a second means for introducing the liquid fuel from the second source into the engine wherein during part of the engine operating time, the engine receives both the fuel from the first source and the liquid fuel from the second source; and

a fuel management system which varies the relative amount of the liquid fuel from the second source that is introduced into the engine so as to prevent knock, wherein the fuel management system uses closed loop control to control the amount of fuel from the second source and employs information from a knock detector, and

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

47. (Previously Presented) The engine system of claim 46, wherein the second source contains a liquid which could be used to operate the engine without fuel from the first source

48. (Previously Presented) The engine system of claim 46 or 47, wherein the fuel from the second source is alcohol.

49. (Previously Presented) The engine system of claim 48, wherein the alcohol is methanol.

50. (Previously Presented) The engine system of claim 48, wherein the alcohol is ethanol.

51. (Previously Presented) The engine system of claims 46 or 47, wherein the second source contains a fuel which is an alcohol-water mixture.

52. (Previously Presented) The engine system of claims 46 or 47, wherein the engine is turbocharged to supercharged.

53. (Previously Presented) The engine system of claims 46 or 47, wherein the fuel from the first source is gasoline.

54. (Previously Presented) The engine system of claims 46 or 47, wherein the fuel management system employs a microprocessor for control of the relative amount of fuel from the second source that is introduced into the engine using information from a knock sensor, and wherein

the relative amount of fuel from the second source increases with increasing torque, and

wherein the fuel management system minimizes the amount of directly injected fuel from the second source that is used over a drive cycle.

55. (Previously Presented) The engine system of claim 54 further including open loop control with a look up table.

56. (Previously Presented) The engine system of claims 46 or 47, wherein spark retard is used and is varied according to the consumption of the fuel from the second tank.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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NOTICE OF ALLOWANCE AND FEE(S) DUE

91197 7590 04/15/2011
MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
HUYNH, HAI H	
ART UNIT	PAPER NUMBER
3747	

DATE MAILED: 04/15/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

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	NO	$1510	$300	$0	$1810	07/15/2011

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:

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If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

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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.

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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. 02/11)

PART B - FEE(S) TRANSMITTAL

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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 04/15/2011

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Cambridge, MA 02142-1493

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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.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

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	NO	$1510	$300	$0	$1810	07/15/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
HUYNH, HAI H	3747	123-431000

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 _____

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❑ 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.

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Typed or printed name _____ Registration No. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

91197 7590 04/15/2011

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
HUYNH, HAI H	
ART UNIT	PAPER NUMBER
3747	

DATE MAILED: 04/15/2011

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 0 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 0 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. 02/11)

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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.

Notice of Allowability	Application No. 12/815,842	Applicant(s) COHN ET AL.	
	Examiner Hai H. Huynh	Art Unit 3747	

-- 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 *terminal disclaimer filed 02-24-11*.

2. ☒ The allowed claim(s) is/are *33-56*.

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 _____.

/Hai H. Huynh/
Primary Examiner, Art Unit 3747

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	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	11/24/2010	01/24/2011	03/15/2011						
	1	-	-	-						
	2	-	-	-						
	3	-	-	-						
	4	-	-	-						
	5	-	-	-						
	6	-	-	-						
	7	-	-	-						
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	28	-	-	-						
	29	-	-	-						
	30	-	-	-						
	31	-	-	-						
	32	-	-	-						
	33	✓	✓	=						
	34	✓	✓	=						
	35	✓	✓	=						
	36	✓	✓	=						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	**Art Unit**
	Hai H Huynh	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	11/24/2010	01/24/2011	03/15/2011						
	37	✓	✓	=						
	38	✓	✓	=						
	39	✓	✓	=						
	40	✓	✓	=						
	41	✓	✓	=						
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	52	✓	✓	=						
	53	✓	✓	=						
	54	✓	✓	=						
	55	✓	✓	=						
	56	✓	✓	=						

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	**Art Unit**
	Hai H Huynh	3747

ORIGINAL		INTERNATIONAL CLASSIFICATION														
CLASS	SUBCLASS	CLAIMED						NON-CLAIMED								
123	431	F	0	2	B	7 / 02 (2006.01.01)										
CROSS REFERENCE(S)		F	0	2	B	13 / 00 (2006.01.01)										
		F	0	2	M	25 / 04 ()										
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															
123	198A	1A	575													

☒ 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	Final	Original
	1		17		33		49								
	2		18		34		50								
	3		19		35		51								
	4		20		36		52								
	5		21		37		53								
	6		22		38		54								
	7		23		39		55								
	8		24		40		56								
	9		25		41										
	10		26		42										
	11		27		43										
	12		28		44										
	13		29		45										
	14		30		46										
	15		31		47										
	16		32		48										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	24	
/Hai H Huynh/ Primary Examiner.Art Unit 3747	03-15-11	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12815842	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

SEARCHED			
Class	Subclass	Date	Examiner
123	1A, 431, 198A, 575, 435, 299, 300, 305, 559.1	11/24/10	HHH
update	search	1/19/11	HHH
123	525, 527, 27GE	3/15/11	HHH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	11/24/10	HHH
	1/19/11	HHH
	3/15/11	HHH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
above	search	11/24/10	HHH
		1/19/11	HHH
		3/15/11	HHH

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5	(first or primary or main) same (second$3 or auxiliary) same fuel same knock$3 same close$2loop	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/15 13:28
L2	23	(first or primary or main) same (second$3 or auxiliary) same fuel same knock$3 same (closed near loop)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/15 13:28
L3	7113	((123/1A) or (123/431) or (123/198A) or (123/575) or (123/435) or (123/299) or (123/300) or (123/305) or (123/559.1) or (123/525) or (123/527) or (123/27GE)). CCLS.	US-PGPUB; USPAT	OR	OFF	2011/03/15 13:41
L5	3	l1 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/15 13:42
L6	10	l2 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/15 13:42

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	13	((123/1A) or (123/431) or (123/198A) or (123/575) or (123/435) or (123/299) or (123/300) or (123/305) or (123/559.1) or (123/525) or (123/527) or (123/27GE)).CCLS.	UPAD	OR	OFF	2011/03/15 13:42

3/15/11 1:43:32 PM
C:\Documents and Settings\hhuynh\My Documents\EAST\Workspaces\- new text.wsp

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	12/815,842	COHN ET AL.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : 24 FEB 2011 & 14 JAN 2011	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
JAB TWO TDS APPROVED

U.S. Patent and Trademark Office

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

PTO/SB/08a (01-10)
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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12815842
Filing Date	2010-06-15
First Named Inventor	Daniel R. Cohn
Art Unit	3747
Examiner Name	HUYNH, HAI H
Attorney Docket Number	11381.109439

U.S.PATENTS

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	4993386		1991-02-19	Ozasa et al.	

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

U.S.PATENT APPLICATION PUBLICATIONS

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.

FOREIGN PATENT DOCUMENTS

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]
	1							☐

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

NON-PATENT LITERATURE DOCUMENTS

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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	HUYNH, HAI H
	Attorney Docket Number	11381.109439

	1		☐

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

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	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	HUYNH, HAI H
	Attorney Docket Number	11381.109439

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).

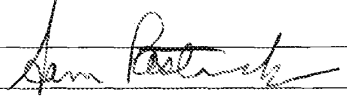
☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

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		Date (YYYY-MM-DD)	2011-05-09
Name/Print	Sam Pasternack	Registration Number	29576

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.**

Electronic Patent Application Fee Transmittal	
Application Number:	12815842
Filing Date:	15-Jun-2010
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/Ellen Byal
Attorney Docket Number:	11381.109439
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:	10046957
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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/Ellen Byal
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	11381.109439
Receipt Date:	09-MAY-2011
Filing Date:	15-JUN-2010
Time Stamp:	14:31:18
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	937
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 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	11381109439STATEMENT.pdf	66477 c5486484c8c0c26b3f3105c369fca77915f31060	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Filed (SB/08)	11381109439TRANS.pdf	130210 c916e7bb9e85d7ab9dd371d3465321b469d7b84a	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Fee Worksheet (PTO-875)	fee-info.pdf	30592 7b4687e3bfcfbdee945fee2eef7141bdca23d989	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	227279		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
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 DOCKET NO.: 11381.109439
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn	Examiner:	HUYNH, HAI H
Serial No.:	12/815842	Art Unit:	3747
Filing Date:	June 15, 2010	Confirmation No.:	2175
Title:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		

INFORMATION DISCLOSURE STATEMENT

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

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/08a. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue there from.

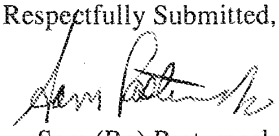
In accordance with 37 CFR 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of non-patent literature and a PCT Search report in accordance with 37 CFR 1.98(a)(2).

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.

If there is a fee occasioned by this communication, the director 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. 11381.109439.

Respectfully Submitted,



Sam (Bo) Pasternack
Registration Number: 29576
Massachusetts Institute of Technology
One Cambridge Center
Room NE18-501
Cambridge, MA 02142
617.258.7171

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.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

91197 7590 05/17/2011

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
HUYNH, HAI H	

ART UNIT	PAPER NUMBER
3747	

NOTIFICATION DATE	DELIVERY MODE
05/17/2011	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):

mitdocket@mit.edu
mjoyce@mit.edu

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
12815842	6/15/10	COHN ET AL.	11381.109439

MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
Cambridge, MA 02142-1493

EXAMINER	
Hai H.. Huynh	
ART UNIT	**PAPER**
3747	20110510

DATE MAILED:

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

Commissioner for Patents

The IDS filed May 9, 2011 has been considered.

attached 1449

/Hai H. Huynh/
Primary Examiner, Art Unit 3747

PTO-90C (Rev.04-03)

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

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	12815842
Filing Date	2010-06-15
First Named Inventor	Daniel R. Cohn
Art Unit	3747
Examiner Name	HUYNH, HAI H
Attorney Docket Number	11381.109439

U.S.PATENTS

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	4993386		1991-02-19	Ozasa et al.	

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

U.S.PATENT APPLICATION PUBLICATIONS

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					

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FOREIGN PATENT DOCUMENTS

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]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

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]

/Hai Huynh/ (05/10/2011)

EFS Web 2.1.17

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /HHH/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	HUYNH, HAI H
	Attorney Docket Number	11381.109439

	1		☐

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

EXAMINER SIGNATURE

Examiner Signature	/Hai Huynh/ (05/10/2011)	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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /HHH/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12815842
	Filing Date	2010-06-15
	First Named Inventor	Daniel R. Cohn
	Art Unit	3747
	Examiner Name	HUYNH, HAI H
	Attorney Docket Number	11381.109439

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.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

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		Date (YYYY-MM-DD)	2011-05-09
Name/Print	Sam Pasternack	Registration Number	29576

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.**

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
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Alexandria, Virginia 22313-1450
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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 04/15/2011
MIT's Technology Licensing Office
One Cambridge Center
Kendall Square, NE 18-501
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.

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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.
12/815,842	06/15/2010	Daniel R. Cohn	11381.109439	2175

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	NO	$1510	$300	$0	$1810	07/15/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
HUYNH, HAI H	3747	123-431000

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 Sam Pasternack
2 MIT's Technology Licensing Office
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): 77 Massachusetts Avenue Cambridge, MA 02139

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 192553 (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 5/31/11
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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Electronic Patent Application Fee Transmittal

Application Number:	12815842
Filing Date:	15-Jun-2010
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/Ellen Byal
Attorney Docket Number:	11381.109439

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:	10197586
Application Number:	12815842
International Application Number:	
Confirmation Number:	2175
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/Ellen Byal
Filer Authorized By:	Sam Pasternack
Attorney Docket Number:	11381.109439
Receipt Date:	31-MAY-2011
Filing Date:	15-JUN-2010
Time Stamp:	16:07:38
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	2947
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 1.21 (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)	11381109439NOA.pdf	129700 f36ba32ab9014cd491b3586ff06f9fce6078ee1f	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	32139 2718ed78fdbf4c89711e07ded704902537b27c7e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	161839		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
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/08a (01-10)
Approved for use through 07/31/2012 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	12815842
Filing Date	2010-06-15
First Named Inventor	Daniel R. Cohn et al.
Art Unit	3747
Examiner Name	Not Yet Assigned
Attorney Docket Number	11381.109439

U.S.PATENTS						
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	6990956		2006-01-31	Niimi	
Change(s) applied to document, /G.H./ 5/23/2011	2	~~4480861~~ 4,480,616		1984-11-06	Takeda	
	3	3106194		1963-10-08	Cantwell et al.	
	4	4721081		1988-01-26	Krauja et al.	
	5	6508233		2003-01-21	Suhre, B. et al.	
	6	6076487		2000-06-20	Wulff, J. et al.	
	7	6575147		2003-06-10	Wulff, J. et al.	
	8	6513505		2003-02-04	Watanabe et al.	

/Hai Huynh/ (11/24/2010)

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,842	07/05/2011	7971572	11381.109439	2175

91197 7590 06/15/2011

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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 0 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;