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. <u>See</u>, 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.

4394442v1

1 of 15

[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

3 of 15

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 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).

4394442v1

[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)

4394442v1

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

4394442v1

8 of 15

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.

4394442v1

11 of 15

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

12 of 15

4394442v1

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.

4394442v1

13 of 15

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.



FIG. 1



FIG. 2

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FIG. 4

2/3

Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines First Named Inventor: Daniel Cohn Attorney Docket No.: 0492611-0883

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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

<u>X</u> was filed on <u>November 18, 2004</u> as Application Serial No. <u>10/991,774</u> 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 A	pplication(s):	Priority Claimed						
(Number)	(Country)	(Day/Month/Year/Filed)	Yes	No				
(Number)	(Country)	(Day/Month/Year/Filed)	Yes	No				

Attorney Docket No.: 0492611-0598

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:

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(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.

Page 2 of 3

Attorney Docket No.: 0492611-0598

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0492611-0883 (MIT11381)				
		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:

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Application Da	ta Shoot 37 CEP 1 76	Attorney Docket Number	0492611-0883 (MIT11381)			
Application Data Sheet S7 CFR 1.76		Application Number				
Title of Invention	FUEL MANAGEMENT SYSTE ENGINES	EM FOR VARIABLE ETHANOL	OCTANE ENHANCEMENT OF GASOLINE			
Citizenship under	37 CFR 1.41(b) [†] US					

Mailing Address of Applicant:									
Address 1		218 Mill Street							
Address 2	2								
City	Newton			State	e/Province	МА			
Postal Code 02460			Cou	intryi	US				
All Inventors Must Be Listed - Additional Inventor Information blocks may be Add generated within this form by selecting the Add button.									

Correspondence Information:

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

Application Information:

Title of the Invention	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES							
Attorney Docket Number	0492611-0883 (MI⁻	Г11381)	Small Entity Status Claimed 🔀					
Application Type	Nonprovisional							
Subject Matter	Utility							
Suggested Class (if any)	123		Sub Class (if any) 198A					
Suggested Technology C	enter (if any)							
Total Number of Drawing Sheets (if any)		3	Suggested Figure for Publication (if any)	1				
Dublication Information:								

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.

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Representative	information	should be	provided 1	or all prac	titioners having a	a power o	of attorney	in the a	applic	ation.	Providing
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0492611-0883 (MIT11381)
		Application Number	
Title of Invention	FUEL MANAGEMENT SYST	EM FOR VARIABLE ETHANOL	OCTANE ENHANCEMENT OF GASOLINE
Customer Number 24280			

Domestic Benefit Information:

This section allows for the applicant to claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c). 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 Applicati	on Status	Pending				Rer	nove
Application Number Continuity Type		Prior Application Number Filing Date (YYYY-MM			te (YYYY-MM-DD)		
		Continuation of		11/840719 2007-08-17			
Prior Applicati	on Status	Patented				Rer	nove
Application Number	Con	tinuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Pat	ent Number	Issue Date (YYYY-MM-DD)
11/840719	Continua	tion of	10/991774	2004-11-18	731	14033	2008-01-01
Additional Domestic Priority Data may be generated within the Add button.			n this form by selecting	ļ	A	dd	

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).				
		Re	move	
Application Number	Country ⁱ	Parent Filing Date (YYYY-MM-DD)	Priority Claimed	
			🔿 Yes 💿 No	
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				

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

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0492611-0883 (MIT11381)
		Application Number	
Title of Invention	FUEL MANAGEMENT SYSTE ENGINES	EM FOR VARIABLE ETHANOL	OCTANE ENHANCEMENT OF GASOLINE

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

Add

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/SamPasternack/			Date (YYYY-MM-DD)	2008-12-08
First Name	Sam	Last Name	Pasternack	Registration Number	29576

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

Privacy Act Statement



Electronic Patent Application Fee Transmittal					
Application Number:					
Filing Date:					
Title of Invention:	FU EN	EL MANAGEMENT S HANCEMENT OF GA	SYSTEM FOR VA	RIABLE ETHANOL G ES	DCTANE
First Named Inventor/Applicant Name:	Da	niel R. Cohn			
Filer:	Sam Pasternack/Elyse Pino				
Attorney Docket Number:	04	92611-0883 (MIT11)	381)		
Filed as Small Entity					
Utility under 35 USC 111(a) Filing Fees					
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:					
Utility filing Fee (Electronic filing)		4011	1	82	82
Utility Search Fee		2111	1	270	270
Utility Examination Fee		2311	1	110	110
Pages:					
Claims:					
Claims in excess of 20		2202	34	26	884
Multiple dependent claims		2203	1	195	195
Miscellaneous-Filing:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
	Tot	al in USD	(\$)	1541

Electronic Acknowledgement Receipt			
EFS ID:	4408973		
Application Number:	12329729		
International Application Number:			
Confirmation Number:	9459		
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		
First Named Inventor/Applicant Name:	Daniel R. Cohn		
Customer Number:	24280		
Filer:	Sam Pasternack/Elyse Pino		
Filer Authorized By:	Sam Pasternack		
Attorney Docket Number:	0492611-0883 (MIT11381)		
Receipt Date:	08-DEC-2008		
Filing Date:			
Time Stamp:	11:16:23		
Application Type:	Utility under 35 USC 111(a)		

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Payment was	successfully received in RAM	\$1541			
RAM confirmation Number		5791			
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		specification_0492611_0883.	138694	Nor	15
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	Document De	scription	Start	E	nd
	Specificat	ion	1		10
	Claims		11		14
	Abstrac	t	15		15
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2	drawings dra		bead326ff63422d53405530651d277e4b42 de920	no	3
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2	Oath or Declaration filed		193110		3
5	Oath of Declaration filed	declaration_0492611_0596.pdf	4b62eb43f5b321b9ec1e20b6533b7b7011 3773e9	no	
Warnings:					
Information	:				
4	Application Data Sheet	ADS.pdf	1082541	no	5
			b5b02858277eb934587d9ae848de1f3e54b ff02c		
Warnings:					
Information	:	i	i		
5 Fee Worksheet (PTO-06)		fee-info.pdf	38164	no	2
			ceae427d2c89c05a321269ae945b718b20d 60707		
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		Total Files Size (in bytes)	: 15	68133	

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PTO/SB/06 (12-04)

Filing Date: 12/08/08

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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. Pater 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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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, Chestnut Hill, MA; Leslie BROMBERG, Sharon, MA; John B. HEYWOOD, Newton, 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 11/840,719 08/17/2007 which is a CON of 10/991,774 11/18/2004 PAT 7,314,033

Foreign Applications

If Required, Foreign Filing License Granted: 12/16/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/329,729**

Projected Publication Date: 04/02/2009

Non-Publication Request: No

Early Publication Request: No ** SMALL ENTITY **

page 1 of 3

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.

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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.

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Title

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Doc code :IDS

Doc description: Information Disclosure Statement (IDS) Filed

FORD Ex. 1019, page 36 IPR2019-01400

	PTO/SB/08a (08-08)
formation Disclosure Statement (IDS) Filed	Approved for use through 08/31/2008. OMB 0651-0031
normation Disclosure Statement (IDS) Flieu	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 Number 12329729 Filing Date 2008-12-08 **INFORMATION DISCLOSURE** First Named Inventor Daniel R. Cohn **STATEMENT BY APPLICANT** Art Unit 1797 (Not for submission under 37 CFR 1.99) **Examiner** Name not yet assigned 0492611-0883 Attorney Docket Number

U.S.PATENTS							Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Releva Figures	Columns,Lines where nt Passages or Relevant Appear
	1	2741230		1956-04-10	Reynolds, Blake		
	2	3106194		1963-10-08	Cantwell, et al.		
	3	3557763		1971-01-26	Probst, Stephen C.		
	4	4031864		1977-06-28	Crothers, William T.		
	5	4056087		1977-11-01	Boyce, Leonard D.		
	6	4230072		1980-10-28	Noguchi et al.		
	7	4312310		1982-01-26	Chivilo et al.		
	8	4402296		1983-09-06	Schwarz, Walter J.		
Application Number		12329729					
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Filing Date		2008-12-08					
First Named Inventor	Danie	IR. Cohn					
Art Unit		1797					
Examiner Name	not ye	et assigned					
Attorney Docket Number		0492611-0883					

9	4480616	1984-11-06	Takeda, Keiso	
10	4541383	1985-09-17	Jessel, Alfred J.	
11	4594201	1986-06-10	Phillips et al.	
12	4721081	1988-01-26	Krauja, et al.	
13	4958598	1990-09-25	Fosseen, Dwayne	
14	4967714	1990-11-06	Inoue, Ryuzaburo	
15	4974416	1990-12-04	Taylor, Jack R.	
16	5179923	1993-01-19	Tsurutani et al.	
17	5233944	1993-08-10	Mochizuki, Kenji	
18	5560344	1996-10-01	Chan, Anthony K.	
19	5911210	1999-06-15	Flach, Thomas A.	

Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor Danie		IR. Cohn		
Art Unit		1797		
Examiner Name	not ye	et assigned		
Attorney Docket Number		0492611-0883		

20	5937799	1999-08-17	Binion, W. Sidney	
21	6076487	2000-06-20	Wulff et al.	
22	6260525	2001-07-17	Moyer, David F.	
23	6287351	2001-09-11	Wulff, et al.	
24	6298838	2001-10-09	Huff, et al.	
25	6332448	2001-12-25	Ilyama, et al.	
26	6358180	2002-03-19	Kuroda et al.	
27	6508233	2003-01-21	Suhre et al.	
28	6513505	2003-02-04	Watanabe et al.	
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30	6561157	2003-05-13	zur Loye et al.	

Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor Danie		IR. Cohn		
Art Unit		1797		
Examiner Name	not ye	et assigned		
Attorney Docket Number		0492611-0883		

	31	6575147	2003-06-10	Wulff et al.	
	32	6622663	2003-09-23	Weissman et al.	
	33	6668804	2003-12-30	Dobryden, et al.	
	34	6725827	2004-04-27	Ueda et al.	
	35	6799551	2004-10-05	Nakakita et al.	
	36	6892691	2005-05-17	Uhl, et al.	
	37	6951202	2005-10-04	Oda, Tomihisa	
	38	6990956	2006-01-31	Niimi, Kuniaki	
	39	7021277	2006-04-04	Kuo et al.	
	40	7107942	2006-09-19	Weissman et al.	
	41	7156070	2007-01-02	Strom et al.	

Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor Danie		IR. Cohn		
Art Unit		1797		
Examiner Name	not ye	et assigned		
Attorney Docket Number		0492611-0883		

	42	7188607		2007-03-13	Kobayashi, Tatsuo	
	43	7320302		2008-01-22	Kobayashi, Tatsuo	
	44	3089470		1963-05-14	Payne, W.H.	
	45	4182278		1980-01-08	Coakwell, Charles A.	
	46	4993386		1991-02-19	Ozasa et al.	
	47	5497744		1996-03-12	Nagaosa et al.	
	48	5715788		1998-02-10	Tarr et al.	
	49	5983855		1999-11-16	Benedikt et al.	
	50	6073607		2000-06-13	Liber, Bruno	
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Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor Danie		IR. Cohn		
Art Unit		1797		
Examiner Name	not ye	et assigned		
Attorney Docket Number		0492611-0883		

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	1	A. MODAK and L.S. CARLETTO, "Engine Cooling by Direct Injection of Cooling Water," Society of Automotive Engineers, Inc., 700887.									
	2	JULIAN A. LoRUSSO ar Automotive Engineers, li 1998).	JULIAN A. LoRUSSO and HARRY A. CIKANEK, "Direct Injection Ignition Assisted Alcohol Engine," Society of Automotive Engineers, Inc., 880495, International Contress and Exposition in Detroit, Michigan (February 29-March 5, 1998).								
	3	BORJE GRANDIN, et al., "Knock Suppression in a Turbocharged SI Engine by Using Cooled EGR," Society of Automotive Engineers, Inc., 982476, International Fall Fuels and Lubricants Meeting and Exposition in San Francisco, California (October 19-22, 1998).									
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INFORMATION DISCLOSURE	Application Number		12329729	
	Filing Date		2008-12-08	
	First Named Inventor Daniel		el R. Cohn	
STATEMENT BY APPLICANT (Not for submission under 37 CER 1 99)	Art Unit		1797	
	Examiner Name not ye		yet assigned	
	Attorney Docket Numb	er	0492611-0883	

6	USPTO Non-Final Office Action, Application No. 10/991,774, April 25, 2006.	
7	USPTO Final Office Action, Application No. 10/991,774, September 27, 2006.	
8	USPTO Non-Final Office Action, Application No. 10/991,774, May 25, 2007.	
9	USPTO Non-Final Office Action, Application No. 11/100,026, August 3, 2006.	
10	FIKRET YUKSEL and BEDRI YUKSEL, "The Use of Ethanol-Gasoline Blend as a Fuel in an SI Engine," Renewable Energy, Vol. 29 (2004) pp. 1181-1191.	
11	USPTO Non-Final Office Action, Application No. 11/229,755, March 22, 2007.	
12	USPTO Non-Final Office Action, Application No. 11/229,755, October 4, 2007.	
13	USPTO Non-Final Office Action, Application No. 11/682,372, January 2, 2008.	
14	USPTO Final Office Action, Application No. 11/682,372, October 17, 2008.	
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16	PCT International Search Report and Written Opinion, Application No. PCT/IB07/03004, July 9, 2008.	

INFORMATION DISCLOSURE Application Number 12329729 Filing Date 2008-12-08 First Named Inventor Danie R. Cohn Art Unit 1797 Examiner Name not yet assigned Attorney Docket Number 0492611-0883

17	PCT International Search Report and Written Opinion, Application No. PCT/US07/05777, March 24, 2008.	
18	PCT International Search Report and Written Opinion, Application No. PCT/US07/74227, February 25, 2008.	
19	PCT International Search Report and Written Opinion, Application No. PCT/US08/69171, October 3, 2008.	
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22	H. J. Curran et al., "A comprehensive modeling study of iso-octane oxidation," Combustion and Flame 129:263-280 (2002) pp. 253-280.	
23	B. Lecointe and G. Monnier, "Downsizing a gasoline engine using turbocharging with direct injection" SAE paper 2003-01-0542.	
24	PCT International Search Report and Written Opinion, Appl. No. PCT/US05/041317, April 6, 2006.	
25	PCT International Search Report and Written Opinion, Appl. No. PCT/US06/012750, June 28, 2007.	
26	USPTO Notice of Allowance, Application No. 11/684,100, March 3, 2009.	
27	USPTO Non-Final Office Action, Application No. 11/840719, July 11, 2008.	

	Application Number		12329729	
	Filing Date		2008-12-08	
INFORMATION DISCLOSURE	First Named Inventor Daniel		el R. Cohn	
STATEIVIENT BY APPLICANT (Not for submission under 37 CER 1 99)	Art Unit		1797	
	Examiner Name	not ye	et assigned	
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¹ See Kind Codes of USPTO Patent Documents at <u>www.USPTO.GOV</u> 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.

	Application Number		12329729	
	Filing Date		2008-12-08	
INFORMATION DISCLOSURE	First Named Inventor Danie		el R. Cohn	
STATEMENT BY APPLICANT (Not for submission under 37 CER 1 99)	Art Unit		1797	
	Examiner Name not ye		yet assigned	
	Attorney Docket Numb	er	0492611-0883	
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	CERTIFICATION STATEMENT						
Plea	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	ł						
	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).						
X	See attached ce	rtification statement.					
	Fee set forth in 3	7 CFR 1.17 (p) has been submitted herewith					
	None None						
A si form	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.						
Sigr	nature	/John D. Lanza/	Date (YYYY-MM-DD)	2009-03-09			
Name/Print John D. Lanza Registration Number 40,060							

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- 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).
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- 6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
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ATTORNEY'S DOCKET NUMBER: 0492611-0883 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn U.S. App. No.: 12/329,729 Filing Date: December 8, 2008

Confirmation No.: 9459 Art Unit: 1797 Examiner: Not yet assigned

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

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

INFORMATION DISCLOSURE STATEMENT (IDS) LETTER WITH CERTIFICATION STATEMENT

Madam:

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

CERTIFICATION STATEMENT

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

37 CFR § 1.97 (b)(3), i.e. before the mailing of a first Office action on the merits.

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

1 of 2

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Attorney Docket No.: 0492611-0883

FORD Ex. 1019, page 47 IPR2019-01400 Additionally, the Applicant brings to the attention of the Examiner co-pending or prior U.S. patent applications: App. No. 10/991,774 now issued as patent No. 7,314,033; App. No. 11/100,026 now issued as patent No. 7,225,787; App. No. 11/229,755 now issued as patent No. 7,444,987; App. No. 11/840,719; App. No. 11/758,157; App. No. 11/871,384 and App. No. 12/020,285. Applicant also brings to the attention of the Examiner co-pending U.S. patent applications: App. No. 11/682,372; App. No. 11/683,564; App. No. 11/782,050; App. No. 11/684,100; and App. No. 12/167,534. Prosecution of these applications may have bearing on the above-identified application.

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

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

2 of 2

Respectfully submitted, CHOATE, HALL & STEWART LLP

Date: March 9, 2009

CHOATE, HALL & STEWART LLP Intellectual Property Two International Place Boston, MA 02110 /John D. Lanza/ John D. Lanza Registration No. 40,060

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

4425579v1

Attorney Docket No.: 0492611-0883

FORD Ex. 1019, page 48 IPR2019-01400 Doc code :IDS

Doc description: Information Disclosure Statement (IDS) Filed

FORD Ex. 1019, page 49 IPR2019-01400

ormation Disclosure Statement (IDS) Filed	U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE Application Number 12329729 Filing Date 2008-12-08 First Named Inventor Danie T. Cohn Art Unit 1797 Examiner Name not yet assigned Attorney Docket Number 0492611-0883

	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	6340015		2002-01-22	Benedikt et al.			
	2	6536405		2003-03-25	Rieger et al.			
	3	6745744		2004-06-08	Suckewer et al.			
	4	6748918		2004-06-15	Rieger et al.			
	5	6755175		2004-06-29	McKay et al.			
	6	6955154		2005-10-18	Douglas, Denis			
	7	7013847		2006-03-21	Auer, Gerhard			
	8	7077100		2006-06-18	Vogel et al.			

PTO/SB/08a (08-08) Approved for use through 08/31/2008. OMB 0651-0031

Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor	Danie	IR. Cohn		
Art Unit		1797		
Examiner Name	not ye	et assigned		
Attorney Docket Numb	er	0492611-0883		

	9	7086376		2006-08	3-08	McKay, Michael					
	10	7201136		2007-04	I-10	McKay et al.					
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Application Number		12329729			
Filing Date		2008-12-08			
First Named Inventor	Danie	I.R. Cohn			
Art Unit		1797			
Examiner Name	not ye	at assigned			
Attorney Docket Numb	er	0492611-0883			

EXAMINER SIGNATURE						
Examiner Signature		Date Considered				
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	Examiner Name not ye		yet assigned	
	Attorney Docket Numb	er	0492611-0883	
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		CERTIFICATION	I STATEMENT			
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×	See attached ce	rtification statement.				
	Fee set forth in 3	37 CFR 1.17 (p) has been submitted herewith	n.			
	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		/John D. Lanza/	Date (YYYY-MM-DD)	2009-03-09		
Name/Print		John D. Lanza	Registration Number	40,060		
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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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Electronic Acknowledgement Receipt			
EFS ID:	4926174		
Application Number:	12329729		
International Application Number:			
Confirmation Number:	9459		
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES		
First Named Inventor/Applicant Name:	Daniel R. COHN		
Customer Number:	24280		
Filer:	John D. Lanza/Kimberly Hutchins		
Filer Authorized By:	John D. Lanza		
Attorney Docket Number:	0492611-0883 (MIT11381)		
Receipt Date:	09-MAR-2009		
Filing Date:	08-DEC-2008		
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Application Type:	Utility under 35 USC 111(a)		

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File Listing:						
Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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15	NPL Documents	OA_11682372_080102.pdf	22b91e17f637a0852a3c71df458fc11d3d68 1d15	no	0
Warnings:			1		
Information					
14	NPL Documents	04 11602272 001017 pdf	224290	no	7
14		OA_11682372_081017.pdf	a43b3f989531ed41309ab0b8786956867e0 12b25		
Warnings:			·		
Information:					
15	NPL Documents	OA_11684100_080603.pdf	173736	no 7	5
			77770bea940bccb062e999c50c5619b3b37 ea294		
Warnings:					
Information:					
16	NPL Documents	ISR_WO_PCTIB0703004.pdf	679100	no	10
			16908fda10dae50c49e01269a4a5b48360c 842cd		
Warnings:					•
Information					
17	NDI Desumente		919580	no	9
17	NPL Documents	ISR_WO_PCTUSU/US///.pdf	2b0a668424c2c2c5c838d785348650e599f dfaab		
Warnings:			•	I	•
Information:					
			426322		
18	NPL Documents	ISR_WO_PCTUS0774227.pdf	b525a57242d868818b39c28e98568fb2b3d ea003	no	6
Warnings:			I		
Information	:				
		ISR_WO_PCTUS0869171.pdf	923993	- no	11
19	NPL Documents		3ae57dd406fadef0dacd64932deba474b30 b52c3		
Warnings:	l		1		<u> </u>
Information:	2				

20	NPL Documents Herwood 1988 pdf	137182	no	3	
	NPL Documents	neywood_1988.pdf	15361cbd29422d427bd73a946f8ad82216b dc064		5
Warnings:					•
Information:					
21		Stakes 2000 pdf	1206260		12
21	NEL Documents	Stokes_2000.put	a25bd86aeb6dedb75dd6be1adad10c150d b16bf9		12
Warnings:				I	•
Information:	;				
		5 0000 K	2621607		
22	NPL Documents	Curran_2002.pdf		no	28
Warnings:			I		I
Information:	:				
			1359043		12
23	NPL Documents	Lecointe_2003.pdf	e 1584f91a0bf4705bc3004cfcb061a426a6d 46ee	no	
Warnings:				•	•
Information:					
	NPL Documents I	ISR_WO_pctus05041317.pdf	592173	no	
24			89b76226212e5c99ba140d9a3591bde3a31 62c0f		8
Warnings:				I	
Information					
	NPL Documents	ISR_WO_pctus06012750.pdf	480648	- no	7
25					
Warnings:					
- Information:					
			323701	no	7
26	NPL Documents	NOA_11684100_090303.pdf	e5fe1cee0fc6d5cfca3b2f6be9b53ae18ed03		
Warnings:			8,0		
- Information:					
			419178		
27	NPL Documents	OA_11840719_071108_2.pdf		no	6
			5055f		
warnings:					
Information:					
28	Information Disclosure Statement Letter	IDS_ltr_0492611_0883.pdf	79817	no	2
			e93e0c2bc145e0910ba989989f38dd6a3e6 ae0fd		
Warnings:					
Information:					

29	Information Disclosure Statement (IDS)	1396100 US_IDS_FormSB_08a_1.pdf		no	11	
	Filed (SB/08)	<u>-</u>	017a86ae8aaa4b41251d4c6f1bab0e37b5f 3aa44			
Warnings:			·		•	
Information						
30	Information Disclosure Statement (IDS) Filed (SB/08)	US_IDS_FormSB_08a_2.pdf -	863472	no	5	
			47c325b8d4700974ec24f8bc4175a4cc21b 0bc81			
Warnings:						
Information	:					
		Total Files Size (in bytes)	: 32	805469		
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.						

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.

PCT/IB2007 03004 09.07.2008

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PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

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To: SAM PASTERNACK	PCT			
CHOATE, HALL & STEWART TWO INTERNATIONAL PLACE BOSTON, MA 02110	NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION			
· · · ·	(PCT Rule 44.1)			
	Date of mailing (day/month/year) 0 9 JUL 2008			
Applicant's or agent's file reference 2006734-0002	FOR FURTHER ACTION See paragraphs 1 and 4 below			
International application No. PCT/IB07/03004	International filing date (<i>day/month/year</i>) 06 March 2007 (06.03.2007)			
Applicant ETHANOL BOOSTING SYSTEMS. LLC				
1. The applicant is hereby notified that the international sea have been established and are transmitted herewith.	arch report and the written opinion of the International Searching Authority			
Filing of amendments and statement under Article 19 The applicant is entitled, if he so wishes, to amend the cl	: aims of the international application (see Rule 46):			
When? The time limit for filing such amendments i search report.	s normally two months from the date of transmittal of the international			
Where? Directly to the International Bureau of WIP 1211 Geneva 20, Switzerland, Facsimile No	O, 34 chemin des Colombettes .: (41-22) 338.82.70.			
For more detailed instructions, see the notes on the	accompanying sheet.			
2. The applicant is hereby notified that no international sea Article 17(2)(a) to that effect and the written opinion oft	rch report will be established and that the declaration under he International Searching Authority are transmitted herewith.			
3. With regard to the protest against payment of (an) add	itional fee(s) under Rule 40.2, the applicant is notified that:			
the protest together with the decision thereon has be request to forward the texts of both the protest and	een transmitted to the International Bureau together with the applicant's the decision thereon to the designated Offices.			
no decision has been made yet on the protest; the ap	pplicant will be notified as soon as a decision is made.			
4. Reminders				
Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of the technical prenarations for international publication.				
The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.				
Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.				
In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.				
See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the PCT Applicant's Guide, Volume II, National Chapters and the WIPO Internet site.				
Name and mailing address of the ISA/US	Authorized officer			
Mail Stop PC1, Attn: ISA/US Commissioner for Patents P.O. Box 1450	Stephen K Cronin (CMMCHetter			
Alexandria, Virginia 22313-1450 Telephone No. (571) 272-4383 Facsimile No. (571) 273-3201 Telephone No. (571) 272-4383				
Form PCT/ISA/220 (January 2004)	(See notes on accompanying sheet)			

PCT/IB2007 03004 09.07.2008

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2006734-0002	FOR FURTHER see ACTION as well as, who	Form PCT/ISA/220 ere applicable, item 5 below			
International application No. PCT/IB07/03004	International filing date (<i>day/month/year</i>) 06 March 2007 (06.03.2007)	(Earliest) Priority Date (day/month/year) 08 March 2006 (08.03.2006)			
Applicant ETHANOL BOOSTING SYSTEMS. LLC					
This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.					
the international a	application in the language in which it was file	zd			
a translation of th of a translation fu	e international application into	h (Rules 12.3(a) and 23.1(b))			
b. This international search rep authorized by or notified to t	ort has been established taking into account the this Authority under Rule 91 Rule 43.6 bis(a)	e rectification of an obvious mistake			
c. With regard to any nucleotic	le and/or amino acid sequencedisclosed in th unsearchable (See Box No. II)	ne international application, see Box No. I.			
3. Unity of invention is lackin	g(See Box No. III)	· · · ·			
the text is approved as subm	itted by the applicant.				
the text has been established	by this Authority to read as follows:				
5. With regard to the abstract,					
the text is approved as subm	itted by the applicant.				
the text has been established may, within one month from	, according to Rule 38.2(b), by this Authority a the date of mailing of this international search	as it appears in Box No. IV. The applicant a report, submit comments to this Authority.			
6. With regard to the drawings , a. the figure of the drawings to be p as suggested by the as selected by this A as selected by this A	published with the abstract is Figure No. <u>1</u> applicant. Authority, because the applicant failed to sugge Authority, because this figure better characteriz published with the abstract	est a figure. zes the invention.			
D none of the rightes is to be published with the abstract.					

PCT/IB2007 03004 09.07.2008

	ΙΝΤΈΝΙΑΤΙΟΝΙΑΙ ΟΓΑΡΟΊΙ ΡΕΡΟΙ)T	ication No.				
	INTERNATIONAL SEARCH REPOR						
A. CLAS	SIFICATION OF SUBJECT MATTER		1.1.01/100004				
n c.	F02M 1//00(2000.01)						
USPC: According to	USPC: 123/447 According to International Patent Classification (IPC) or to both national classification and IPC						
B. FIELI	DS SEARCHED						
Minimum doo U.S. : 12	Minimum documentation searched (classification system followed by classification symbols) U.S. : 123/447						
Documentatio	on searched other than minimum documentation to the	extent that such doc	uments are included in	the fields searched			
Flantania de	to been executed during the intermetional second (news	of data hase and w	here prostiable score	h terms used)			
EAST	ta base consulted during the international search (name	o o data base and, w	nere practicable, searc				
C. DOCI	JMENTS CONSIDERED TO BE RELEVANT			·			
Category *	Citation of document, with indication, where a	ppropriate, of the re	levant passages	Relevant to claim No.			
A	US 2005/0056264 A1, (WEISSMAN et al) 17 Marc	h 2005, Figure 2, cl	aim 11.	1-15			
A	US 5,560,344 A (CHAN) 1, October 1996 (01.10.19	96), whole documer	ıt.	1-15			
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		•					
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Further	documents are listed in the continuation of Box C.	"T" later dage	ment published after the inte	mational filing date or priority			
"A" document	t defining the general state of the art which is not considered to be of	date and principle	not in conflict with the applic or theory underlying the invo	ation but cited to understand the			
"E" carlier ap	plication or patent published on or after the international filing date	"X" documen considere when the	t of particular relevance; the d novel or cannot be conside document is taken alone	claimed invention cannot be red to involve an inventive step			
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		"Y" documen considere with one	t of particular relevance; the ed to involve an inventive ste or more other such documen	claimed invention cannot be p when the document is combined ts, such combination being			
"O" document	t referring to an oral disclosure, use, exhibition or other means	obvious t	o a person skilled in the art				
"P" document priority d	t published prior to the international filing date but later than the ate claimed	"&" documen	t member of the same patent	family			
Date of the a	ctual completion of the international search		r the international sear 2008	cn report			
Name and ma	ailing address of the ISA/US	Authorized office	r 🔿				
Maine and Ina Maine Cor	il Stop PCT, Attn: ISA/US nmissioner for Patents	Stephen K Cronin	a Gruer	Vealte			
P.O Ale Facsimile No	7. Box 1450 xandria, Virginia 22313-1450 6. (571) 273-3201	Telephone No. (5	571) 272-4383	Jey			
orm PCT/ISA/210 (second sheet) (April 2007)							

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PCT/IB2007/(3004 09.07.2008

PATENT COOPERATION TREATY

To: SAM PASTERNACK CHOATE, HALL & STEWART TWO INTERNATIONAL PLACE BOSTON, MA 02110 THE IN THE WRI SEARCHI	From the INTERNATIONAL SEARCHING AUTHORITY	
	To: SAM PASTERNACK CHOATE, HALL & STEWART TWO INTERNATIONAL PLACE BOSTON, MA 02110	NOTIFI THE INTER THE WRITTE SEARCHING

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FILE COPY

PCT

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

(PCT Rule 44.1)

	· · · · · · · · · · · · · · · · · · ·				
	Date of mailing				
	(day/month/year)				
Applicant's or agent's file reference 2006734-0002	FOR FURTHER ACTION See paragraphs 1 and 4 below				
International application No.	International filing date				
Applicate	(<i>aay/monin/year</i>) 06 March 2007 (06.03.2007)				
ETHANOL BOOSTING SYSTEMS, LLC	·				
1. The applicant is hereby notified that the international sea have been established and are transmitted herewith.	rch report and the written opinion of the International Searching Authority				
Filing of amendments and statement under Article 19 The applicant is entitled, if he so wishes, to amend the cla	: ims of the international application (see Rule 46):				
When? The time limit for filing such amendments is search report.	normally two months from the date of transmittal of the international				
Where? Directly to the International Bureau of WIP(1211 Geneva 20, Switzerland, Facsimile No), 34 chemin des Colombettes .: (41-22) 338.82.70.				
For more detailed instructions, see the notes on the a	ccompanying sheet.				
2. The applicant is hereby notified that no international sear Article 17(2)(a) to that effect and the written opinion of t	ch report will be established and that the declaration under he International Searching Authority are transmitted herewith.				
3. With regard to the protest against payment of (an) addi	tional fee(s) under Rule 40.2, the applicant is notified that:				
the protest together with the decision thereon has be request to forward the texts of both the protest and t	en transmitted to the International Bureau together with the applicant's be decision thereon to the designated Offices				
no decision has been made yet on the protest; the ap	plicant will be notified as soon as a decision is made.				
4. Reminders					
Shortly after the expiration of 18 months from the priority dat Bureau. If the applicant wishes to avoid or postpone publicati priority claim, must reach the International Bureau as provided i technical preparations for international publication.	e, the international application will be published by the International on, a notice of withdrawal of the international application, or of the n Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of the				
The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.					
Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.					
In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.					
See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the PCT Applicant's Guide, Volume II, National Chapters and the WIPO Internet site.					
Name and mailing address of the ISA/ US	Authorized officer				
Mail Stop PCT, Attn: ISA/US	Stephen K Cronin				
P.O. Box 1450					
Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Telephone No. (571) 272-4383				
Form PCT/ISA/220 (January 2004)	(See notes on accompanying sheet)				

PCT/IB2007/ 3004 09.07.2008

PATENT COOPERATION TREATY



PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2006734-0002	FOR FURTHER see ACTION as well as, who	Form PCT/ISA/220 ere applicable, item 5 below.				
International application No. PCT/IB07/03004	International filing date (<i>day/month/year</i>) 06 March 2007 (06.03.2007)	(Earliest) Priority Date (day/month/year) 08 March 2006 (08.03.2006)				
Applicant ETHANOL BOOSTING SYSTEMS. LLC	Applicant ETHANOL BOOSTING SYSTEMS. LLC					
This international search report has been according to Article 18. A copy is being This international search report consists It is also accompanied 1. Basis of the Report	prepared by this International Searching Au transmitted to the International Bureau. of a total of sheets. by a copy of each prior art document cited	thority and is transmitted to the applicant in this report.				
a. With regard to the language, the the international	international search was carried out on the bas application in the language in which it was file	is of: .d.				
a translation of the of a translation fit	e international application into	h (Rules 12.3(a) and 23.1(b))				
b This international search rep authorized by or notified to the	ort has been established taking into account th this Authority under Rule 91 Rule 43.6 bis(a)	e rectification of an obvious mistake				
c. With regard to any nucleotic 2. Certain claims were found	de and/or amino acid sequence disclosed in th unsearchable (See Box No. II)	he international application, see Box No. I.				
3. Unity of invention is lackin 4. With regard to the title.	3. Unity of invention is lacking (See Box No. III)					
the text is approved as subm	itted by the applicant.					
the text has been established	by this Authority to read as follows:					
5. With regard to the abstract,						
the text is approved as subm the text has been established may, within one month from	itted by the applicant. , according to Rule 38.2(b), by this Authority the date of mailing of this international search	as it appears in Box No. IV. The applicant a report, submit comments to this Authority.				
 6. With regard to the drawings, a. the figure of the drawings to be as suggested by the 	published with the abstract is Figure No. <u>1</u>					
as selected by this A	Authority, because the applicant failed to sugge	est a figure.				
as selected by this Authority, because this figure better characterizes the invention.						

Form PCT/ISA/210 (first sheet) (April 2007)

PCT/IB2007/()004 09.07.2008

INTERNATIONAL SEARCH REPOR		RT Internationallapp		Interior No IPY	
A. CLASS	SIFICATION OF SUBJECT MATTER	****	rembeneser		
IPC:	F02M 17/00(2006.01)				
USPC: 123/447 According to International Patent Classification (IPC) or to both national classification and IPC					
B. FIELD	B. FIELDS SEARCHED				
Minimum docu U.S. : 123	umentation searched (classification system followed b //447	y classificatio	n symbols)		
Documentation	n searched other than minimum documentation to the	extent that su	ch documents are included ir	the fields searched	
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST				h terms used)	
C. DOCU	MENTS CONSIDERED TO BE RELEVANT				
Category *	Citation of document, with indication, where a	ppropriate, of	the relevant passages	Relevant to claim No.	
A	US 2005/0056264 A1, (WEISSMAN et al) 17 Marc	n 2005, Figur	e 2, claim 11.	1-15	
A US 5,560,344 A (CHAN) 1, October 1996 (01.10.1996), whole document. 1-15			1-15		
Further c	documents are listed in the continuation of Box C.		e patent family annex.		
* Spe "A" document d	ceial categories of cited documents: lefining the general state of the art which is not considered to be of levance	"T" la d P	tter document published after the inter ate and not in conflict with the applica rinciple or theory underlying the inver	mational filing date or priority ation but cited to understand the ntion	
"E" earlier appl	ication or patent published on or after the international filing date	"X" d	ocument of particular relevance; the c onsidered novel or cannot be consider	laimed invention cannot be red to involve an inventive step	
"L" document w establish the specified)	which may throw doubts on priority claim(s) or which is cited to e publication date of another citation or other special reason (as	"Y" đ ci W	ocument of particular relevance; the c onsidered to involve an inventive step with one or more other such documents	laimed invention cannot be when the document is combined s, such combination being	
"O" document r	eferring to an oral disclosure, use, exhibition or other means	0	bvious to a person skilled in the art		
"P" document p priority date	"P" document published prior to the international filing date but later than the "&" document member of the same patent family priority date claimed		amily		
Date of the actual completion of the international search		Date of mai	ling of the international searc	ch report .	
08 June 2008 ((08.06.2008) ling address of the ISA/US	Authorized	officer n		
Mail	Stop PCT, Attn: ISA/US	Stanhan V	Crossin Hole		
Comr P.O. 1 Alexe	missioner for Patents Box 1450 andria, Virginia 22313-1450	Telephone 1	No. (571) 272-4383		
racsimile No.	(5/1) 2/3-3201				

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Form PCT/ISA/210 (second sheet) (April 2007)

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PCT/IB2007/ 3004 09.07.2008

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHOR	ITY		FILE COPY
To: SAM PASTERNACK CHOATE, HALL & STEWART TWO INTERNATIONAL PLACE BOSTON, MA 02110		WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	
			(PCT Rule 43bis.1)
		Date of mailing	
Applicant's or agent's file reference		FOR FURTHER ACTION	
2006734-0002			See paragraph 2 below
International application No.	nternational filing date	(day/month/year)	Priority date (day/month/year)
PCT/IB07/03004 0	6 March 2007 (06.03.2	007)	08 March 2006 (08.03.2006)
International Patent Classification (IPC) or I	both national classification	ion and IPC	
IPC: Please See Continuation Sheet USPC: 123/447.1A.300.304.431.478.575.	.577.198C.198A:701/10)1	
Applicant			
ETHANOL BOOSTING SYSTEMS. LLC			
1. This opinion contains indications relation	ng to the following item	S:	
Box No. I Basis of the op	oinion		
Box No. II Priority			
Box No. III Non-establish	ment of opinion with reg	gard to novelty, inve	ntive step and industrial applicability
Box No. IV Lack of unity	Box No. IV Lack of unity of invention		
Box No. V Reasoned statement under Rule 43 <i>bis</i> .1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
Box No. VI Certain docum	ients cited		
Box No. VII Certain defect	Box No. VII Certain defects in the international application		
Box No. VIII Certain observ	rations on the internation	nal application	
2. FURTHER ACTION			
If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.			
If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.			
For further options, see Form PCT/ISA/220.			
3. For further details, see notes to Form PCT/ISA/220.			
Name and mailing address of the ISA/US Date of completion of this opinion Authorized officer			
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450	08 June 2008 (0	08.06.2008)	Stephen K Cronin
Atexandria, Virginia 22313-1430 Telephone No. (571) 272-4383 Facsimile No. (571) 273-3201 Telephone No. (571) 272-4383			

PCT/IB2007/ 3004 09.07.2008

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	International application No. FILLE COPY PCT/IB07/03004
Box No. I Basis of this opinion	
 With regard to the language, this opinion has been established on the basis of: the international application in the language in which it was filed a translation of the international application into, which is the languinternational search (Rules 12.3(a) and 23.1(b)). This opinion has been established taking into account the rectification of Authority under Rule 91 (Rule 43bis.1(a)) With regard to any nucleotide and/or amino acid sequence disclosed in the established on the basis of: 	uage of a translation furnished for the purposes of Fan obvious mistake authorized by or notified to this ae international application, this opinion has been
 a. type of material a sequence listing table(s) related to the sequence listing 	
 b. format of material on paper in electronic form 	
 c. time of filing/furnishing contained in the international application as filed. filed together with the international application in electronic form. furnished subsequently to this Authority for the purposes of search. 	
4. In addition, in the case that more than one version or copy of a sequence or furnished, the required statements that the information in the subseq application as filed or does not go beyond the application as filed, as appr	listing and/or table(s) relating thereto has been filed uent or additional copies is identical to that in the opriate, were furnished.
5. Additional comments:	
Form PCT/ISA (227/Day No. D. (Angil 2002)	

PCT/IB2007/()004 09.07.2008

INTERNATIONAL SEARCHING AUTHORITY			
Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
1. Statement			
Novelty (N)	Claims 1-15		V
	Claims <u>NONE</u>		N
Inventive step (IS)	Claims 1-15		Y
	Claims NONE		N
Industrial applicability (IA)	Claims <u>1-15</u>		Y
	Claims NONE		N
2 Citations and evaluations:			
Claims 1-15 meet the criteria set out in PCT Article	e 33(2)-(3), because the prio	r art does not teach or fairly suggest cl	aimed inventio
		· - · · · · · · · · · · · · · · · · · ·	
Claim 1-15 meet the criteria set out in PCT Article 3 be made or used in industry.	33(4), and thus have industri	ial applicability because the subject ma	tter claimed ca

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PCT/IB2007/ 3004 09.07.2008

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No PCT/IB07/03004 DPY

Supplemental Box In case the space in any of the preceding boxes is not sufficient.

Continuation of IPC: F02M 63/00(2006.01),43/00(2006.01);F02B 47/00(2006.01),47/04(2006.01),13/00(2006.01),13/10(2006.01)

Form PCT/ISA/237 (Supplemental Box) (April 2007)

PATENT COOPER	RATION TREASE MAR 2 6 2008		
From the INTERNATIONAL SEARCHING AUTHORITY			
To: Sam Pasternack Choate, Hall & Stewart Two International Place Boston, Massachusetts 02110	PCT NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION (PCT Rule 44.1)		
	Date of mailing (day/month/year)		
Applicant's or agent's file reference	FOR FUE ACTION See paragraphs 1 and 4 below		
International application No. PCT/US 07/05777	International filing date (day/month/year) 08 March 2007 (08.03.2007)		
Applicant Ethanol Boosting Systems, LLC			
Authonity have been established in and an diminate intermittice 19: Filing of amendments and statement under Article 19: The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46): When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report. Wher? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 740 14 35 For more detailed instructions, see the notes on the accompanying sheet. 2. The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith. 3. With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that: applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices. applicant's request to forward the texts of both the protest and the decision will be published by the International Bureau. If the applicant, must reach the International Bureau as provided in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of 18 months from the priority date, the international application, will be published by the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international Bureau, submit comments on an informal basis on the written opinion of the Inter			
Name and mailing address of the ISA/OS Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774		
Form PCT/ISA/220 (January 2004)	(See notes on accompanying shee		

2006734-0013

PATENT COOPERATION TREAMY

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From the INTERNATIONAL SEARCHING AUTHORITY				
To: Sam Pasternack Choate, Hall & Stewart Two International Place	РСТ			
Boston, Massachusetts 02110	NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION			
	(PCT Rule 44.1)			
	Date of mailing (day/month/year) 24 MAR 2008			
Applicant's or agent's file reference	FOR FURTHER ACTION See paragraphs 1 and 4 below			
International application No.	International filing date (day/month/year) 08 March 2007 (08.03.2007)			
Ampliant Ethanol Boosting Systems LLC				
Applicant Entanoi Doosting Oyotomo, 220				
1. X The applicant is hereby notified that the international s Authority have been established and are transmitted he	search report and the written opinion of the International Searching erewith.			
Filing of amendments and statement under Article The applicant is entitled, if he so wishes, to amend the	19: claims of the international application (see Rule 46):			
When? The time limit for filing such amendminiterrational search report.	ents is normally two months from the date of transmittal of the			
Where? Directly to the International Bureau of W	IPO, 34 chemin des Colombertes) CKCLCO No.: +41 22 740 14 35 Image: Colombertes)			
For more detailed instructions, see the notes on the accompanying sheet. DUE <u>Article 19 Amont</u> 5/24/58 The applicant is hereby notified that no international search report will be established and that the declaration under MPL				
Article $17(2)(a)$ to that effect and the written opinion of the International Searching Authority are transmitted network.				
3. With regard to the protest against payment of (any of the protest together with the decision thereon	has been transmitted to the International Bureau together with the			
applicant's request to forward the texts of both the protest and the decision thereon to the designated offices.				
A Reminders				
4. Reminters Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, application, of the priority claim, must reach the International Bureau as provided in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively,				
The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the nublic but not before the expiration of 30 months from the priority date.				
Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.				
In respect of other designated Offices, the time limit of 30 months (or later) will apply even it no demand is filed within 19 months.				
See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the PCT Applicant's Guide, Volume II, National Chapters and the WIPO Internet site.				
Name and mailing address of the ISA/US				
Mail Stop PCT, Attn: ISA/US Commissioner for Patents	Lee W. Young MAR 2 6 2008			
P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774			
D D D D D D D D D D D D D D D D D D D	(See notes on-ddcompanythg sheet)			

Form PCT/ISA/220 (January 2004)

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PATENT COOPERATION TREFAXY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2006734-0003PC	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No.	International filing date (day/m	conth/year) (Earliest) Priority Date (day/month/year)
PCT/US 07/05777	08 March 2007 (08.03.2007)	10 March 2006 (10.03.2006)
Applicant Ethanol Boosting Systems, LLC	·	
This international search report has be according to Article 18. A copy is bein	en prepared by this Internationa g transmitted to the International	l Searching Authority and is transmitted to the applicant Bureau.
This international search report consists It is also accompanied by	s of a total of $\underline{\lambda}$ sheets. a copy of each prior art documen	t cited in this report.
1. Basis of the report		
a. With regard to the language, th	e international search was carried	l out on the basis of:
the international app	plication in the language in which	it was filed.
a translation of the i a translation furnish	nternational application into ed for the purposes of internation	which is the language of nal search (Rules 12.3(a) and 23.1(b)).
b. This international search authorized by or notified t	report has been established taking to this Authority under Rule 91 (1)	ng into account the rectification of an obvious mistake Rule 43.6 <i>bis</i> (a)).
c. With regard to any nucleo	otide and/or amino acid sequenc	e disclosed in the international application, see Box No. I.
2. Certain claims were four	nd unsearchable (see Box No. II).
3. Unity of invention is lacl	king (see Box No. III).	
4. With regard to the title ,		
the text is approved as sub	omitted by the applicant.	
the text has been establish	ed by this Authority to read as fo	illows:
5. With regard to the abstract,		
the text is approved as sul	bmitted by the applicant.	
the text has been establish may, within one month from the second	ned, according to Rule 38.2(b), by om the date of mailing of this inte	this Authority as it appears in Box No. IV. The applicant rnational search report, submit comments to this Authority.
6. With regard to the drawings ,		
a. the figure of the drawings to b	e published with the abstract is F	
as suggested by the	applicant.	
as selected by this A	Authority, because the applicant f	ailed to suggest a figure. MAR 2 6 2008
as selected by this A	Authority, because this figure bet	ter characterizes the invention.
b. none of the figures is to b	e published with the abstract.	PATENT DEPARTMENT

Form PCT/ISA/210 (first sheet) (April 2007)

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INTERNA . JONAL SEARCH REPORT

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International application No. PCT/US 07/05777

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - F02B 77/04 (2007.10) USPC - 123/198A According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIEL	DS SEARCHED	lessification symbols)		
Minimum do USPC: 123/1	is the second searched (classification system followed by classification s	sassineation symbols)		
Documentati USPC: 123/	on searched other than minimum documentation to the ext 198R, 406.29, 406.47 (text search - see terms below)	ent that such documents are included in the	fields searched	
Electronic da PubWEST(U Search Term injection, mo	ata base consulted during the international search (name of ISPT,PGPB,EPAB,JPAB); Google Patents; Google Scho ns: gasoline engine, ethanol, direct injection, engine knoo tor	data base and, where practicable, search ter lar k, emissions, restart, control system, shut	ms used) down, deceleration, port	
C. DOCUI	MENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where ap	propriate, of the relevant passages	Relevant to claim No.	
Y	Calculations of Knock Suppression in Highly Turbochar Direct Ethanol Injection (L. Bromberg et al.) 23 Februar especially Abstract, Section I, para [0003], Section II, p	ged Gasolin/Ethanol Engines Using y 2006 (23.02.2006), entire document ara [0001], [0003], [0006]	1-18	
Y	US 4,312,310 A (Chivilo' et al.) 26 January 1982 (26.01	1.1982), col 2, in 20-26 and in 36-54	1-18	
Y	US 6,358,180 B1 (Kuroda et al.) 19 March 2002 (19.03.2002), Fig 4, col 3, ln 65-67 to col 4, ln 1 -15, col 8, ln 3-27col 12, ln 54-56			
Y	US 4,974,416 A (Taylor) 04 December 1990 (04.12.1990), col 4, in 15-21 5			
Y	US 6,260,525 B1 (Moyer) 17 July 2001 (17.07.2001), col 3, ln 5-8 6, 8, 13-18			
Y	Y US 4,967,714 A (Inoue) 06 November 1990 (06.11.1990), col 3, in 27-30 and in 66-67 11			
Further documents are listed in the continuation of Box C.				
* Special categories of cited documents: "A" document defining the general state of the art which is not considered "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the priority of the art underlying the invention				
"E" earlier filing d	application or patent but published on or after the international late	"X" document of particular relevance; the considered novel or cannot be considered step when the document is taken along	claimed invention cannot be lered to involve an inventive	
cited to special	"L" document which may throw doubts on priority claim(s) or which is sited to establish the publication date of another citation or other special reason (as specified) "Y" document of particular relevance; the claimed invention can considered to involve an inventive step when the docum			
"O" document referring to an oral disclosure, use, exhibition or other means """ document referring to an oral disclosure, use, exhibition or other being obvious to a person skilled in the art				
the price	the priority date claimed			
Date of the actual completion of the international search (03 December 2007 (03.12.2007) 24 MAR 2008				
Name and mailing address of the ISA/US Authorized officer:				
Mail Stop PC P.O. Box 145 Facsimile N	Mail Stop PCT, Attn: ISA/US, Commissioner for Patents Lee W. Young P.O. Box 1450, Alexandria, Virginia 22313-1450 PCT Helpdesk: 571-272-4300 Facsimile No. 571-273-3201			
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Form PCT/ISA/210 (second sheet) (April 2007)
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From the INTERNATIONAL SEARCHING AUTHO	DRITY			
To: Sam Pasternack Choate, Hall & Stewart Two International Place			PCT	
Boston, Massachusetts 02110		WF INTERNAT	UTTEN OPINION OF THE IONAL SEARCHING AUTHORITY	
			(PCT Rule 43 <i>bis</i> .1)	
		Date of mailing (day/month/year)	24 MAR 2008	
Applicant's or agent's file reference		FOR FURTHER ACTION		
International application No	International filing date	(dav/month/vear)	Priority date (day/month/year)	
PCT/US 07/05777	08 March 2007 (08.	03.2007)	10 March 2006 (10.03.2006)	
International Patent Classification (IPC) o IPC(8) - F02B 77/04 (2007.10) USPC - 123/198A Applicant Ethanol Boosting System	r both national classificat	tion and IPC		
1. This opinion contains indications relations Box No. I Box No. II Box No. III Priority Box No. III Non-establishm Box No. IV Lack of unity of Box No. V Reasoned states Citations and ex Box No. VI Certain docume Box No. VII Certain defects Box No. VIII Certain observa	ating to the following item inion nent of opinion with regar of invention ment under Rule 43 <i>bis</i> .1(<i>a</i> cplanations supporting su- ents cited in the international appli- ations on the international	ns: rd to novelty, inventiv a)(i) with regard to nov ch statement cation l application	Docketed Due <u>Reporte United Opinior</u> e step and industrial applicability velty, inventive step or industrial applicability;	24/08 MP
 FURTHER ACTION If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1<i>bis</i>(b) that written opinions of this International Searching Authority will not be so considered. If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later. For further options, see Form PCT/ISA/220. For further details, see notes to Form PCT/ISA/220. 				
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Date of completion of the O3 December 2007	his opinion 7 (03.12.2007)	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774	

Form PCT/ISA/237 (cover sheet) (April 2007)

		C^{*}	• ****
		WRITTEN OPINION OF THE	International application No.
		INTERNATIONAL SEARCHING AUTHORITY	PCT/US 07/05777
Box	No. I	Basis of this opinion	
1.		egard to the language, this opinion has been established on the basis of:	
		a teorelation of the international application in the language in which it was filed.	which is the language of
		translation furnished for the purposes of international search (Rules 12.3	(a) and 23.1(b)).
2.		This opinion has been established taking into account the rectification of to this Authority under Rule 91 (Rule 43 <i>bis</i> .1(a))	an obvious mistake authorized by or notific
3.	With re establis	egard to any nucleotide and/or amino acid sequence disclosed in the in shed on the basis of:	ternational application, this opinion has be
	a. typ	e of material	
	L	a sequence listing	
		table(s) related to the sequence listing	
	b. forr	mat of material	
		on paper	
		in electronic form	
	c. tim	e of filing/furnishing	
		contained in the international application as filed	
		filed together with the international application in electronic form	
		furnished subsequently to this Authority for the purposes of search	
4.		In addition, in the case that more than one version or copy of a sequence l filed or furnished, the required statements that the information in the sub- in the application as filed or does not go beyond the application as filed,	isting and/or table(s) relating thereto has be sequent or additional copies is identical to th as appropriate, were furnished.
5.	Additio	onal comments:	
		· · · · · · · · · · · · · · · · · · ·	

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> FORD Ex. 1019, page 74 IPR2019-01400

Υ.	WRITTEN	OPINION O	FTHE		cation No.
				PCT/US 07/05	777
Box No. V	Reasoned statement un citations and explanation	der Rule 43 <i>l</i> ons supporti	bis.1(a)(i) with regard to no ng such statement	ovelty, inventive step or ind	ustrial applicability;
1. Statemer	ıt				
Nove	ty (N)	Claims	1-18		YES
		Claims	None		NO
Inven	tive step (IS)	Claims	None		VFS
. mven		Claims	1-18		NO
		-	1-18		
Indus	trial applicability (IA)	Claims	None		YES NO
		Clainis			NO
As per claim 1,	Bromberg discloses a fuel	management	t system for operation of a sp	park ignition gasoline engine	in a vehicle comprising action II, para [00031];
gasoline engine separate source Section II, para into the engine shutting down ti driver demand system as discl Bromberg is fue As per claim 3, conditions to pr	powering the vehicle (see e of ethanol (see Section II (0001]). Bromberg does r during vehicle deceleration he engine by stopping gas (col 2, in 20-26 and in 36-5 osed by Bromberg with the el conservation and an obv Bromberg further disclose event engine knock (see S	I, para [0003]] not disclose a n and idling ar oline flow into 54). It would f e control syste rious way to c s the system	control system for shutting of control system for shutting of nd restarting the engine upor the engine during vehicle di- nave been obvious to one of em as taught by Chivilo since onserve fuel is to shut down wherein the engine uses dire (00031) Bromberg does no	on of the ethanol into a cylind lown the engine by stopping in driver demand. Chivilo disc eceleration and idling and res ordinary skill in the art to more a major development in the the engine during idle or dec ect ethanol injection during a t specifically disclose direct a	ler of the engine (see gasoline and ethanol fl closes a control system starting the engine upo dify the fuel managem system disclosed by veleration. range of engine operal thanol injection during
gasoine engine separate source Section II, para into the engine shutting down ti driver demand i system as discl Bromberg is fue As per claim 3, conditions to pr engine restart to during engine r is to prevent en As per claim 4, Section II, para emissions. How minimize hydror	 powering the vehicle (see e of ethanol (see Section II [0001]). Bromberg does r during vehicle deceleration he engine by stopping gas (col 2, in 20-26 and in 36-E el conservation and an obv Bromberg further disclose event engine knock. F estart as one of the operat gine knock. Bromberg discloses the sy [0006]). Bromberg does r vever, it would have been carbon emissions. 	(, para [0003]) not disclose a n and idling an oline flow into 54). It would h e control system ious way to c s the system is bection I, para lowever, it wo ing conditions ystem whereir not specifically obvious to on drocarbon en	(i) an injector for direct injecti control system for shutting d nd restarting the engine upor b the engine during vehicle d have been obvious to one of erm as taught by Chivilo since onserve fuel is to shut down wherein the engine uses direct (0003)). Bromberg does no build have been obvious to on s since engine knock often or n the engine uses direct ethan y disclose direct ethanol inject te of ordinary skill in the art to nissions can be high during r	and the ethanol into a cylind lown the engine by stopping in driver demand. Chivilo disc eccleration and idling and res ordinary's kill in the art to more a major development in the the engine during idle or dec ect ethanol injection during a t specifically disclose direct e e of ordinary skill in the art to ccurs during restart and one of nol injection to minimize hydr tion during engine restart to o include ethanol injection du estart and one of the objects	ler of the engine (see gasoline and ethanol fl closes a control system starting the engine upo diffy the fuel managem system disclosed by eleration. range of engine opera- thanol injection during b include ethanol inject of the objects of Bromt rocarbon emissions (se minimize hydrocarbon ring engine restart to of Bromberg is to
gasoline engine separate source Section II, para into the engine shutting down ti driver demand I system as discl Bromberg is fue As per claim 3, conditions to pr engine restart ti during engine re is to prevent en As per claim 4, Section II, para emissions. How minimize hydror As per claim 7,	 powering the vehicle (see e of ethanol (see Section II [0001]). Bromberg does r during vehicle deceleration he engine by stopping gas (col 2, in 20-26 and In 36-5 osed by Bromberg with the el conservation and an obv Bromberg further disclose event engine knock (see S o prevent engine knock. I bastart as one of the operat gine knock. Bromberg discloses the sy [0006]). Bromberg does r vever, it would have been carbon emissions since hy ucarbon emissions. Bromberg further disclose 	I, para [0003]) not disclose a n and idling an oline flow into 54). It would h e control system vious way to c s the system bection I, para lowever, it wo ing conditions ystem whereir not specifically obvious to on drocarbon en	source of gasoline for inject injecti control system for shutting d nd restarting the engine upor be the engine during vehicle d have been obvious to one of em as taught by Chivilo since onserve fuel is to shut down wherein the engine uses direc (0003]). Bromberg does no huld have been obvious to on a since engine knock often of the engine uses direct ethat y disclose direct ethanol injet te of ordinary skill in the art to hissions can be high during r	and the ethanol into a cylind on of the ethanol into a cylind lown the engine by stopping in driver demand. Chivilo disc eccleration and idling and res ordinary skill in the art to moo a a major development in the the engine during idle or dec ect ethanol injection during a t specifically disclose direct e e of ordinary skill in the art to cacurs during restart and one of nol injection to minimize hydi tion during engine restart to b include ethanol injection du estart and one of the objects harged or supercharged (see	ler of the engine (see gasoline and ethanol fl closes a control system starting the engine upo dify the fuel manageme system disclosed by eleration. range of engine operal thanol injection during o include ethanol inject of the objects of Bromb rocarbon emissions (se minimize hydrocarbon ring engine restart to of Bromberg is to a Section II, para [0001
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gasoine engine separate source Section II, para into the engine shutting down ti driver demand i system as discl Bromberg is fue As per claim 3, conditions to pr engine restart to during engine r is to prevent en As per claim 4, Section II, para emissions. How minimize hydror minimize hydror Minimize hydror Minimize hydror Claims 2, 9 and 6,358,180 B1 to	 powering the vehicle (see e of ethanol (see Section II [0001]). Bromberg does r during vehicle deceleration he engine by stopping gas (col 2, in 20-26 and in 36-E osed by Bromberg with the el conservation and an obv Bromberg further disclose event engine knock (see S o prevent engine knock (see S o prevent engine knock (see S o prevent engine knock (see gine knock. Bromberg discloses the sy [0006]). Bromberg does r vever, it would have been carbon emissions. Bromberg further disclose Bromberg further disclose Bromberg further disclose as the only fuel (see Abs 10 lack an inventive step Kuroda et al. (hereinafter 	I, para [0003]) not disclose a n and idling an oline flow into 54). It would f e control system ious way to c s the system i Section I, para lowever, it wo ing conditions ystem whereir not specifically obvious to on drocarbon en s the system i tract). Bromt under PCT Ai 'Kuroda').	source of gasoline of modules (; an injector for direct injecti on control system for shutting d and restarting the engine upor to the engine during vehicle d have been obvious to one of erm as taught by Chivilo since onserve fuel is to shut down wherein the engine uses direct (0003)). Bromberg does no huld have been obvious to on s since engine knock often of the engine uses direct ethan y disclose direct ethanol inject te of ordinary skill in the art to nissions can be high during r wherein the engine is turboc wherein gasoline is not used perg states direct ethanol inject tricle 33(3) as being obvious	and the ethanol into a cylind lown the engine by stopping in driver demand. Chivilo disc eccleration and idling and res ordinary's kill in the art to more a major development in the the engine during idle or dec ect ethanol injection during a t specifically disclose direct e e of ordinary skill in the art to ccurs during restart and one of nol injection to minimize hydr ction during engine restart to o include ethanol injection du estart and one of the objects harged or supercharged (see and ethanol, E85, methanol ection could be be used to dis over Bromberg in view of Ch	ler of the engine (see gasoline and ethanol fl closes a control system starting the engine upo dify the fuel manageme system disclosed by releration. range of engine operation thanol injection during o include ethanol inject of the objects of Bromt rocarbon emissions (se minimize hydrocarbon ring engine restart to of Bromberg is to e Section II, para [0001 , other alcohols or a bl splace gasoline.
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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 07/05777

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V. 2. Citations and explanations:

As per claim 10, Kuroda further discloses the system including a restart motor (Fig 4; col 12, ln 54-56), wherein the low voltage motor is a low voltage motor (Fig 4 - the motor used for restarting the engine is a low voltage motor operating on 12 V).

Claim 5 lacks an inventive step under PCT Article 33(3) as being obvious over Bromberg in view of Chivilo, further in view of US 4,974,416 A (Taylor).

As per claim 5, Bromberg discloses the system wherein the engine uses direct injection (see Section II, para [0001]). Bromberg does not specifically disclose the system wherein the engine uses direct injection during engine restart to supplement port fuel injection while a fuel film that feeds the engine is established so as to minimize energy, emissions and time required for engine restart. Taylor discloses a system wherein the engine includes port fuel injection while a fuel film that feeds the engine is established (col 4, In 15-21). It would have been obvious to one of ordinary skill in the art to modify the system as disclosed by Bromberg with the port fuel injection and fuel film sat to modify the system as disclosed by Bromberg with the port fuel injection and fuel film as taught by Taylor, since it is well known in the art to supplement port injection with direct injection and since fuel films are well known and the use of such would have minimized energy, emissions and time required for engine restart.

Claims 6 and 8 lack an inventive step under PCT Article 33(3) as being obvious over Bromberg in view of Chivilo, further in view of US 6,260,525 B1 (Moyer).

As per claim 6, Chivilo discloses a control system for shutting down the engine by stopping gasoline flow into the engine (col 2, In 20-26 and In 36-54). Chivilo does not specifically disclose the system further including a valve disabler for all engine valves. Moyer discloses the system further including a valve disabler for all engine valves (col 3, In 5-8). It would have been obvious to one of ordinary skill in the art to modify the system as disclosed by Chivilo and Bromberg with the valve disabler as taught by Moyer, since all relate to the technology of shutting engines down to conserve fuel and since such would have enagled the engine to be a variable displacement engine so that when less than maximum power is required some cylinders can be shut down and power increased in the remaining cylinders which will then operate at greater efficiency.

As per claim 8, Bromberg further discloses the system wherein maximum manifold pressure is increased by at least a factor of two over a non-pressure-boosted engine (see Abstract).

Claims 11 lacks an inventive step under PCT Article 33(3) as being obvious over Bromberg in view of Chivilo, further in view of US 4,967,714 A (Inoue).

As per claim 11, Bromberg further discloses the system wherein the ethanol is injected through a fuel injector (see Section II, para [0001]). Bromber does not specifically disclose wherein the gasoline and the ethanol are injected through the same fuel injector. Inoue discloses the system wherein the gasoline and the ethanol are injected through the same fuel injector (col 3, In 27-30 and In 66-67). It would have been obvious to one of ordinary skill in the art to modify the system as disclosed by Bromberg to enable the system to inject ethanol and gasoline through the same fuel injector as taught by Inoue, since both relate to the technology of ethanol burning systems and since such would have enabled the system to operate using only one fuel injector per cylinder which is a well known design to one of ordinary skill in the art.

Claims 13-18 lack an inventive step under PCT Article 33(3) as being obvious over Bromberg in view of Chivilo, further in view of Kuroda, further in view of Moyer.

As per claim 13, Bromberg discloses a turbocharged spark ignition engine which uses separately controlled direct injection of ethanol and port fuel injection of gasoline (see Abstract). Bromberg does not specifically disclose where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle (col 8, In 3-27). Bromberg further discloses the engine comprising a first source of gasoline (see Section II, para [0003]); a second source of ethanol (see Section II, para [0003]); a gasoline engine (see Abstract). Bromberg does not specifically disclose a means to engine cylinder deactivation through valve disabling during engine deceleration and idling. Moyer discloses a means to engine cylinder deactivation through valve disabling (col 3, In 5-8). It would have been obvious to one of ordinary skill in the art to modify the engine as disclosed by Bromberg with the shut down during deceleration and idle as taught by Kuroda and the disabling of the valves as taught by Moyer, since all relate to the technology of improving fuel economy and since the disabling of the valves is well known in the art as an effective way to shut down the engine and since shutting down the engine during deceleration and idle is an obvious means to conserving fuel.

As per claim 14, Bromberg further discloses the turbocharged spark ignition engine (see Section II, para [0001]) wherein the engine uses direct ethanol injection during a range of engine operating conditions to prevent engine knock (see Section I, para [0003]). Bromberg does not specifically disclose direct ethanol injection during engine restart to prevent engine knock. However, it would have been obvious to one of ordinary skill in the art to include ethanol injection during engine restart as one of the operating conditions since engine knock often occurs during restart and one of the objects of Bromberg is to prevent engine knock.

---- Please See Continuation Sheet ----

Form PCT/ISA/237 (Supplemental Box) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No. PCT/US 07/05777

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Suplemental Box 1:

As per claim 15, Bromberg discloses the turbocharged spark ignition engine (see Section II, para [0001]) wherein the engine uses direct ethanol injection to minimize hydrocarbon emissions (see Section II, para [0006]). Bromberg does not specifically disclose direct ethanol injection during engine restart to minimize hydrocarbon emissions. However, it would have been obvious to one of ordinary skill in the art to include ethanol injection during engine restart to minimize hydrocarbon emissions since hydrocarbon emissions can be high during restart and one of the objects of Bromberg is to minimize hydrocarbon emissions.

As per claim 16, Bromberg discloses the turbocharged spark ignition engine (see Section II, para [0001]). Bromberg does not specifically disclose the turbocharged spark ignition engine where a low voltage motor is used to restart the engine. Kuroda discloses the system wherein the low voltage motor is a low voltage motor (Fig 4; col 12, ln 54-56). Furthermore, it would have been obvious to one of ordinary skill in the art to modify the engine as disclosed by Bromberg and Chivilo with the low voltage motor for restart since most vehicles currently operate with a 12 V battery and using a low voltage motor for restart would not require an additional battery for operating the restart motor.

As per claim 17, Bromberg discloses a turbocharged spark ignition engine which uses separately controlled direct injection of ethanol and port fuel injection of gasoline (see Abstract). Bromberg does not specifically disclose where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle. Kuroda discloses where the engine is shut down during periods of deceleration and idle. (col 8, In 3-27). Bromberg further discloses the engine comprising a first source of gasoline (see Section II, para [0003]); a second source of ethanol (see Section II, para [0003]); a gasoline engine (see Abstract). Bromberg does not specifically disclose a means to disable the engine cylinders and where direct ethanol injection is used during engine restart and further where a low voltage motor is used for engine restart. Moyer discloses a means to engine cylinder deactivation through valve disabling (col 3, In 5-8). Kuroda further discloses where a low voltage motor is used for engine restart (Fig 4; col 12, In 54-56). It would have been obvious to one of ordinary skill in the art to modify the engine as disclosed by Bromberg with the shut down during deceleration and idle and low voltage restart motor as taught by Kuroda and the disabling of the valves as taught by Moyer, since all relate to the technology of improving fuel economy and since the disabling of the valves is well known in the art as an effective way to shut down the engine and since shutting down the engine during deceleration and idle is an obvious means to conserving fuel.

As per claim 18. Bromberg discloses a turbocharged spark ignition engine which uses direct injection of ethanol (see Abstract). Bromberg does not specifically disclose where the engine is shut down during periods of deceleration and idle comprising a turbocharged spark ignition engine; and a means to shutdown the engine cylinders and where direct ethanol injection is used during engine restart and further where a low voltage motor is used for engine restart. Kuroda discloses where the engine is shut down during periods of deceleration and idle comprising a turbocharged spark ignition engine; and a means to shutdown the engine cylinders and where direct ethanol injection is used during periods of deceleration and idle (col 8, In 3-27). Moyer discloses a means to engine cylinder deactivation through valve disabling (col 3, In 5-8). Kuroda further discloses where a low voltage motor is used for engine restart (Fig 4; col 12, In 54-56). It would have been obvious to one of ordinary skill in the art to modify the engine as disclosed by Bromberg with the shut down during deceleration and idle and low voltage restart motor as taught by Kuroda and the disabling of the valves as taught by Moyer, since all relate to the technology of improving fuel economy and since the disabling of the valves is well known in the art as an effective way to shut down the engine and since shutting down the engine during deceleration and idle is an obvious means to conserving fuel.

Claims 1-18 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

Form PCT/ISA/237 (Supplemental Box) (April 2007)

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	PATENT COOPE	RATION TREATY DOCKETED
Fro	om the INTERNATIONAL SEARCHING AUTHORITY	DUE 5.25.08
To: SA CH TW BO	M PASTERNACK IOATE, HALL & STEWART LLP /O INTERNATIONAL PLACE ISTON, MA 02110 Amend Classics	PCT NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHIDE AUTHORITY, OR THE DECLAR ATION
	DUE 4.92.08	(PCT Rule 44.1)
Ap	plicant's or agent's file reference	FOR FURTHER ACTION See paragraphs 1 and 4 below
Inte	ernational application No.	International filing date (day/month/year) 24 July 2007 (24.07.2007)
Ap	plicant HANOL BOOSTING SYSTEMS, LLC	
1.	The applicant is hereby notified that the international search have been established and are transmitted herewith.	ch report and the written opinion of the International Searching Authority
	Filing of amendments and statement under Article 19: The applicant is entitled, if he so wishes, to amend the clai	ims of the international application (see Rule 46):
	When? The time limit for filing such amendments is	normally two months from the date of transmittal of the international
	Where? Directly to the International Bureau of WIPO 1211 Geneva 20, Switzerland, Facsimile No.), 34 chemin des Colombettes : (41-22) 338.82.70.
	For more detailed instructions, see the notes on the ac	ccompanying sheet.
2.	The applicant is hereby notified that no international search Article 17(2)(a) to that effect and the written opinion of the	ch report will be established and that the declaration under ne International Searching Authority are transmitted herewith.
3.	With regard to the protest against payment of (an) addit	tional fee(s) under Rule 40.2, the applicant is notified that:
	the protest together with the decision thereon has been request to forward the texts of both the protest and the reduction has been mode yet on the protect, the approximation of the protect is the approximation of the protect in the protect.	en transmitted to the International Bureau together with the applicant's he decision thereon to the designated Offices.
4	Deminders	picalit will be notified as soon as a decision is made.
4.	Shortly after the expiration of 18 months from the priority date Bureau. If the applicant wishes to avoid or postpone publicatic priority claim, must reach the International Bureau as provided in technical preparations for international publication.	e, the international application will be published by the International on, a notice of withdrawal of the international application, or of the n Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of the
	The applicant may submit comments on an informal basis on International Bureau. The International Bureau will send a copy preliminary examination report has been or is to be established. before the expiration of 30 months from the priority date.	the written opinion of the International Searching Authority to the y of such comments to all designated Offices unless an international These comments would also be made available to the public but not
	Within 19 months from the priority date, but only in respect examination must be filed if the applicant wishes to postpone the (in some Offices even later); otherwise, the applicant must, with entry into the national phase before those designated Offices.	of some designated Offices, a demand for international preliminary e entry into the national phase until 30 months from the priority date hin 20 months from the priority date, perform the prescribed acts for
	In respect of other designated Offices, the time limit of 30 month See the Annex to Form PCT/IB/301 and, for details about the ap Volume II, National Chapters and the WIPO Internet site.	is (or later) will apply even if no demand is filed within 19 months. oplicable time limits, Office by Office, see the <i>PCT Applicant's Guide</i> ,
Na	me and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450	Authorized officer Stephen K Cronin Telephone No. (571) 272-4383
Forn	csimile No. (571) 273-3201 n PCT/ISA/220 (January 2004)	FEB 2 7 2008

FORD Ex. 1019, page 78 IPR2019-01400 1.1

PATENT DEPARTMENT

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2006734-0015	FOR FURTHER ACTION a	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US07/74227	International filing date (<i>day/mor</i> 24 July 2007 (24.07.2007)	<i>with/year)</i> (Earliest) Priority Date (<i>day/month/year</i>) 24 July 2006 (24.07.2006)
Applicant ETHANOL BOOSTING SYSTEMS, LLC		
This international search report has been according to Article 18. A copy is being This international search report consists of It is also accompanied 1. Basis of the Report a. With regard to the language, the i the international a a translation of th of a translation fu b. With regard to any nucleotic 2. Certain claims were found 3. Unity of invention is lacking 4. With regard to the title, the text is approved as submit the text has been established	prepared by this International Se transmitted to the International E of a total of \mathcal{L} sheets. by a copy of each prior art docum international search was carried ou application in the language in whice e international application into mished for the purposes of interna le and/or amino acid sequence dis unsearchable (See Box No. II) g (See Box No. III) itted by the applicant. by this Authority to read as follow	arching Authority and is transmitted to the applicant Bureau. ument cited in this report. ut on the basis of: ch it was filed.
the text is approved as submi	itted by the applicant.	
the text has been established may, within one month from	, according to Rule 38.2(b), by this the date of mailing of this internat	s Authority as it appears in Box No. IV. The applicant tional search report, submit comments to this Authority.
 6. With regard to the drawings, a. the figure of the drawings to be p as suggested by the as selected by this A b. none of the figures is to be p 	published with the abstract is Figur applicant. Authority, because the applicant fai Authority, because this figure better ublished with the abstract.	re No. $\underline{1}$ iled to suggest a figure. r characterizes the invention.

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

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INTERNATIONAL SEARCH REPOR	г		
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imentation searched (classification system followed b /1A,300,304,431,447,478,575,577,198C,198A	y classification symbols	;)	
a searched other than minimum documentation to the	extent that such docume	ents are included in	the fields searched
base consulted during the international search (name trinuation Sheet	of data base and, where	e practicable, search	ı terms used)
MENTS CONSIDERED TO BE RELEVANT			
Citation of document, with indication, where ap	propriate, of the releva	nt passages	Relevant to claim
US 2007/0119416 A1 (Boyarski) 31 May 2007 (31.0	5.2007), figures 16, 17,	23, 28, 37, 44,	1-23, 26, 42-48,
paragraphs [0066], [0107]-[0117], [0284]-[0318], cla	ums 3, 5, 11, 15.		24,25,27-41,49
US 2002/01393321 A1 (Weissman et al.) 3 October 2	2002 (03.10.2002), fig	ure 2, paragraphs	24-25, 27-56
[0022]-[0046].			1-23, 26
locuments are listed in the continuation of Box C. scial categories of cited documents: lefining the general state of the art which is not considered to be of	See patent f	amily annex. t published after the inte conflict with the applic cory underlying the inve	mational filing date or pr ation but cited to understa
evance ication or patent published on or after the international filing date	"X" document of p considered no when the docu	particular relevance; the c vel or cannot be consider ment is taken alone	laimed invention cannot red to involve an inventiv
vhich may throw doubts on priority claim(s) or which is cited to e publication date of another citation or other special reason (as	"Y" document of p considered to combined with	particular relevance; the c involve an inventive step h one or more other such	claimed invention cannot when the document is documents, such combin
eferring to an oral disclosure, use, exhibition or other means published prior to the international filing date but later than the	being obvious "&" document mer	to a person skilled in the	e art family
	Deter der 11 Cit	· · · · · · · · · · · · · · · · · · ·	1
ual completion of the international search 2007 (07.12.2007)	25 FEB 2	008	n report
ling address of the ISA/US	Authorized officer	2	other!
Stop PCT, Attn: ISA/US missioner for Patents	Stephen K Cronin	Neni	e y in
Box 1450 Indria, Virginia 22313-1450 (571) 273-3201	Telephone No. (571)	272-4383	f
	F02D 41/30(2006.01);F02B 1/08(2006.01) 123/1A,431,447,575 nternational Patent Classification (IPC) or to both nat S SEARCHED umentation searched (classification system followed by/1A,300,304,431,447,478,575,577,198C,198A n searched other than minimum documentation to the other than minimum documentation to the other than minimum documentation to the other than of document, with indication, where an US 2007/0119416 A1 (Boyarski) 31 May 2007 (31.0) paragraphs [0066], [0107]-[0117], [0284]-[0318], classed of the sector of the documents: US 2002/01393321 A1 (Weissman et al.) 3 October 2 [0022]-[0046]. documents are listed in the continuation of Box C. scial categories of cited documents: tefning the general state of the art which is not considered to be of elevance ication or patent published on or after the international filing date which may throw doubts on priority claim(s) or which is cited to e publication date of another citation or other means published prior to the international filing date but later than the e claimed tual completion of the ISA/US Stop PCT, Attn: ISA/US missioner for Patents Box 1450 andria, Virginia 22313-1450	F02D 41/30(2006.01);F02B 1/08(2006.01) 123/1A,431,447,575 nternational Patent Classification (IPC) or to both national classification and SEARCHED amentation searched (classification system followed by classification symbols //1A,300,304,431,447,478,575,577,198C,198A a searched other than minimum documentation to the extent that such docume a base consulted during the international search (name of data base and, where tinuation Sheet MENTS CONSIDERED TO BE RELEVANT Citation of document, with indication, where appropriate, of the releva US 2007/0119416 A1 (Boyarski) 31 May 2007 (31.05.2007), figures 16, 17, paragraphs [0066], [0107]-[0117], [0284]-[0318], claims 3, 5, 11, 15. US 2002/01393321 A1 (Weissman et al.) 3 October 2002 (03.10.2002), fig [0022]-[0046]. "T later documents: "T later documents "T later document of proceed colspan="2">considered to be of considered to considered to considered to considered to be of considered to con	F02D 41/30(2006.01);F02B 1/08(2006.01) 123/1A,431,447,575 international Patent Classification (IPC) or to both national classification and IPC S SEARCHED amentation searched (classification system followed by classification symbols) /1A,300,304,431,447,478,575,577,198C,198A i searched other than minimum documentation to the extent that such documents are included in base consulted during the international search (name of data base and, where practicable, search through the search of document, with indication, where appropriate, of the relevant passages US 2007/0119416 A1 (Boyarski) 31 May 2007 (31.05.2007), figures 16, 17, 23, 28, 37, 44, paragraphs [0066], [0107]-[0117], [0284]-[0318], claims 3, 5, 11, 15. US 2002/01393321 A1 (Weissman et al.) 3 October 2002 (03.10.2002), figure 2, paragraphs [0022]-[0046]. See patent family annex. related to the continuation of Box C. related at the continuation of Box C. related to the opticity claim(0) or which is cited to e publication date of eart which is not considered to be of edvance. refering to an oral disclosure, we, exhibition or other means edarined valid completion of the international filing date e claimed valid completion of the international search 2007 (07.12.2007) Thing address of the ISA/US Stop PCT. Attri. ISA/US missioner for Patents Box 1550 Stephen K Cronin Box 1450

$\left(\begin{array}{c} & & \\ & & \\ & & \\ & & \end{array} \right)$ PATENT COOPERATION TREATY

From the INTERNAT	IONAL SEARC	HING AUTH	ORITY		
To: SAM PAS CHOATE, TWO INT BOSTON,	To: SAM PASTERNACK CHOATE, HALL & STEWART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110		- WF	PCT RITTEN OPINION OF THE ONAL SEARCHING AUTHORITY	
					(PCT Rule 43bis.1)
· · · · · · · · · · · · · · · · · · ·			Date of mailing (day/month/year)	25 FEB 2008	
Applicant'	Applicant's or agent's file reference		FOR FURTHER	ACTION	
2006734-0	2006734-0015			See paragraph 2 below	
Internation	al application No).	International filing date	(day/month/year)	Priority date (day/month/year)
PCT/US07	//74227		24 July 2007 (24.07.200)7)	24 July 2006 (24.07.2006)
Internation	al Patent Classifi	ication (IPC) o	or both national classification	tion and IPC	
IPC: I USPC: I	F 02D 41/30(200 23/1A-431-447.5	6.01);F 02B 1 / 575	08(2006.01)	-	
Applicant					
ETHANOI	L BOOSTING S	YSTEMS, LL	С		
1 This o	ninion contains i	ndications rel:	ting to the following item	25.	
	pinton contains i		ting to the following iten	15.	
	Box No. I	Basis of the	opinion		
	Box No. II	Priority			
	Box No. III	Non-establi	shment of opinion with re	egard to novelty, inve	ntive step and industrial applicability
	Box No. IV	Lack of unit	ty of invention		
	Box No. V	Reasoned st applicability	atement under Rule 43 <i>bis</i> /; citations and explanations and explanations and explanations and explanations and explanations are a set of the	s.1(a)(i) with regard t ons supporting such s	o novelty, inventive step or industrial tatement
	Box No. VI	Certain doc	uments cited		
	Box No. VII	Certain defe	ects in the international ap	plication	
	Box No. VIII	Certain obse	ervations on the internation	onal application	
2. FUR	FHER ACTIO	N			
If a de Interna Autho that wa	emand for intern ational Prelimina rity other than th ritten opinions of	ational prelim ary Examinin is one to be t this Internation	inary examination is ma g Authority ("IPEA") e he IPEA and the chosen onal Searching Authority	de, this opinion will xcept that this does IPEA has notified th will not be so consid	be considered to be a written opinion of the s not apply where the applicant chooses an he International Bureau under Rule $66.1bis(b)$ lered.
If this IPEA of For	opinion is, as pa a written reply to m PCT/ISA/220	rovided above ogether, where or before the e	e, considered to be a write appropriate, with amend expiration of 22 months fi	tten opinion of the I lments, before the ex rom the priority date,	PEA, the applicant is invited to submit to the spiration of 3 months from the date of mailing whichever expires later.
For fu	rther options, see	Form PCT/IS	A/220.		
3. For fu	rther details, see	notes to Form	PCT/ISA/220.		
Name and	mailing address	of the ISA/US	5 Date of comple	etion of this opinion	Authorized officer
	Aail Stop PCT, Attr Commissioner for P	n: ISA/US atents	18 February 20	008 (18.02.2008)	Stephen K Cronin Juno Atak
Facsimile N	Alexandria, Virginia	a 22313-1450 01			Telephone No. (571) 272-4383
D DOT	0.1/007.(1		I		L

Form PCT/ISA/237 (cover sheet) (April 2007)

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		Ī	nternational application No.
	WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORIT	Y I	PCT/US07/74227
Box N	lo. I Basis of this opinion	I	
1. With	regard to the language , this opinion has been established on	the basis of:	
	the international application in the language in which	i it was med	as of a translation furnished for the surnages of
	a translation of the international application into, we international search (Rules 12.3(a) and 23.1(b)).	tion is the langua	ge of a translation furnished for the purposes of
2.	This opinion has been established taking into account the r	rectification of a	n obvious mistake authorized by or notified to thi
3. With	Authority under Rule 91 (Rule 43 <i>bis.</i> 1(a)) a regard to any nucleotide and/or amino acid sequence of bished on the basis of:	disclosed in the	international application, this opinion has been
a.	type of material		
	a sequence listing		
	table(s) related to the sequence listing		
h	format of material		
0.			
	in electronic form		
c.	time of filing/furnishing		
	contained in the international application as filed.		
	filed together with the international application in el	lectronic form.	
	furnished subsequently to this Authority for the purp	ooses of search.	
4.	In addition, in the case that more than one version or copy or furnished, the required statements that the information application as filed or does not go beyond the application a	of a sequence lis i in the subseque as filed, as approp	sting and/or table(s) relating thereto has been filed ent or additional copies is identical to that in the priate, were furnished.
5. Addi	tional comments:		
1			

iox No. V Reasoned statement under Rule 43 <i>bis.</i> 1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
. Statement			
Novelty (N)	Claims <u>1-56</u>	·	YES
	Claims <u>NONE</u>		NO
Inventive step (IS)	Claims <u>1-56</u>		YE
	Claims <u>NONE</u>		NO
Industrial applicability (IA)	Claims 1-56		YE
			NO
. Citations and explanations: laims 1-56 meet the criteria set out in PCT Articlor	Claims <u>NONE</u> e 33(2)-(3), because the prio	or art does not teach or fairly suggest the c	NO
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Articl nvention. Claim1-56 meet the criteria set out in PCT Article be made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio 33(4), and thus have indust	or art does not teach or fairly suggest the c	claimed
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Articl nvention. Claim1-56 meet the criteria set out in PCT Article be made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio 33(4), and thus have indust	or art does not teach or fairly suggest the c rial applicability because the subject matte	er claimed
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Article nvention. Claim 1-56 meet the criteria set out in PCT Article be made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio 33(4), and thus have indust	or art does not teach or fairly suggest the c	elaimed
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Article nvention. Claim1-56 meet the criteria set out in PCT Article he made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio 33(4), and thus have indust	or art does not teach or fairly suggest the c	elaimed
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Articl nvention. Claim1-56 meet the criteria set out in PCT Article he made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio 33(4), and thus have indust	or art does not teach or fairly suggest the c	er claimed car
2. Citations and explanations: Claims 1-56 meet the criteria set out in PCT Article nvention. Claim 1-56 meet the criteria set out in PCT Article be made or used in industry.	Claims <u>NONE</u> e 33(2)-(3), because the prio	or art does not teach or fairly suggest the c	elaimed

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Form PCT/ISA/237 (Box No. V) (April 2007)

SPIJDL/JGG SKS

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY		
To: SAM PASTERNACK Choate, Hall & Stewart LLP	PCT	
Two International Place Boston, Massachusetts 02110 Amend Claim Lite Art in US. Action: Resp to writh. Opin.	NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION	
Due Date	(PCT Rule 44.1)	
Final Due Date Docket AdmInistratiorDate:DIg	Date of mailing	
Applicant's of agent's file reference	FOR FURTHER ACTION See paragraphs 1 and 4 below	
2006734-0021		
International application No. PCT/US2008/069171	(day-month year) 03 July 2008	
Applicant ETHANOL BOOSTING SYSTEMS LLC		
1. The applicant is hereby notified that the international se Authority have been established and are transmitted her	arch report and the written opinion of the International Searching ewith.	
Filing of amendments and statement under Article 19 The applicant is entitled, if he so wishes, to amend the c When? The time limit for filing such amendmer international search report.); claims of the international application (see Rule 46); claims of the international provided and the set of transmittal of the	
Where? Directly to the International Bureau of WII 1211 Geneva 20, Switzerland, Facsimile N	PO, 34 chemin des Colombettes lo.: +41 22 740 14 35	
For more detailed instructions, see the notes on the	accompanying sheet.	
2. The applicant is hereby notified that no international Article 17(2)(a) to that effect and the written opinion of	search report will be established and that the decidation under f the International Searching Authority are transmitted herewith.	
3. With regard to the protest against payment of (an) ad	ditional fee(s) under Rule 40.2, the applicant is notified that:	
the protest together with the decision thereon h applicant's request to forward the texts of both t	he protest and the decision thereon to the designated Offices.	
no decision has been made yet on the protest; th	ne applicant will be notified as soon as a decision is made.	
4. Reminders Shortly after the expiration of 18 months from the prior International Bureau. If the applicant wishes to avoid or p application, or of the priority claim, must reach the Internatio before the completion of the technical preparations for interna-	ity date, the international application will be published by the ostpone publication, a notice of withdrawal of the international nal Bureau as provided in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, ational publication.	
The applicant may submit comments on an informal basis on International Bureau. The International Bureau will send international preliminary examination report has been or is to the public but not before the expiration of 30 months from the	the written opinion of the international scatching Authority to the a copy of such comments to all designated Offices unless an be established. These comments would also be made available to e priority date.	
Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminar examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the prioriti date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribe acts for entry into the national phase before those designated Offices.		
In respect of other designated Offices, the time limit of 30 months.	months (or later) will apply even if no demand is filed within 19	
See the Annex to Form PCT/IB/301 and, for details about the <i>Guide</i> , Volume II, National Chapters and the WIPO Internet	e applicable time limits, Office by Office, see the <i>PCT Applicant</i> 's site.	
Name and mailing address of the ISA/US	Authorized officer:	
Mail Stop PCT, Attn: ISA/US Commissioner for Patents	Blaine R. Copenheaver	
P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Telephone No. 571-272-7774	
r acommente, en ene		

Form PCT/ISA/220 (January 2004)

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(See notes on accompanying sheet)

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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2006734-0021	FOR FURTHER ACTION as well	see Form PCT/ISA/220 as, where applicable, item 5 below.
International application No.	International filing date (day/month/year)	(Earliest) Priority Date (day/month/year)
PCT/US2008/069171	03 July 2008	10 July 2007
Applicant ETHANOL BOOSTING SYSTEMS LLC		
This international search report has be according to Article 18. A copy is bein This international search report consists	en prepared by this International Searching g transmitted to the International Bureau. to f a total of 3 sheets. a copy of each prior art document cited in thi	Authority and is transmitted to the applicant s report.
1. Basis of the report	e international search was carried out on the	basis of:
a. while regard to the international approximation of the internation of th	blication in the language in which it was filed	
a translation of the i	nternational application into	, which is the language
of a translation furn	ished for the purposes of international search	(Rules 12.3(a) and 23.1(b))
b. With regard to any nucleo	tide and/or amino acid sequence disclosed	in the international application, see Box No. 1.
2. Certain claims were four	nd unsearchable (see Box No. II)	
3. Unity of invention is lacl	king (see Box No. III)	
4. With regard to the title,		
the text is approved as su	bmitted by the applicant	
the text has been establish	ned by this Authority to read as follows:	
5 With regard to the abstract.		
the text is approved as su	bmitted by the applicant	
the text has been establis may, within one month fr	hed, according to Rule 38.2(b), by this Author om the date of mailing of this international se	rity as it appears in Box No. IV. The applicant carch report, submit comments to this Authority
6. With regard to the drawings,		
a. the figure of the drawings to l	be published with the abstract is Figure No. 1	
as suggested by the	e applicant	
as selected by this	Authority, because the applicant failed to sug	gest a figure
as selected by this	Authority, because this figure better characte	rizes the invention
b none of the figures is to	be published with the abstract	

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

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INTERNATIONAL SEARCH REPORT	International application No.		
	PCT/US2008/069171		
Box No. II Observations where certain claims were found unsearchable (Continu	nation of item 2 of first sheet)		
This international search report has not been established in respect of certain claims unde	r Article 17(2)(a) for the following reasons:		
1. Claims Nos.: because they relate to subject matter not required to be searched by this Author	ity, namely:		
2. Claims Nos.: because they relate to parts of the international application that do not comply extent that no meaningful international search can be carried out, specifically:	with the prescribed requirements to such an		
3. Claims Nos.: 15-17, 31-33 because they are dependent claims and are not drafted in accordance with the	second and third sentences of Rule 6.4(a).		
Box No. III Observations where unity of invention is lacking (Continuation of ite	m 3 of first sheet)		
This International Searching Authority found multiple inventions in this international ap	plication, as follows:		
1. As all required additional search fees were timely paid by the applicant, this in claims.	nternational search report covers all searchable		
2. As all searchable claims could be searched without effort justifying additiona additional fees.	I fees, this Authority did not invite payment of		
3. As only some of the required additional search fees were timely paid by the an only those claims for which fees were paid, specifically claims Nos.:	pplicant, this international search report covers		
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:			
-			
Remark on Protest The additional search fees were accompanied by the payment of a protest fee.	e applicant's protest and, where applicable, the		
The additional search fees were accompanied by t fee was not paid within the time limit specified in	the applicant's protest but the applicable protest the invitation.		
No protest accompanied the payment of additiona	1 JOH ON 1003.		

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/069171

1			
A. CLAS IPC(8) - USPC - C	SSIFICATION OF SUBJECT MATTER F02B 77/04 (2008.04) 123/198A International Patent Classification (IPC) or to both nati	onal classification and IPC	
	S SEARCHED		
Minimum do IPC(8) - F02I USPC - 123/	cumentation searched (classification system followed by cla B 77/04 (2008.04) 198A, 406.29, 435	assification symbols)	
Documentati	on searched other than minimum documentation to the exter	nt that such documents are included in the	fields searched
Electronic da	ta base consulted during the international search (name of d	lata base and, where practicable, search ter	ms used)
MicroPatent,	DialogPro, IP.com		
C. DOCUI	MENTS CONSIDERED TO BE RELEVANT	T	
Category*	Citation of document, with indication, where app	ropriate, of the relevant passages	Relevant to claim No.
Y	US 7,225,787 B2 (BROMBERG et al) 05 June 2007 (05.	06.2007) entire document	1-14, 18-30, 34-35
Y	US 2006/0102145 A1 (COHN et al) 18 May 2006 (18.05.	1-14, 18-30, 34-35	
Y	US 6,561,157 B2 (ZUR LOYE et al) 13 May 2003 (13.05	.2003) entire document	6, 23, 35
А	US 3,557,763 A (PROBST) 26 January 1971 (26.01.197	(1) entire document	1-35
А	US 4,056,087 A (BOYCE) 01 November 1977 (01.11.19	77) entire document	1-35
А	US 4,230,072 A (NOGUCHI et al) 28 October 1980 (28.	10.1980) entire document	1-35
А	US 4,594,201 A (PHILLIPS et al) 10 June 1986 (10.06.1	986) entire document	1-35
A	US 5,179,923 A (TSURUTANI et al) 19 January 1993 (1	1-35	
A	US 7,156,070 B2 (STROM et al) 02 January 2007 (02.0	1-35	
А	US 2007/0119421 A1 (LEWIS et al) 31 May 2007 (31.0	1-35	
А	US 2007/0125321 A1 (RITTER) 07 June 2007 (07.06.20	1-35	
	l		J
Furth	her documents are listed in the continuation of Box C.	"T" later document published after the inte	rnational filing date or priority
"A" docum	an categories of cried documents. nent defining the general state of the art which is not considered of narticular relevance	date and not in conflict with the appli the principle or theory underlying the	cation but cited to understand invention
"E" earlier filing	application or patent but published on or after the international date	"X" document of particular relevance; the considered novel or cannot be considered and the document is taken alon	e claimed invention cannot be dered to involve an inventive e
"L" docun cited	nent which may throw doubts on priority claim(s) or which is to establish the publication date of another citation or other (as associated)	"Y" document of particular relevance; the	claimed invention cannot be step when the document is
"O" docun	n reason (as specified) nent referring to an oral disclosure, use, exhibition or other	combined with one or more other such being obvious to a person skilled in the	documents, such combination he art
"P" docum	, nent published prior to the international filing date but later than iority date claimed	"&" document member of the same patent	family
Date of the	e actual completion of the international search	Date of mailing of the international sea	rch report
25 Septerr	nber 2008	0 3 OCT 2008	
Name and	mailing address of the ISA/US	Authorized officer:	
Mail Stop P	CT, Attn: ISA/US, Commissioner for Patents 450, Alexandria, Virginia 22313-1450	Biaine R. Copenne RCT Heindesk: 571-272-4300	Eavel
Facsimile	No. 571-273-3201	PCT OSP: 571-272-7774	

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

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From the INTERNATIONAL SEARCHING AUTHORITY	? ?					
To: SAM PASTERNACK Choate, Hall & Stewart LLP Two International Place	WRI	PCT TTEN OPINION OF THE				
Boston, Massachusetts 02110	INTERNATIO	ONAL SEARCHING AUTHORITY				
		(PCT Rule 43 <i>bis</i> .1)				
	Date of mailing (day/month/year)	3 OCT 2008				
Applicant's or agent's file reference 2006734-0021	FOR FURTHER AC	CTION ee paragraph 2 below				
International application No. Inter PCT/US2008/069171 03	national filing date (day:month/year) July 2008	Priority date <i>(day month year)</i> 10 July 2007				
International Patent Classification (IPC) or both IPC(8) - F02B 77/04 (2008.04) USPC - 123/198A	n national classification and IPC					
Applicant ETHANOL BOOSTING SYST	EMS LLC					
1. This opinion contains indications relating	to the following items:					
Box No. I Basis of the opinion						
Box No. II Priority						
Box No. III Non-establishment of	of opinion with regard to novelty, inventive	step and industrial applicability				
Box No. IV Lack of unity of invention						
Box No. V Reasoned statement under Rule 43 <i>bis</i> .1(a)(i) with regard to novelty, inventive step or industrial applicability citations and explanations supporting such statement						
Box No. VI Certain documents of	bited					
Box No. VII Certain defects in th	e international application					
Box No. VIII Certain observation:	s on the international application					
2. FURTHER ACTION		the second s				
If a demand for international preliminary International Preliminary Examining Auth other than this one to be the IPEA and the opinions of this International Searching A	v examination is made, this opinion will b sority ("IPEA") except that this does not app e chosen IPEA has notified the Internations uthority will not be so considered.	by where the applicant chooses an Authority al Bureau under Rule 66.1 <i>bis</i> (b) that written				
If this opinion is, as provided above, consi a written reply together, where appropriate PCT/ISA/220 or before the expiration of 2	idered to be a written opinion of the IPEA, t e, with amendments, before the expiration of 22 months from the priority date, whichever	the applicant is invited to submit to the IPEA of 3 months from the date of mailing of Form r expires later.				
For further options, see Form PCT/ISA/22	20.					
3. For further details, see notes to Form PCT	r/ISA/220.					
Name and mailing address of the ISA/US Da	te of completion of this opinion	Authorized officer:				
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450	5 September 2008	Blaine Copenheaver PCT Helpdesk: 571-272-4300				
Facsimile No. 571-273-3201		PCT OSP: 571-272-7774				

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Form PCT/ISA/237 (cover sheet) (April 2007)

	WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	International application No. PCT/US2008/069171
Box No. I	Basis of this opinion	
1. With r	egard to the language, this opinion has been established on the basis of: the international application in the language in which it was filed. a translation of the international application into translation furnished for the purposes of international search (Rules 12.3(a))	which is the language of a) and 23.1(b)).
2.	This opinion has been established taking into account the rectification of ar to this Authority under Rule 91 (Rule 43 <i>bis</i> .1(a))	n obvious mistake authorized by or notified
3. With r establi a. typ	egard to any nucleotide and/or amino acid sequence disclosed in the intershed on the basis of: be of material a sequence listing table(s) related to the sequence listing	rnational application, this opinion has been
b. for	mat of material on paper in electronic form	
c. tir	 ne of filing/furnishing contained in the international application as filed filed together with the international application in electronic form furnished subsequently to this Authority for the purposes of search 	
4.	In addition, in the case that more than one version or copy of a sequence lis filed or furnished, the required statements that the information in the subset in the application as filed or does not go beyond the application as filed, as	ting and/or table(s) relating thereto has been quent or additional copies is identical to that s appropriate, were furnished.
5. Addit	ional comments:	

Form PCT/ISA/237 (Box No. I) (April 2007)

	WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	International application No. PCT/US2008/069171
Box No.	III Non-establishment of opinion with regard to novelty, inventive step a	nd industrial applicability
The quest applicable	tions whether the claimed invention appears to be novel, to involve an inventive e have not been examined in respect of	step (to be non obvious), or to be industrially
	the entire international application	
\boxtimes	claims Nos. 15-17, 31-33	
	e: the said international application, or the said claims Nos	relate to the following
	the description claims or drawings <i>(indicate particular elements below)</i> or said	claims Nos. 15-17 31-33
	are so unclear that no meaningful opinion could be formed (<i>specify</i>):	oraniis (103. 1 <u>9-17, 91-99</u>
Claims 15	-17, 31-33 are multiple dependent claims not drafted in accordance with the seco	nd and third sentences of Rule 6.4(a).
	· .	
	the claims, or said claims Nos	are so inadequately supported
\boxtimes	no international search report has been established for said claims Nos. 15-17	, 31-33
	a meaningful opinion could not be formed without the sequence listing; the app	licant did not, within the prescribed time limit:
	furnish a sequence listing on paper complying with the standard pro Instructions, and such listing was not available to the International Search	vided for in Annex C of the Administrative ing Authority in a form and manner acceptable
	furnish a sequence listing in electronic form complying with the standard Instructions, and such listing was not available to the International Search	provided for in Annex C of the Administrative ing Authority in a form and manner acceptable
	pay the required late furnishing fee for the furnishing of a sequence Rule 13 <i>ter</i> .1(a) or (b).	e listing in response to an invitation under
	a meaningful opinion could not be formed without the tables related to the sequ prescribed time limit, furnish such tables in electronic form complying with Annex C-bis of the Administrative Instructions, and such tables were not availa a form and manner acceptable to it.	nence listings; the applicant did not, within the h the technical requirements provided for in able to the International Searching Authority in
	the tables related to the nucleotide and/or amino acid sequence listing, if in technical requirements provided for in Annex C-bis of the Administrative Instru-	electronic form only, do not comply with the ructions.
	See Supplemental Box for further details.	

Form PCT/ISA/237 (Box No. III) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY			International application No. PCT/US2008/069171	
Box No. V Reasoned statement un citations and explanati	ider Rule 43/	bis.1(a)(i) with regard to novelt ng such statement	y, inventive step or industrial applic:	ability;
1. Statement				
Novelty (N)	Claims Claims	1-14, 18-30, 34-35 None		YES NO
Inventive step (IS)	Claims Claims	None 1-14, 18-30, 34-35		YES NO
Industrial applicability (IA)	Claims Claims	1-14, 18-30, 34-35 None		YES NO
Claims 1-5, 7-14, 18-22, 24-30, and 34 la Cohn et al. Regarding claim 1, Bromberg et al. disclo gasoline engine (18); a source of gasoline into the cylinders of the engine (18); injec engine (18); a fuel management control s provided in an amount needed to prevent lines 45-55). Bromberg et al. do not show needed to prevent knock as torque increa a fast burn. Cohn et al. show a fuel mana provided in an amount needed to prevent was made to a person having ordinary sk Bromberg et al. in order to provide improv Regarding claim 2, Bromberg et al. and C burn occurs in 15-20 crank angle rang (burn) occurs in a small crank angle rang Regarding claim 3, Bromberg et al. and C lines 45-55) in the engine is provided by o Regarding claim 4, Bromberg et al. and C lines 45-55) in the engine is provided by o Regarding claim 5, Bromberg et al. and C lines 45-55) in the engine is provided by o Regarding claim 7, Bromberg et al. and C lines 45-60 in the engine is provided by o Regarding claim 7, Bromberg et al. and C lines 45-60 in the engine is provided by o Regarding claim 7, Bromberg et al. and C lines 45-60 in the engine is provided by o Regarding claim 7, Bromberg et al. and C lines the periphery (paragraph 7). It would art to employ the structures and processe performance. Regarding claim 8, Bromberg et al. and C lineitor of the second fuel is adjusted to	se a fuel man a (Fig. 4a); a s tors for direct ystem (Col. 1, knock (Fig. 3 controlling in sses; and a m gement contra knock as torci ill in the art to ved engine pe cohn et al. diss charge motion cohn et al. diss charge motion cohn et al. diss charge motion cohn et al. diss charge motion cohn et al. diss consect term ark (Col. 4, lin cohn et al. diss on the exhaus s aimed toward d have been o as as at aught b cohn et al. diss on the exhaus s aimed toward d have been o as as taught b	agement system for a spark igniti source of a second liquid fuel (Fig injection of the second liquid fuel lines 45-50) for controlling inject) as other conditions require; and jection of the second fuel into the eans for providing fast burn. It is of o laystem (14) for controlling inject que increases (paragraph 32). It w employ the structures and proces from Bromberg et al. (Figs. 2A-2 at claimed. close that as applied above. Brom (Col. 10, lines 15-20). close that as applied above. Brom perature (Col. 4, lines 1-10) in the es 30-45). close that as applied above. Brom s ignition sources (Col. 1, lines 13 uplete combustion. close that as applied above. Brom s valve side of the cylinder and th d an end gas on an exhaust valvi bvious at the time the invention w y Cohn et al. in the device of Bror ethanol consumption (Col. 6, line	on gasoline engine (Abstract) comprisi . 4a); a means for introducing gasoline (Col. 11, lines 23-50) into the cylinders ion of the second fuel into the cylinder second fuel into the cylinder second fuel into the cylinder second fuel into a cylinder so that it is provided in an amo feemed obvious that a fast flame speet cylinder so that it is provided in an amo feemed obvious that a fast flame speet cylinder so that it is provided in an amo feemed obvious that a fast flame speet cylinder so that it is provided in an amo feemed obvious that a fast flame speet cylinder so that it is provided in an amo feemed obvious that a fast flame speet cylinder so that it is provided in an amo feemed obvious that a fast flame speet ses as taught by Cohn et al. in the dev aberg et al. do not show where the 10% but a significant portion of the energy herg et al. show where the fast burn (C a unburned zone of air/fuel mixture zon aberg et al. do not show where there ar -15, Col. 6, lines 23-30). It is obvious the aberg et al. do not show where the spray a side of the cylinder and an injector is ras made to a person having ordinary s nberg et al. in order to provide improve aberg et al. show where the time of the s 48-52, Col. 10, lines 25-35).	riew of ng: a (Fig. 4b) of the so that it is d (Col. 10, ount d produces that it is e invention vice of o - 90% gy fraction Col. 10, Col. 10, e that burns e dual nat the dual wy of the . Cohn et located kill in the d engine direct
Regarding claim 9, Bromberg et al. and C created at or near the intake port. Cohn e been obvious at the time the invention wa taught by Cohn et al. in the device of Bro	Cohn et al. dis It al. show whe Is made to a p mberg et al. ir	close that as applied above. Brom ere turbulence is created at or ne- person having ordinary skill in the n order to provide improved engin	nberg et al. do not show where turbulen ar an intake port (paragraph 28). It wou art to employ the structures and proces e performance.	ice is Id have sses as
Regarding claim 10, Bromberg et al. and by means of spark retard relative to what	Cohn et al. di it would be if	sclose that as applied above. Bro fast burn were not employed (Col	mberg et al. show where combustion is . 8, lines 20-25).	retarded
Regarding claim 11, Bromberg et al. and measured by the 50% burn crank angle, i spark retard (Col. 8, lines 20-25). It is dec	Cohn et al. di is retarded usi emed obvious	sclose that as applied above. Bro ing appropriate spark retard by ar that spark retard is a small but si	mberg et al. do not show where combu n amount between 5 and 10 degrees bu gnificant amount including that claimed	istion, as it show
(Continued in Supplemental Box)				
Form PCT/ISA/237 (Box No. V) (April 2	2007)			

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY International application No. PCT/US2008/069171

Supplemental Box

In case the space in any of the preceding boxes is not sufficient. Continuation of:

Box V

Regarding claim 12, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the amount of second fuel that is used is reduced when the fast burn is provided (Col. 3, lines 25-30).

Regarding claim 13, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the amount of combustion retard is varied as a function of load (Col. 1, lines 20-25) and speed by means of appropriate spark retard (Col. 8, lines 20-25).

Regarding claim 14, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the degree of combustion retard is chosen so as to optimize the combination of efficiency gain and minimization of the required amount of the second fluid fuel. Cohn et al. show where a degree of combustion retard is chosen so as to optimize the combination of efficiency gain and minimization of the required amount of the second fluid fuel (Fig. 5, paragraphs 14 and 35). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 18, Bromberg et al. disclose a fuel management system for a spark ignition gasoline engine (Abstract) comprising: a gasoline engine (18) of compression ratio between 13 and 14 (Col. 7, lines 55-60); a source of a second liquid fuel (Fig. 4a); a means for introducing gasoline (Fig. 4b) into the cylinders of the engine (18); injectors for direct injection of the second liquid fuel (Col. 11, lines 23-50) into the cylinder of the engine (18); a fuel management control system (Col. 1, lines 45-50) for controlling injection of the second fuel into the cylinder so that it is provided in an amount needed to prevent knock (Fig. 3) as torque increases or other conditions require; and a means for fast flame speed (Col. 10, lines 45-55). Bromberg et al. do not show controlling injection of the second fuel into the cylinder so that it is provided in an amount needed to prevent knock as torque increases; and a means for providing fast burn. It is deemed obvious that a fast flame speed produces a fast burn. Cohn et al. show a fuel management control system (14) for controlling injection of a second fuel into a cylinder so that it is provided in an amount needed to prevent knock as torque increases (paragraph 32). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. In the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 19, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the 10% - 90% burn occurs in 15-20 crank angle degrees. It is obvious from Bromberg et al. (Figs. 2A-2B) that a significant portion of the energy fraction (burn) occurs in a small crank angle range including that claimed.

Regarding claim 20, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the fast burn (Col. 10, lines 45-55) in the engine is provided by charge motion (Col. 10, lines 15-20).

Regarding claim 21, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the fast burn (Col. 10, lines 45-55) in the engine is provided by increased temperature (Col. 4, lines 1-10) in the unburned zone of air/fuel mixture zone that burns early in the cycle after the firing of the spark (Col. 4, lines 30-45).

Regarding claim 22, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where there are dual ignition sites on either side of the cylinder but show two ignition sources (Col. 1, lines 13-15, Col. 6, lines 23-30). It is obvious that the dual sites can be on opposite cylinder sides to promote complete combustion.

Regarding claim 24, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the spray of the second fuel is aimed toward the end gas on the exhaust valve side of the cylinder. Cohn et al. show where spray of the second fuel is aimed toward an end gas on the exhaust valve side of the cylinder (paragraph 7). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 25, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where turbulence is created at or near the intake port. Cohn et al. show where turbulence is created at or near an intake port (paragraph 28). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 26, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where combustion is retarded by means of spark retard relative to what it would be if fast burn were not employed (Col. 8, lines 20-25).

Regarding claim 27, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where combustion, as measured by the 50% burn crank angle, is retarded using appropriate spark retard by an amount between 5 and 15 degrees but show spark retard (Col. 8, lines 20-25). It is deemed obvious that spark retard is a small but significant amount including that claimed.

Regarding claim 28, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the amount of second fuel that is used is reduced when the fast burn is provided (Col. 3, lines 25-30).

Regarding claim 29, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. show where the amount of combustion retard is varied as a function of load (Col. 1, lines 20-25) and speed by means of appropriate spark retard (Col. 8, lines 20-25).

(Continued in next Supplemental Box)

Form PCT/ISA/237 (Supplemental Box) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No. PCT/US2008/069171

Supplemental Box

In case the space in any of the preceding boxes is not sufficient. Continuation of

Previous Supplemental Box

Regarding claim 30, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the degree of combustion retard is chosen so as to optimize the combination of efficiency gain and minimization of the required amount of the second fluid fuel. Cohn et al. show where a degree of combustion retard is chosen so as to optimize the combination of efficiency gain and minimization of the required amount of the second fluid fuel. Cohn et al. show where a degree of combustion retard is chosen so as to optimize the combination of efficiency gain and minimization of the required amount of the second fluid fuel (Fig. 5, paragraphs 14 and 35). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 34, Bromberg et al. disclose a spark ignition gasoline engine (18) where alcohol and gasoline are both directly injected (Col. 1, lines 55-60) and where the alcohol/gasoline ratio needed to prevent knock uses fast burn. Bromberg et al. do not show where the alcohol/gasoline ratio needed to prevent knock uses fast burn. Bromberg et al. do not show where the alcohol/gasoline ratio needed to prevent knock uses fast burn. Bromberg et al. do not show where the alcohol/gasoline ratio needed to prevent knock is reduced by using fast flame speed. It is deemed obvious that a fast flame speed (Bromberg - Col. 10, lines 45-55) produces a fast burn. Cohn et al. show where an alcohol/gasoline ratio needed to prevent knock is reduced (paragraph 19). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. in the device of Bromberg et al. in order to provide improved engine performance.

Claims 6, 23, 35 lack an inventive step under PCT Article 33(3) as being obvious over Bromberg et al. in view of Cohn et al. and zur Loye et al.

Regarding claim 6, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the direct injector is located in the center of the cylinder. zur Loye et al. show where a direct injector (62) is located in a center of a cylinder (Fig. 1). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. and zur Loye et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 23, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where the direct injector is located in the center of the cylinder. zur Loye et al. show where a direct injector (62) is located in a center of a cylinder (Fig. 1). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. and zur Loye et al. in the device of Bromberg et al. in order to provide improved engine performance.

Regarding claim 35, Bromberg et al. and Cohn et al. disclose that as applied above. Bromberg et al. do not show where a high energy spark plug is used to provide fast burn. zur Loye et al. show where a high energy spark plug (52) is used to provide fast burn. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the structures and processes as taught by Cohn et al. and zur Loye et al. in the device of Bromberg et al. in order to provide improved engine performance.

Claims 1-14, 18-30, and 34-35 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Form PCT/ISA/237 (Supplemental Box) (April 2007)

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

- [Where originally there were 48 claims and after amendment of some claims there are 51]: "Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers;
- claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
- [Where originally there were 15 claims and after amendment of all claims there are 11]: "Claims 1 to 15 replaced by amended claims 1 to 11." 2.
- [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
 - "Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or "Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged.
- [Where various kinds of amendments are made]:
- "Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)). The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

If a demand for international preliminary examination is made, the written opinion of the International Searching Authority will, except in certain cases where the International Preliminary Examining Authority did not act as International Searching Authority and where it has notified the International Bureau under Rule 66.1*bis*(b), be considered to be a written opinion of the International Preliminary Examining Authority. If a demand is made, the applicant may submit to the International Preliminary Examining Authority. If a demand is made, the mathematical experimentary examined and the experimentary examined at the second experimentary examined experimentary experimen

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see the PCT Applicant's Guide, Volume II

Notes to Form PCT/ISA/220 (second sheet) (October 2005)

PATENT COOP	PIVITIUM Sp to WYHAMOPM
rom the INTERNATIONAL SEARCHING AUTHORITY	Due 9.18116
0:	PCT
AM PASTERNACK HOATE, HALL & STUART LLP WO INTERNATIONAL PLACE HORNA CLAMS	NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION
Due <u>60606</u>	Date of mailing (day/month/year) 0 & APR 2006
Applicant's or agent's file reference	FOR FURTHER ACTION See paragraphs 1 and 4 below
492012-0400 nternational application No. PCT/US05/41317	International filing date (<i>day/month/year</i>) 14 November 2005 (14.11.2005)
Applicant	
. The applicant is hereby notified that the international so have been established and are transmitted herewith. Filing of amendments and statement under Article The applicant is entitled, if he so wishes, to amend the	earch report and the written opinion of the International Searching Authority 19: claims of the international application (see Rule 46):
When? The time limit for filing such amendments search report.	s is normally two months from the date of transmittal of the international
Where? Directly to the International Bureau of WI 1211 Geneva 20, Switzerland, Facsimile I	IPO, 34 chemin des Colombettes No.: (41-22) 338.82.70.
For more detailed instructions, see the notes on the	e accompanying sheet.
2. The applicant is hereby notified that no international se Article 17(2)(a) to that effect and the written opinion of	earch report will be established and that the declaration under of the International Searching Authority are transmitted herewith.
3. With regard to the protest against payment of (an) a	dditional fee(s) under Rule 40.2, the applicant is notified that:
the protest together with the decision thereon has request to forward the texts of both the protest an no decision has been made yet on the protest; the	been transmitted to the International Bureau together with the applicant's and the decision thereon to the designated Offices.
4. Reminders Shortly after the expiration of 18 months from the priority Bureau. If the applicant wishes to avoid or postpone public priority claim, must reach the International Bureau as provide technical preparations for international publication. The applicant may submit comments on an informal basis International Bureau. The International Bureau will send a c preliminary examination report has been or is to be establish before the expiration of 30 months from the priority date.	date, the international application will be published by the International cation, a notice of withdrawal of the international application, or of the ed in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of the copy of such comments to all designated Offices unless an international hed. These comments would also be made available to the public but not
Within 19 months from the priority date, but only in resp examination must be filed if the applicant wishes to postpone (in some Offices even later); otherwise, the applicant must, entry into the national phase before those designated Offices	ect of some designated Offices, a demand for international preliminary e the entry into the national phase until 30 months from the priority date within 20 months from the priority date, perform the prescribed acts for
In respect of other designated Offices, the time limit of 30 m See the Annex to Form PCT/IB/301 and, for details about th Volume II, National Chapters and the WIPO Internet site.	the applicable time limits, Office by Office, see the PCT Applicant's Guide,
Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450	Authorized officer For HENRY YUEN Juginica Liby DEFERENCIE NO (703) 508-086
orm PCT/ISA/220 (January 2004)	APR 1 0 2006
	PATENT DEPARTNENIT

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FORD Ex. 1019, page 95 IPR2019-01400

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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference FOR FURTHER see Form PCT/ISA/220 0492612-0406 ACTION as well as, where applicable, item 5 below.						
International application No. PCT/US05/41317	International filing date (<i>day/month/year</i>) 14 November 2005 (14.11.2005)	(Earliest) Priority Date (<i>day/month/year</i>) 18 November 2004 (18.11.2004)				
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY						
This international search report has been according to Article 18. A copy is being This international search report consists It is also accompanied 1. Basis of the Report a. With regard to the language, the the international a translation of th of a translation of th of a translation ff b. With regard to any nucleoti 2. Certain claims were found 3. Unity of invention is lackin 4. With regard to the title, the text is approved as subm the text has been established Variable Ethanol Octane Enhancement of	prepared by this International Searching Aut transmitted to the International Bureau. of a total of sheets. I by a copy of each prior art document cited i international search was carried out on the basi application in the language in which it was file the international application into urnished for the purposes of international search de and/or amino acid sequence disclosed in the unsearchable (See Box No. II) the (See Box No. III) interd by the applicant. I by this Authority to read as follows: Gasoline Engines	thority and is transmitted to the applicant in this report. is of: d. , which is the language h (Rules 12.3(a) and 23.1(b)) ne international application, see Box No. I.				
5. With regard to the abstract , the text is approved as subr the text has been establishe may, within one month from	nitted by the applicant. d, according to Rule 38.2(b), by this Authority n the date of mailing of this international searcl	as it appears in Box No. IV. The applicant h report, submit comments to this Authority.				
 6. With regard to the drawings, a. the figure of the drawings to be as suggested by the as selected by this b. none of the figures is to be 	published with the abstract is Figure No. <u>1</u> e applicant. Authority, because the applicant failed to sugg Authority, because this figure better characteris published with the abstract.	- est a figure. zes the invention.				

INTERNATIONAL SEARCH REPOR	T International app	lication No.
	PCT/US05/4131	7
A. CLASSIFICATION OF SUBJECT MATTER IPC(8): F02B 75/12(2006.01)		
USPC: 123/198A,575,1A,525 According to International Patent Classification (IPC) or to both national Patent Classification (IP	onal classification and IPC	
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by U.S. : 123/ 198A, 575, 1A, 525	v classification symbols)	
Documentation searched other than minimum documentation to the e NONE	extent that such documents are included	in the fields searched
Electronic data base consulted during the international search (name NONE	of data base and, where practicable, sea	rch terms used)
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category * Citation of document, with indication, where ap	propriate, of the relevant passages	Relevant to claim No.
X US 6,076,487 A (WULFF et al) 20 June 2000 (20.06.	2000), column 4, lines 60-64 and	1,4,54
Column 5, lines 3-6. A US 4,495,930 A (NAKAJIMA) 29 January 1985 (29.	01.1985), see entire document.	1-22,24-85
A US 4,402,296 A (SCHWARZ) 06 September 1983 (0	6.09.1983), see entire document.	1-22,24-85
Further documents are listed in the continuation of Box C.	See patent family annex.	
 * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of 	"T" later document published after the in date and not in conflict with the app principle or theory underlying the in	nternational filing date or priority lication but cited to understand the vention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the considered novel or cannot be considered novel or cannot be considered novel or cannot be document is taken alone	e claimed invention cannot be idered to involve an inventive step
"L" document which mây throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; th considered to involve an inventive s with one or more other such docum	te claimed invention cannot be tep when the document is combined ents, such combination being
"O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same pate	t nt family
Date of the actual completion of the international search	Date of mailing of the international se	arch report
13 March 2006 (13.03.2006)	UG APR ZUUD	
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alwardin Virginia 22313, 1450	Authorized officer For HENRY YUEN Jugunus Telephone No. (703) 398-0861	liby
Facsimile No. (571) 273-3201		-

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

From the	ONAL SEARCH	ING AUTHO	ORITY			
To: SAM PASTERNACK CHOATE, HALL & STUART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110		WRI INTERNATIO	PCT TTEN OPINION OF THE NAL SEARCHING AUTHORITY			
						(PCT Rule 43bis.1)
					Date of mailing (day/month/year)	06 APR 2006
Applicant's	s or agent's file re	ference			FOR FURTHER A	ACTION
0492612-0	406					
Internation	al application No.		Internatio	onal filing date	(day/month/year)	Priority date (<i>day/month/year</i>)
PCT/US05	/41317		14 Nove	mber 2005 (14.1	1.2005)	18 November 2004 (18.11.2004)
Internation	al Patent Classific	cation (IPC) o	or both nat	ional classificati	ion and IPC	
IPC(8): I	702B 75/12(2006	.01) 525				
Applicant	25/1966,975,17,	,525				
MASSACI	HUSETTS INSTI	TUTE OF TI	ECHNOLO	OGY		
1. This o	pinion contains ir	dications rel	ating to the	e following item	15:	
	Box No. I	Basis of the	e opinion			
	Box No. II	Priority				
	Box No. III	Non-establ	ishment of	opinion with re	gard to novelty, inven	tive step and industrial applicability
	Box No. IV	Lack of un	ity of inver	ntion		
	Box No. V Reasoned statement under Rule 43 <i>bis</i> .1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement					
	Box No. VI Certain documents cited					
	Box No. VII Certain defects in the international application					
	Box No. VIII Certain observations on the international application					
2. FURTHER ACTION						
If a d Interr Autho that v	lemand for intern national Prelimina prity other than th written opinions of	ational prelin ary Examini his one to be f this Internat	ninary exa ng Author the IPEA ional Sear	amination is ma ity ("IPEA") e and the chosen ching Authority	de, this opinion will accept that this does IPEA has notified th will not be so conside	be considered to be a written opinion of the not apply where the applicant chooses an e International Bureau under Rule $66.1bis(b)$ ered.
If this IPEA of Fo For fi	s opinion is, as p a written reply to rm PCT/ISA/220 orther options, see	rovided above ogether, whe or before the Form PCT/J	ve, conside re appropr expiration SA/220.	ered to be a wri iate, with amend of 22 months f	tten opinion of the If dments, before the ex rom the priority date,	PEA, the applicant is invited to submit to the piration of 3 months from the date of mailing whichever expires later.
3. For f	urther details, see	notes to For	n PCT/ISA	\/220.		
Name and	d mailing address Mail Stop PCT, Att Commissioner for P P.O. Box 1450 Alexandria, Virginia	of the ISA/ U n: ISA/US Patents a 22313-1450	JS	Date of compl 13 March 200	etion of this opinion 6 (13.03.2006)	Authorized officer HENRY YUEN Unginia Luby Telephone No. (703) 308-0861
Facsimile	No. (571) 273-32	201		1	*	

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

	International application No.
WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	PCT/US05/41317
Box No. I Basis of this opinion	
Box No. I Basis of this opinion 1. With regard to the language, this opinion has been established on the basis of: Image: the international application in the language in which it was filed a translation of the international application into, which is the lang international search (Rules 12.3(a) and 23.1(b)). 2. With regard to any nucleotide and/or amino acid sequence disclosed in the internation, this opinion has been established on the basis of: a. type of material Image: a sequence listing Image: table(s) related to the sequence listing b. format of material Image: on paper Image: internation in the sequence form	uage of a translation furnished for the purposes of ternational application and necessary to the claimed
 c. time of filing/furnishing contained in the international application as filed. filed together with the international application in electronic form furnished subsequently to this Authority for the purposes of search 	h.
 3. In addition, in the case that more than one version or copy of a sequence or furnished, the required statements that the information in the subse application as filed or does not go beyond the application as filed, as applet. 4. Additional comments: 	e listing and/or table(s) relating thereto has been filed equent or additional copies is identical to that in the propriate, were furnished.

 $\left(\begin{array}{c} & & \\ & & \\ & & \\ & & \\ \end{array} \right)$

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YES
NO
YES
NO
YES
NO

2. Citations and explanations:

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

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

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

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

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

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

Form PCT/ISA/237 (Box No. V) (April 2005)

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US05/41317

Box No. VII Certain defects in the international application

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

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

Form PCT/ISA/237 (Box No. VII) (April 2005)

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NOTES TO FORM PCT/ISA/220

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

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

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

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

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

What parts of the international application may be amended ?

Under Article 19, only the claims may be amended.

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

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

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

Where not to file the amendments ?

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

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

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

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

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

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

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

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

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

Notes to Form PCT/ISA/220 (first sheet) (January 2004)

SPIR	(m) Rept Written Dr
PATENT COOL	PERATION TREATY DOCKETED
From the INTERNATIONAL SEARCHING AUTHORITY	Due 9.2807
To: SAM PASTERNACK CHOATE, HALL & STEWART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110 DOCKETEO	PCT NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION
Due $\underline{\varsigma \cdot 2\varsigma 0}$	(PCT Rule 44.1)
Applicant's or agent's file reference	day/month/year) 28 JUN 2007
0492611- 0617 • 0433	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US06/12750	International filing date (<i>day/month/year</i>) 06 April 2006 (06.04.2006)
Applicant MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
1. The applicant is hereby notified that the international set have been established and are transmitted herewith.	earch report and the written opinion of the International Searching Authority
Filing of amendments and statement under Article The applicant is entitled, if he so wishes, to amend the	19: claims of the international application (see Rule 46);
When? The time limit for filing such amendments search report.	s is normally two months from the date of transmittal of the international
Where? Directly to the International Bureau of WI 1211 Geneva 20, Switzerland, Facsimile N	IPO, 34 chemin des Colombettes No.: (41-22) 338.82.70.
For more detailed instructions, see the notes on the	e accompanying sheet.
2 The applicant is hereby notified that no international se Article 17(2)(a) to that effect and the written opinion of	earch report will be established and that the declaration under f the International Searching Authority are transmitted herewith.
3. With regard to the protest against payment of (an) ad	ditional fee(s) under Rule 40.2, the applicant is notified that:
the protest together with the decision thereon has request to forward the texts of both the protest and	been transmitted to the International Bureau together with the applicant's d the decision thereon to the designated Offices.
no decision has been made yet on the protest; the	applicant will be notified as soon as a decision is made.
4. Reminders Shortly after the expiration of 18 months from the priority d Bureau. If the applicant wishes to avoid or postpone publica priority claim, must reach the International Bureau as provided technical preparations for international publication.	late, the international application will be published by the International ation, a notice of withdrawal of the international application, or of the d in Rules 90 <i>bis</i> .1 and 90 <i>bis</i> .3, respectively, before the completion of the
The applicant may submit comments on an informal basis of International Bureau. The International Bureau will send a co preliminary examination report has been or is to be establishe before the expiration of 30 months from the priority date.	on the written opinion of the International Searching Authority to the opy of such comments to all designated Offices unless an international ed. These comments would also be made available to the public but not
Within 19 months from the priority date, but only in respective examination must be filed if the applicant wishes to postpone (in some Offices even later); otherwise, the applicant must, w entry into the national phase before those designated Offices.	ct of some designated Offices, a demand for international preliminary the entry into the national phase until 30 months from the priority date ithin 20 months from the priority date, perform the prescribed acts for
In respect of other designated Offices, the time limit of 30 mon See the Annex to Form PCT/IB/301 and, for details about the	ths (or later) will apply even if no demand is filed within 19 months. applicable time limits, Office by Office, see the PCT Applicant's Guide,
Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450	Authorized officer Stephen Kirk Cronin Telephone No. (703) 308-0861

Form PCT/ISA/220 (January 2004)

(See notes on accompanying sheet)

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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 0492611-0617	FOR FURTHER see ACTION as well as, who	Form PCT/ISA/220 ere applicable, item 5 below.
International application No. PCT/US06/12750	International filing date (day/month/year) 06 April 2006 (06.04.2006)	(Earliest) Priority Date (day/month/year) 06 April 2005 (06.04.2005)
Applicant MASSACHUSETTS INSTITUTE OF 1 This international search report has be according to Article 18. A copy is bei This international search report consis It is also accompan 1. Basis of the Report a. With regard to the language, t the internation a translation o of a translation b. With regard to any nucle	TECHNOLOGY ten prepared by this International Searching Au ing transmitted to the International Bureau. ats of a total of <u>2</u> sheets. he by a copy of each prior art document cited the international search was carried out on the bas hal application in the language in which it was file of the international application into	in this report. is of: ed. (Rules 12.3(a) and 23.1(b)) re international application, see Box No. 1
 3. Unity of invention is lact 4. With regard to the title, the text is approved as suid the text has been establish DIRECT INJECTION ETHANOL ENH 	king (See Box No. III) bmitted by the applicant. hed by this Authority to read as follows: ANCEMENT OF GASOLINE ENGINES	
 5. With regard to the abstract, the text is approved as sultimative to the text has been establish may, within one month from the figure of the drawings, a. the figure of the drawings to the draw	bmitted by the applicant. ned, according to Rule 38.2(b), by this Authority a om the date of mailing of this international search be published with the abstract is Figure No. <u>3</u> he applicant. is Authority, because the applicant failed to sugges	is it appears in Box No. IV. The applicant report, submit comments to this Authority. st a figure.
as selected by thi	s Authority, because this figure better characterize	es the invention.
b none of the figures is to b	e published with the abstract.	

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

	INTERNATIONAL SEARCH REPO	RT	International appl	ication No.
			PCT/US06/12750	
A. CLAS IPC:	SSIFICATION OF SUBJECT MATTER F02B 77/04(2006.01)	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1		
USPC: According to	123/198A,435,406.29,406.47,25C,559.1 International Patent Classification (IPC) or to both na	ional classificatio	on and IPC	
B. FIEL	DS SEARCHED			· · · · · · · · · · · · · · · · · · ·
Minimum do U.S. : 12	cumentation searched (classification system followed t 23/198A,435,406.29,406.47,25C,559.1	y classification s	ymbols)	
Documentati NONE	on searched other than minimum documentation to the	extent that such c	locuments are included ir	n the fields searched
Electronic da NONE	ta base consulted during the international search (name	of data base and	, where practicable, searc	h terms used)
C. DOC	UMENTS CONSIDERED TO BE RELEVANT			-
Category *	Citation of document, with indication, where a	ppropriate, of the	relevant passages	Relevant to claim No.
X	US 6,513,505 B2 (WATANABE et al) 04 February 2	003 (04.02.2003)	, column 5, lines 45-	1,2,17,36
	66.			
A	US 4,541,383 A (JESSEL) 17 September 1985 (17.0	9.1985), column	l, lines 10-20.	1-51
A	US 5,937,799 A (BINION) 17 August 1999 (17.08.1	999), column 8, l	ines 20-35.	1-51
Further	documents are listed in the continuation of Box C.	See pa	atent family annex.	mational filing date or priority
"A" documen	t defining the general state of the art which is not considered to be of	date ar	d not in conflict with the application of the investigation of the provident of the investigation of the investiga	ation but cited to understand the
"E" earlier ap	relevance plication or patent published on or after the international filing date	"X" docum consid	ent of particular relevance; the c ered novel or cannot be consider	laimed invention cannot be ed to involve an inventive step
"L" documen establish specified	t which may throw doubts on priority claim(s) or which is cited to the publication date of another citation or other special reason (as)	when t "Y" docum conside	he document is taken alone ent of particular relevance; the c cred to involve an inventive step	laimed invention cannot be when the document is
"O" documen	t referring to an oral disclosure, use, exhibition or other means	combin being o	ed with one or more other such byious to a person skilled in the	documents, such combination art
"P" documen priority d	t published prior to the international filing date but later than the ate claimed	"&" docum	ent member of the same patent f	àmily
Date of the a	ctual completion of the international search	Date of mailing	of the international search	h report
31 May 2007	(31.05.2007)	<u>28 JIN</u>	2006	
Name and ma	ailing address of the ISA/US	Authorized offic	er /////	
Ma Cor	II Stop PC1, Attn: ISA/US nmissioner for Patents	Stephen Kirk	ronin	
P.O	. Box 1450 yandria, Virginia 22313-1450	Telephone No.	v √ (703) 308-0861	
Facsimile No	. (571) 273-3201		(,) 00 0001	

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

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Υ.	PATENT COOPERATION TREAT	

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From the INTERNATIONAL SEARCHING AUTH			
To: SAM PASTERNACK CHOATE, HALL & STEWART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110		WI	PCT RITTEN OPINION OF THE ONAL SEARCHING AUTHORITY
			(PC1 Rule 43bis.1)
		Date of mailing (<i>day/month/year</i>)	28 JUN 2007
Applicant's or agent's file reference	·	FOR FURTHER	ACTION
0492611-0617			
International application No.	International filing date	(day/month/year)	Priority date (day/month/year)
PCT/US06/12750	06 April 2006 (06.04.20	06)	06 April 2005 (06.04.2005)
International Patent Classification (IPC) of	or both national classificat	ion and IPC	
IPC: F02B 77/04(2006.01)			
USPC: 123/198A,406.29,406.47,435,55	59.1,25C		
MASSACHUSETTS INSTITUTE OF TE	CHNOLOGY		
Image: Provide Contains indications relations indications relations indications relations relations relations relations in the contains indications in the contains in the contains in the contains indications in the contains in the cont	opinion shment of opinion with re- y of invention atement under Rule 43 <i>bis</i> v; citations and explanation uments cited cts in the international app ervations on the internation inary examination is made g Authority ("IPEA") ex- he IPEA and the chosen is anal Searching Authority of	gard to novelty, inve .1(a)(i) with regard to ns supporting such st plication nal application le, this opinion will cept that this does IPEA has notified th will not be so conside	ntive step and industrial applicability o novelty, inventive step or industrial atement be considered to be a written opinion of the not apply where the applicant chooses an e International Bureau under Rule 66.1 <i>bis(b)</i> pred.
If this opinion is, as provided above, IPEA a written reply together, where of Form PCT/ISA/220 or before the ex For further options, see Form PCT/IS. 3. For further details, see notes to Form	, considered to be a writt appropriate, with amenda xpiration of 22 months fro A/220. PCT/ISA/220.	en opinion of the IP ments, before the exp om the priority date, v	EA, the applicant is invited to submit to the piration of 3 months from the date of mailing whichever expires later.
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Date of complet	tion of this opinion	Authorized officer Stephen Kine Crohin Telephone No. (703) 308-0861

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

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	WRITTEN OPINION OF THE	International application No.
	Bay No. I. Basis of this opinion	PC1/US06/12/50
	 1. With regard to the language, this opinion has been established on the basis of: the international application in the language in which it was filed a translation of the international application into, which is the language international search (Rules 12.3(a) and 23.1(b)). 	l guage of a translation furnished for the purposes of
	 With regard to any nucleotide and/or amino acid sequence disclosed in the invention, this opinion has been established on the basis of: 	nternational application and necessary to the claimed
	 a. type of material a sequence listing table(s) related to the sequence listing 	
9	 b. format of material on paper in electronic form 	
	 c. time of filing/furnishing contained in the international application as filed. filed together with the international application in electronic form furnished subsequently to this Authority for the purposes of search 	1. h.
	 In addition, in the case that more than one version or copy of a sequenc or furnished, the required statements that the information in the subse application as filed or does not go beyond the application as filed, as ap A Additional comments: 	e listing and/or table(s) relating thereto has been filed quent or additional copies is identical to that in the propriate, were furnished.

Form PCT/ISA/237(Box No. I) (April 2005)

		The second s		
WRITTEN OPINION OF TH INTERNATIONAL SEARCHING AU	E THORITY	International application No. PCT/US06/12750		
Box No. V Reasoned statement under Rule 43 <i>b</i> applicability; citations and explanati	Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
1. Statement				
Novelty (N)	Claims 3-16,18-35,37-51		_YES	
	Claims <u>1,2,17,36</u>		_NO	
Inventive step (IS)	Claims <u>3-16,18-35,37</u>	-51	_YES	
	Claims <u>1,2,17,36</u>		_NO	
Industrial applicability (IA)	Claims <u>1-51</u>		_YES	
	Claims <u>NONE</u>		_NO	
2. Citations and explanations:				
Claims 1.2,17,36 lacks novelty under PCT Article 33(2) as being anticipated by Watanabe et al (US 6,513,505).				
As to Claim 1, Watanabe et al discloses fuel management system for operation of a spark ignition gasoline engine comprising: a spark ignition engine 1; a source of gasoline; a source of anti-knock agent 9 which is a fuel; an injector 2 for direct injection of the anti-knock agent 9 into a cylinder 1a of the engine 1; and a fuel management control system 30 for controlling injection of the anti-knock agent 9 into the cylinder 1a to control knock, wherein the antiknock agent 9 has a heat of vaporization per unit of combustion energy that is at least three times that of gasoline. See col. 2, lines 12-20, col. 5, lines 45-66 and col. 6, lines 1-27 and Figs. 1-6.				

As to Claim 2, Watanabe et al discloses fuel management system for operation of a spark ignition gasoline comprising: a spark ignition engine 1; a source of gasoline; a source of an anti-knock agent 9 which is a fuel an injector 2 for direct injection of the anti-knock agent 9 into a cylinder of the engine; and a fuel management control system 30 for controlling injection of the anti-knock agent 9 into the cylinder when engine torque is above a selected value or fraction of maximum torque where the value or fraction of maximum torque is a function of engine speed.

As to Claim 17, Watanabe et al discloses wherein the anti-knock agent is ethanol and where the amounts of air, ethanol and gasoline per cylinder per cycle are controlled so as to achieve a substantially stoichiometric fuel/ air ratio.

As to Claim 36, Watanabe et al discloses fuel management system for efficient operation of a spark ignition gasoline engine comprising: a gasoline engine 1; a source of an anti-knock agent 9; an injector 2 for direct injection of both the anti-knock agent and the gasoline into a cylinder of the engine; and a fuel management control system 30 for controlling injection of the anti-knock agent into the cylinder to control knock.

Claims 3-16,18-35,37-51 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest wherein the maximum anti-knock agent energy fraction used during a drive cycle is between 30% and 100%.

Claims 1-51 meets the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Form PCT/ISA/237 (Box No. V) (April 2005)
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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

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International application No.

PCT/US06/12750

Box No. VII Certain defects in the international application

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

Claims 4,42,48 objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: The inlet valve of claim 4 lacks proper antecedent basis. The claim 42 is an improper multiple dependent claim (not in alternative format, and dependent upon other multiple dependent claims). The claim 48, "expandable pipe and funnel" is not shown in the drawings.

Form PCT/ISA/237 (Box No. VII) (April 2005)



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

Publication No.US-2009-0084349-A1 Publication Date:04/02/2009

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

page 1 of 1

	U.S. Patent	Approved fo and Trademark C	PTO/SB/81 (01- r use through 11/30/2011. OMB 0651-0 ffice; U.S. DEPARTMENT OF COMMER	09) 035 :CE
Under the Paperwork Reduction Act of 1995, no persons are req	uired to respond to a collection	of information un	less it displays a valid OMB control num	ber.
POWER OF ATTORNEY	Application Number	12/329	,729	-)
OR	Filing Date	Decem	iber 8, 2008	
REVOCATION OF POWER OF ATTORNEY	First Named Inventor	Daniel	R. Cohn	
WITH A NEW POWER OF ATTORNEY	Title	FUEL	MANAGEMENT SYSTEM FOR	
AND	Art Unit	1797		_
CHANGE OF CORRESPONDENCE ADDRES	S Examiner Name	not yet	assigned	
	Attorney Docket Nun	nber 04926	11-0883	_
I hereby revoke all previous powers of attorney give	n in the above-identifi	ed application	on.	
A Power of Attorney is submitted herewith.				
OR	ing Customer		04000	
Number as my/our attorney(s) or agent(s) to prosecute th	ne application		24280	
identified above, and to transact all business in the Unite	d States Patent			1
and Trademark Office connected therewith:				
OR	attorney/e) or agent/e) to pr	osecute the an	plication identified above, and	
to transact all business in the United States Patent and T	rademark Office connected	therewith:		
Practitioner(s) Name		Registration	Number	
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City Country Country Telephone I am the: Applicant/Inventor. OR Assignee of record of the entire interest. See 37 CFR 3.7 Statement under 37 CFR 3.73(b) (Form PTO/SB/96) subi	State Email 1. mitted herewith or filed on _ pplicant or Assignee of R	ecord Date Telephone	Zip MARCH 12, 2009 617 253 6966	
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City Country Country Telephone am the: Applicant/Inventor. OR Assignee of record of the entire interest. See 37 CFR 3.7 Statement under 37 CFR 3.73(b) (Form PTO/SB/96) subi Signature Signature Ansich OBRICH Name Ansich OBRICH Itile and Company R HubAccR, MtT NOTE: Signatures of all the inventors or assignees of record of the entire signature is required, see below*. Total of forms are submitted.	State Email 1. mitted herewith or filed on _ pplicant or Assignee of R e interest or their representative	ecord Date Telephone s(s) are required.	Zip <u>M4RCH</u> 12, 2009 <u>617</u> 253 6966 Submit multiple forms if more than one	

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.

/Patent Owner: Massachusetts Institute of Technology
on No./Patent No.: 12/329,729 Filed/Issue Date: December 8, 2008
FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES
usetts Institute of Technology, a educational institution
ssignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.
at it is:
the assignee of the entire right, title, and interest in;
an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is%); or
the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)
nt application/patent identified above, by virtue of either:
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, Frame, or for which a copy therefore is attached.
A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:
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The document was recorded in the United States Patent and Trademark Office at Reel, Frame, or for which a copy thereof is attached.
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Reel , Frame, or for which a copy thereof is attached. 3. From: 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).
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i

ASSIGNMENT

In consideration of One Dollar (\$1.00) and other good and valuable consideration, the receipt of which is hereby acknowledged, each of the undersigned **Daniel R. Cohn** of Chestnut Hill, Massachusetts; **Leslie Bromberg** of Sharon, Massachusetts; and **John B. Heywood** of Newton, Massachusetts; hereby

Sells, assigns and transfers to Massachusetts Institute of Technology having a place of business in 77 Massachusetts Avenue, Cambridge, Massachusetts, its successors, assigns and legal representatives, all hereinafter referred to as the ASSIGNEE, his/her entire right, title and interest for the United States and all foreign countries; in and to any and all inventions which are disclosed in the application for United States Letters Patent entitled "FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES" filed November 18, 2004, and given serial number U.S. 10/991,774 in and to said application and all divisional, continuing, substitute, renewal, reissue reexamination or other application for Letters Patent which has been or shall be filed in the United States or any foreign country on any of said inventions, and in and to all original and reissued patents which have been or shall be issued in the United States and all foreign countries on said inventions including the right to apply for patent rights in each foreign country and all rights to priority.

Agrees that said ASSIGNEE may apply for and receive Letters Patent for said inventions in its own name and when requested, without charge to but at the expense of said ASSIGNEE, agrees to carry out in good faith the intent and purpose of this Assignment by executing all divisional, continuing, substitute, renewal, reissue, reexamination and all other patent applications on any and all said inventions; by executing all rightful oaths, assignments, powers of attorney and other papers; by communicating to said ASSIGNEE all facts known to him/her relating to said inventions and the history thereof, and generally by doing everything possible which said ASSIGNEE shall consider desirable for aiding in securing and maintaining proper patent protection for said inventions and for vesting title to said inventions and all applications for patents and all patents on said inventions, in said ASSIGNEE.

Hereby requests the Honorable Commissioner of Patents and Trademarks to issue said Letters Patent to said ASSIGNEE.

Covenants with said ASSIGNEE that no assignment, grant, mortgage, license or other agreement affecting the rights and property herein conveyed has been made to others by him/her, and that full right to convey the same as herein expressed is possessed by him/her.

3770677 1.DOC

Page 1 of 3

Atty Docket No.0429611-0598

FORD Ex. 1019, page 113 IPR2019-01400

IN WITNESS WHEREOF, I this <u><u></u><u></u> <u>M</u> day of <u>Febru</u> Witness</u>	hereto set my hand an <u>A.My</u> , 200 5 .	Metric Metric Mit Teeh Licenswyofe Daniel R. Cohn 2/1/05 Date
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IN WITNESS WHEREOF, I H this <u><u>H</u> day of <u>FCbm</u></u>	hereto set my hand an (2005)	id seal at Cherry Birnle Mit Tech Lieansis ofe Jesho Brownhey Leslie Bromberg 2/7/85
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3770677_1.DOC	Page 2 of 3	Atty Docket No.0429611-0598

IN WITNESS WHEREOF, I hereto set my hand and seal at , 200**5.** CB day of

Licensing ofe MIT John B. Heywood

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Page 3 of 3

Atty Docket No.0429611-0598

FORD Ex. 1019, page 115 IPR2019-01400

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Electronic Acknowledgement Receipt					
EFS ID:	5199851				
Application Number:	12329729				
International Application Number:					
Confirmation Number:	9459				
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES				
First Named Inventor/Applicant Name:	Daniel R. COHN				
Customer Number:	24280				
Filer:	Sam Pasternack/Daniel Peters				
Filer Authorized By:	Sam Pasternack				
Attorney Docket Number:	0492611-0883 (MIT11381)				
Receipt Date:	22-APR-2009				
Filing Date:	08-DEC-2008				
Time Stamp:	16:46:47				
Application Type:	Utility under 35 USC 111(a)				

Payment information:

Submitted with Payment no										
File Listing:										
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)					
1	Power of Attorney	MIT 11381 POA pdf	82943	no	1					
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Warnings:										
Information:										

2	Assignee showing of ownership per 37	MIT_11381_EstRATA.pdf	212470	no	4
	Criti 5.7 5(b).		99d87366f89e4c3c0137202912ead21f0dcf 7f0d		
Warnings:					
Information	:				
		Total Files Size (in bytes):	2'	95413	
This Acknow characterize Post Card, a:	rledgement Receipt evidences receip d by the applicant, and including pag s described in MPEP 503.	t on the noted date by the US ge counts, where applicable.	SPTO of the indicated It serves as evidence	document of receipt	s, similar to a
<u>New Applica</u> If a new app 1.53(b)-(d) a	ntions Under 35 U.S.C. 111 lication is being filed and the applica nd MPEP 506), a Filing Receipt (37 CF	tion includes the necessary c R 1.54) will be issued in due (components for a filir course and the date s	ng date (see shown on th	37 CFR

Acknowledgement Receipt will establish the filing date of the application.

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

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

New International Application Filed with the USPTO as a Receiving Office

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

United St	ates Patent and Tradema	RK OFFICE UNITED STA United State Address: COMMI 20. Box Alexandi www.uspi	TES DEPARTMENT OF COMMERCE s Patent and Trademark Office SSIOVER FOR PATENTS 1450 A Vignina 22313-1450 ogov
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/329,729	12/08/2008	Daniel R. COHN	0492611-0883
			CONFIRMATION NO. 9459
24280		POA ACC	EPTANCE LETTER
CHOATE, HALL & STEW	ART LLP		
TWO INTERNATIONAL F BOSTON, MA 02110	'LACE		OC000000035688351*
			Date Mailed: 04/30/2009

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/22/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/gbien-aime/

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

page 1 of 1

	ED STATES PATEN	T AND TRADEMARK OFFICE	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22: www.uspto.gov	TMENT OF COMMERCE Trademark Office OR PATENTS 313-1450	
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
12/329,729	12/08/2008	Daniel R. COHN	0492611-0883 9459		
24280 CHOATE HA	7590 08/25/200	9	EXAMINER		
TWO INTERN	ATIONAL PLACE		HUYNH	I, HAI H	
BOSTON, MA	. 02110		ART UNIT	PAPER NUMBER	
			3747		
			NOTIFICATION DATE	DELIVERY MODE	
			08/25/2009	ELECTRONIC	

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

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

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

patentdocket@choate.com

	Application No.	Applicant(s)							
	12/329,729	COHN ET AL.							
Office Action Summary	Examiner	Art Unit							
	Hai H. Huynh	3747							
The MAILING DATE of this communication app Period for Reply	bears on the cover sheet with th	e correspondence address							
 A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> 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 <u>08 D</u>	ecember 2008.								
2a) This action is FINAL . 2b)⊠ This	action is non-final.								
3) Since this application is in condition for allowa	nce except for formal matters,	prosecution as to the merits is							
closed in accordance with the practice under <i>l</i>	Ex parte Quayle, 1935 C.D. 11,	453 O.G. 213.							
Disposition of Claims									
4) Claim(s) <u>7-32</u> is/are pending in the application	wa from consideration								
4a) Of the above claim(s) is/are withdra	wh from consideration.								
6) Claim(s) Is/are allowed.									
6)⊠ Claim(s) <u>1-32</u> Is/are rejected.									
7) Claim(s) is/are objected to.									
8) Claim(s) are subject to restriction and/c	or election requirement.								
Application Papers									
9) The specification is objected to by the Examine	er.								
10) The drawing(s) filed on is/are: a) acc	epted or b) objected to by th	e Examiner.							
Applicant may not request that any objection to the	drawing(s) be held in abevance.	See 37 CFR 1.85(a).							
Replacement drawing sheet(s) including the correc	tion 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 Ex	aminer. Note the attached Offi	ce Action or form PTO-152.							
Priority under 35 II S C & 119									
12) Acknowledgment is made of a claim for foreign	i priority under 35 U.S.C. § 119	(a)-(d) or (f).							
a) All b) Some * c) None of:									
1. Certified copies of the priority document	s have been received.								
2. Certified copies of the priority document	s have been received in Applic	ation No							
3. Copies of the certified copies of the prio	rity documents have been rece	ived in this National Stage							
application from the International Burea	u (PCT Rule 17.2(a)).								
* See the attached detailed Office action for a list	* See the attached detailed Office action for a list of the certified copies not received.								
Attachment(s)									
1) X Notice of References Cited (PTO-892)	4) 🔲 Interview Summ	ary (PTO-413)							
2) D Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mai	I Date							
3) X Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 3-9-09	5) 🔲 Notice of Informa	al Patent Application							
US Patent and Trademark Office	o)								
PTOL-326 (Rev. 08-06) Office A	ction Summary	Part of Paper No./Mail Date 20090819							

FORD Ex. 1019, page 120 IPR2019-01400 Application/Control Number: 12/329,729 Art Unit: 3747

DETAILED ACTION

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 1-32 are provisionally rejected on the ground of nonstatutory

obviousness-type double patenting as being unpatentable over claims 74-98 of

copending Application No. 11/840,719. 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.

Claim Rejections - 35 USC § 102

Application/Control Number: 12/329,729 Art Unit: 3747

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:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Cohn et

al (6,655,324).

Cohn et al teaches 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.

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

					Application/Control No. Applicant(ant(s)/Patent Under		
		Notice of Reference	s Cited		12/329,729		Reexamination COHN ET AL.	1		
			5 Oncu		Examiner		Art Unit	Page 1 of 1		
					Hai H. Huyn	h	3747	Fage For T		
				U.S. P/	ATENT DOCUN	IENTS				
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY			Name		Classification		
*	А	US-6,655,324 B2	12-2003	Cohn e	t al.			123/1A		
*	В	US-6,951,202 B2	10-2005	Oda, To	omihisa			123/406.29		
*	с	US-6,981,487 B2	01-2006	Ohtani,	Motoki			123/406.37		
*	D	US-6,959,693 B2	11-2005	Oda, To	omihisa			123/431		
*	Е	US-7,314,033 B2	01-2008	Cohn e	t al.			123/198A		
*	F	US-7,444,987 B2	11-2008	Cohn e	t al.			123/431		
*	G	US-2008/0060612 A1	03-2008	Cohn e	t al.			123/350		
*	н	US-2004/0065274 A1	04-2004	Cohn e	t al.			123/001.00A		
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				FOREIGN	PATENT DOC	UMENTS				
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	0	Country	Name		Classification		
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*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.

U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20090819

						Application/Control No.				Appli Reex	Applicant(s)/Patent Under Reexamination			
	Ind	lex of (Claim	IS		12329729				СОН	N ET A	۹L.		
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Doc code :IDS

Doc description: Information Disclosure Statement (IDS) Filed

FORD Ex. 1019, page 126 IPR2019-01400

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INFORMATION DISCLOSURE Application Number 12329729 STATEMENT BY APPLICANT Filing Date 2008-12-08 Not for submission under 37 CFR 1.99) Art Unit Darier R. Cohn Art Unit 1797 Examiner Name not yet assigned Attorney Docket Number 0492611-0883

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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	6340015		2002-01-22	Benedikt et al.	
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Application Number		12329729
Filing Date		2008-12-08
First Named Inventor Danie		IR. Cohn
Art Unit		1797
Examiner Name not ye		et assigned
Attorney Docket Number		0492611-0883

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Application Number		12329729
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First Named Inventor Danie		IR. Cohn
Art Unit		1797
Examiner Name not ye		t assigned
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FORD Ex. 1019, page 128 IPR2019-01400

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	12329729	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

	SEARCHED		
Class	Subclass	Date	Examiner
123	1A	8/19/09	ННН
123	198A	8/19/09	HHH
123	431	8/19/09	HHH
123	575	8/19/09	HHH
123	435	8/19/09	HHH

SEARCH NOTES							
Search Notes	Date	Examiner					
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	INTERFERENCE SEARCH		
Class	Subclass	Date	Examiner

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Doc description: Information Disclosure Statement (IDS) Filed

FORD Ex. 1019, page 131 IPR2019-01400

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12329729 Application Number 2008-12-08 Filing Date INFORMATION DISCLOSURE First Named Inventor Daniel R. Cohn STATEMENT BY APPLICANT Art Unit 1797 (Not for submission under 37 CFR 1.99) Examiner Name not yet assigned Attorney Docket Number 0492611-0883

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Application Number		12329729	
Filing Date		2008-12-08	
First Named Inventor	Danie	IR. Cohn	
Art Unit		1797	
Examiner Name not ye		et assigned	
Attorney Docket Number		0492611-0883	

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Application Number		12329729	
Filing Date		2008-12-08	
First Named Inventor	Danie	IR. Cohn	
Art Unit		1797	
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Attorney Docket Number		0492611-0883	

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Application Number		12329729	
Filing Date		2008-12-08	
First Named Inventor	Danie	IR. Cohn	
Art Unit		1797	
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Application Number		12329729
Filing Date		2008-12-08
First Named Inventor	Danie	IR. Cohn
Art Unit		1797
Examiner Name not ye		et assigned
Attorney Docket Number		0492611-0883

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FORD Ex. 1019, page 135 IPR2019-01400

Application Number		12329729		
Filing Date		2008-12-08		
First Named Inventor	Danie	IR. Cohn		
Art Unit		1797		
Examiner Name not ye		et assigned		
Attorney Docket Number		0492611-0883		

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INFORMATION DISCLOSURE Application Number 12329729 Filing Date 2008-12-08 First Named Inventor Darie Art Unit 1797 Examiner Name not yet assigned Attorney Docket Number 0492611-0883

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Filing Date		2008-12-08
First Named Inventor Danie		I R. Cohn
Art Unit		1797
Examiner Name	not yet assigned	
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	Filing Date		2008-12-08	
	First Named Inventor	Danie	IR. Cohn	
	Art Unit		1797	
	Examiner Name	not yet assigned		
	Attorney Docket Number		0492611-0883	

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

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FORD Ex. 1019, page 139 IPR2019-01400

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	121	knock\$3 same (correct\$3 or adjust\$3) same (fuel near inject\$3) same (first or primary or main) same (second\$3 or auxiliary)	US PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/08/19 13:29
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L3	13	("3106194" "4480616" "4541383" "4721081" "4958598" "6076487" "6508233" "6513505" "6575147" "6799551" "6892691" "6990956"). PN. OR ("7314033"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2009/08/19 13:38
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L26	50	("2741230" "3089470" "3106194" "3557763" "4031864" "4056087" "4182278" "4230072" "4312310" "4402296" "4480616" "4541383" "4594201" "4721081" "4958598" "4967714" "4974416" "4993386" "5179923" "5233944" "5497744" "5560344" "5937799" "5983855" "6073607" "6076487" "6260525" "6287351" "6298838" "6332448" "6513505" "6543423" "652663" "6668804" "6725827" "6799551" "6892691" "6951202" "6990956" "7021277" "7107942" "7156070" "7188607" "7320302"). PN.	US-PGPUB; USPAT	OR	OFF	2009/08/19 15:19
L27	1	("6655324").PN.	USPAT	OR	OFF	2009/08/19 15:33
L28	2875	((123/431) or (123/575) or (123/435) or (123/1A) or (123/198A)).CCLS.	US-PGPUB; USPAT	OR	OFF	2009/08/19 16:11

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FORD Ex. 1019, page 157 IPR2019-01400

ATTORNEY'S DOCKET NUMBER: 0492611-0883 (MIT-11381) IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn

Confirmation No.: 9459 Art Unit: 3747

Filed: December 08, 2008

Serial No: 12/329,729

Examiner: Hai H Huynh

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

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

Sir:

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

Applicant hereby submits the following Response to the Non-Final Office Action mailed August 25, 2009. Applicant respectfully requests consideration and entry of this Response.

Listing of Claims begin on page 2. Remarks begin on page 6.

FORD Ex. 1019, page 158 IPR2019-01400

LISTING OF CLAIMS

1. (Original) 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. (Original) The engine system of claim 1, wherein the engine is turbocharged or supercharged.

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

4. (Original) The engine system of claim 3, wherein the alcohol is methanol.

5. (Original) The engine system of claim 3, wherein the alcohol is ethanol.

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

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

8. (Original) 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.

2 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

4388083v3

FORD Ex. 1019, page 159 IPR2019-01400 **9.** (Original) 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. (Original) 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. (Original) 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. (Original) The engine system of claim **11** further including open loop control with a look up table.

13. (Original) 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. (Original) 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

3 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

4388083v3

FORD Ex. 1019, page 160 IPR2019-01400 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. (Original) The engine system of claim **14**, wherein the fuel from the first source is port fuel injected.

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

17. (Original) The engine system of claim 16, wherein the alcohol is methanol.

18. (Original) The engine system of claim 16, wherein the alcohol is ethanol.

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

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

21. (Original) 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. (Original) 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. (Original) The engine system of claim **22** further including open loop control with a look up table.

24. (Original) 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.

4 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

4388083v3

FORD Ex. 1019, page 161 IPR2019-01400 25. (Original) The engine system of claims 14 or 15, wherein the engine is turbocharged.

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

27. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of 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. (Original) The engine system of claim 27, wherein the alcohol is methanol.

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

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

31. (Original) 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. (Original) 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.

5 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

4388083v3

FORD Ex. 1019, page 162 IPR2019-01400

REMARKS

Claims 1-32, of which claim 1, 14 and 27 are independent in form, are presented for examination. Applicants make no amendments to the claims with this Response. Applicants respectfully request a timely Notice of Allowance.

The Examiner provisionally rejected claims 1-32 on the ground of non-statutory obviousness-type double patenting as unpatentable over claims 74-98 of co-pending application No. 11/840,719. Applicants respectfully request that the Examiner hold this rejection in abeyance.

Claim Rejections: Claims 1-32

Claims 1-32 were rejected under 35 U.S.C. 102(e) as anticipated by Cohn *et al*. (6655324).

Claims 1-32 are directed to a spark ignition engine system having, *inter alia*, a second fuel injector for introducing <u>liquid</u> from a second source into the engine.

Cohn *et al.* is directed to a high compression ratio, <u>hydrogen</u> enhanced gasoline engine system. Cohn *et al.* does not teach a second fuel injector for introducing a <u>liquid</u> from a second source into the engine. Although column 8, lines 1-4 discusses "other mixtures involving natural gas propane, ethanol and methanol", these is no explicit teaching that those natural gases be in liquid form. As Cohn *et al.* is silent as to the state of the natural gases, there is no teaching of introducing a liquid from a second source.

Accordingly, Applicants respectfully request that the rejection over Cohn *et al*. be withdrawn.

6 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

4388083v3

FORD Ex. 1019, page 163 IPR2019-01400 Application No. 12/329,729

CONCLUSION

In view of the foregoing remarks, Applicants submit that all claims pending in this application, namely claims **1-32** are in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted, CHOATE, HALL & STEWART LLP

Date: October 19, 2008

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

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

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

4388083v3

7 of 7 Attorney Docket No.: 0492611-0883 (MIT-11381)

Electronic Acknowledgement Receipt					
EFS ID:	6285866				
Application Number:	12329729				
International Application Number:					
Confirmation Number:	9459				
Title of Invention:	FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANOL OCTANE ENHANCEMENT OF GASOLINE ENGINES				
First Named Inventor/Applicant Name:	Daniel R. COHN				
Customer Number:	24280				
Filer:	Sam Pasternack/Adele E. Kalogeris				
Filer Authorized By:	Sam Pasternack				
Attorney Docket Number:	0492611-0883				
Receipt Date:	19-OCT-2009				
Filing Date:	08-DEC-2008				
Time Stamp:	15:49:54				
Application Type:	Utility under 35 USC 111(a)				

Payment information:

Submitted wit	th Payment		no					
File Listing	g:							
Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)		
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Information	:						
		Total Files Size (in bytes)	: 19	94496			
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.							
US.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'S DOCKET NUMBER: 0492611-0883 (MIT-11381) IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Inventor: Daniel R. Cohn

Confirmation No.: 9459

Serial No: 12/329,729

Filed: December 08, 2008

Examiner: Hai H Huynh

Art Unit: 3747

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

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

Sir:

TRANSMITTAL

Enclosed are the following documents:

- 1. Response to Non-Final Office Action (7 pages); and
- 2. This Transmittal (<u>1</u> page).

If any fees are required to be paid or if any overpayment has been made, please charge or credit same to Deposit Account No. 03-1721 referencing Attorney Docket Number 0492611-0883.

Respectfully submitted, CHOATE, HALL & STEWART LLP

Date: October 19, 2008

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

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

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

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This regimes realises records 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, DD 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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		Filing Date	12/08/2	008	
		First Named Inventor	Daniel i	R. Cohn et al.	
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	AND	Art Unit	3747		······································
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PAGE 6/17 * RCVD AT 12/29/2009 5:02:36 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-5/16 * DNIS:2736500 * CSID:617 258 6790 * DURATION (mm-ss):04-30 OIPE/IAP

FORD Ex. 1019, page 169 IPR2019-01400 . -

STATEMENT UNDER 3	37 CFR 3.73(b)
Daniel R. Cohn et al.	
Application No /Patent No · 12/329729	Filed/Issue Date: 12/08/2008
	NOL OCTANE ENHANCEMENT OF GASOLINE
ENGINES	
Assachusetts Institute of Technology , a Non-profit	•
Name of Assignee) (Type of Ass	signee, e.g., corporation, partnership, university, government agency, etc.
tates that it is:	
. 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 com	plete assignment from one of the joint inventors was made)
he patent application/patent identified above, by virtue of either:	
A. X An assignment from the inventor(s) of the patent application/ the United States Patent and Trademark Office at Reel 0223 copy therefore is attached.	patent identified above. The assignment was recorded in 73, Frame 0203, or for which a
DR B C A chain of title from the inventor(s), of the patent application/t	patent identified above, to the current assignee as follows:
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The undersigned (whose title is supplied befow) is authorized to act on b	behalf of the assignee.
hame o Burn	12/30/2009
Signature	Date
Daniel O'Brien	IP Manager
Printed or Typed Name	Title

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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PAGE 7/17 * RCVD AT 12/29/2009 5:02:36 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-5/16 * DNIS:2736500 * CSID:617 258 6790 * DURATION (mm-ss):04-30

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POWER OF ATTORNEY OR Application Number 12/329729 REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND First Name Inventor Daniel R. Coho et al. HANGE OF CORRESPONDENCE ADDRESS First Name Inventor Publication Number 1/3/8 [, IDT 2,14 HANGE OF CORRESPONDENCE ADDRESS Examiner Name HAIH. HUVNH Abover of Attorney is submitted herewith. A Power of Attorney is submitted herewith. 91197 OR Number as mylour atome(s) associated with the following Customer 91197 Number as mylour atome(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent 91197 Or Practitioner(s) Name Registration Number 91197 I braneadt all business in the United States Patent and Trademark Office connected therewith: Practitioner(s) Name Registration Number Or Practitioner(s) Name Registration Number I I I braneadt all business in the United States Patent and Trademark Office connected therewith: Image: State Image: State Image: State OF Practitioner(s) Name Registration Number Image: State Image: State Image: State Image: State Image: State Image: State Image: Sta	POWER OF ATTORNEY OR Application Number 12/329723 REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND Filing Date 12/329723 WITH A NEW POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND The Implication Number Date MARGE OF CORRESPONDENCE ADDRESS The Atulut 374 AND And unit 374 Around Construction The Sammer Name HAILH HUYNH Atomay Docket Number 1158 LDT 2.14 Around Construction 1158 LDT 2.14 Arower of Attorney is submitted herewith. OR 91197 Inserby appoint Practitioner(s) associated with the following Customer Number as mylour attorney (s) to prosecute the application 91197 Inserby appoint Practitioner(s) mared below as mylour attorney(s) or appent(s) to prosecute the application itemfitid abuses and to transact all business in the United States Patent and Trademark Office connected therewith: 91197 Inserby appoint Practitioner(s) named below as mylour attorney(s) or appent(s) to prosecute therewith: 91197 Inserby appoint Practitioner(s) named below as mylour attorney(s) or appent(s) to prosecute therewith: 91197 Inserby appoint Practitioner(s) name Registration Number 91197 Inserby appoint Practitioner(s) name Registration Number </th <th>Under the Faperwork Reduction Act of 1995, no persons are rec</th> <th>U.S. Patent an Juired to respond to a collection of</th> <th>PTO Approved for use through 11/30/2011, O d Trademark Office; U.S. DEPARTMENT OF information unitess it displays a valid OMB o</th> <th>258/81 (01-09 MB 0651-003) COMMERCE DITrol number</th>	Under the Faperwork Reduction Act of 1995, no persons are rec	U.S. Patent an Juired to respond to a collection of	PTO Approved for use through 11/30/2011, O d Trademark Office; U.S. DEPARTMENT OF information unitess it displays a valid OMB o	258/81 (01-09 MB 0651-003) COMMERCE DITrol number
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Inits collection or immortation is required by 37 CFR 1.31, 1.32 and 1.32. 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 astimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is astimated 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 wformation Officer, U.S. Pateni and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450, DEVEND FEES-OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissionar for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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	STATEMENT UNDER 37	CFR 3.73(b)
	Applicant/Patent Owner: Daniel R. Cohn et al.	
	Application No./Patent No.: 12/329729 File	ed/Issue Date: 12/08/2008
	Titlec: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETHANC ENGINES	DL OCTANE ENHANCEMENT OF GASOLINE
	Massachusetts Institute of Technology Non-profit	
	(Name of Assignee) (Type of Assign	ee, e.g., corporation, partnership, university, povernment egency, etc.
1	states that it is:	
	1. \boxed{X} the assignce 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 complet	te 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/pate the United States Patent and Trademark Office at Reel 022373 copy therefore is attached.	ent identified above. The assignment was recorded in, Frame 0203, or for which a
	B. A chain of title from the inventor(s), of the patent application/pate	nt identified above, to the current assignee as follows:
	1. From:	То:
- :	The document was recorded in the United States Pater	nt and Trademark Office at
	Reel Frame	or for which a copy thereof is attached.
	2. From:	То:
ľ	The document was recorded in the United States Pater	and Trademark Office at
	Reel, Frame	, or for which a copy thereof is attached.
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	The document was recorded in the United States Pater	and Trademark Office at
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	Additional documents in the chain of title are listed on a supplement	
		בוויםי אופלו(צ).
	As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the or concurrently is being, submitted for recordation pursuant to 37 CFR	e chain of tille from the original owner to the assignee wa 3.11.
	INDIE: A separate copy (<i>i.e.</i> , a true copy of the original assignment of accordance with 37 CFR Part 3, to record the assignment in the record	locument(s)) must be submitted to Assignment Division is of the USPTO. <u>See</u> MPEP 302.08]
'	he undersigned (whose title is supplied below) is authorized to act on behalf	of the assignee.
-	Signature	12/30/2009
		Date
	Broted or Tunnel Name	IP Manager
-	Primed of Typed Name	Title

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	SIGNATURE of Ap	plicant or Assignee	of Record	1			
Signature	Lame O'Ponen		Dat	e	12/30	2009	
Name	Daniel O'Brien		Te)	ephone	617.2	58.7148	
Title and Company	IP Manager Massachusetts Ins	stitute of Technol	logy				
NOTE: Signatures of all the	e inventors or assignees of record of the entire velow".	interest or their represe	ntative(s) ar	e required	Submit n	nulliple forms if	more than one
X Total of 1	forms are submitted.				_		
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	37 CFR 3.73(b)
Deniel P. Cohe et al	<u></u>
Applicant/Patent Owner: Daniel R. Conn et al.	
Application No./Palent No.: 12/329729	
Titled: FUEL MANAGEMENT SYSTEM FOR VARIABLE ETH ENGINES	ANOL OCTANE ENHANCEMENT OF GASOLINE
Massachusetts Institute of Technology . a Non-pro	<u>តំ</u>
(Name of Assignee) (Type of	Assignee, e.g., corporation, partnership, university, government agency, etc.
states that it is:	
1. \boxed{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. In the assignee of an undivided interest in the entirety of (a co	mplete 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 the United States Patent and Trademark Office at Reel 02 copy therefore is attached. OR OR	n/patent identified above. The assignment was recorded in 2373, or for which a
A chain of the interime interiors, of the patent application 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	То
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 su	pplemental sheet(s).
As required by 37 CFR 3.73(b)(1)(i), the documentary evidence or concurrently is being, submitted for recordation pursuant to 3	e of the chain of title from the original owner to the assignee was, 7 CFR 3.11
(NOTE: A separate copy (<i>i.e.</i> , a true copy of the original assign accordance with 37 CFR Part 3, to record the assignment in the	ment document(s)) must be submitted to Assignment Division in records of the USPTO. See MPEP 302.08]
The undersigned (whose title is supplied befow) is authorized to act on	behalf of the assignee.
Knowl & Princing	12/30/2009
Signature	Date
Daniel O'Brien	IP Manager
	T 11-

Technology Licensing Office

*`~· ~· *

6172531850

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process) an application. Confidencially is governed by 35 U.S.C. 122 and 37 CFR 1 II and 1,14. This collection is estimated to take 12 minutes to complete including garrering, prepang, 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 10 THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-500-PTO-9199 and select option 2.

PAGE 13/17 * RCVD AT 12/30/2009 9:54:47 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/4 * DNIS:2738300 * CSID:6172531850 * DURATION (mm-ss):04-46

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	TED STATES PATEN	T AND TRADEMARK OFFICE	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22. www.uspto.gov	TMENT OF COMMERCE Trademark Office OR PATENTS 313-1450			
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.			
12/329,729	12/08/2008	Daniel R. COHN	0492611-0883	9459			
24280 CHOATE HA	7590 01/12/201	0	EXAMINER				
TWO INTERN	ILL & STEWART LLF JATIONAL PLACE		HUYNH	I, HAI H			
BOSTON, MA	. 02110		ART UNIT	PAPER NUMBER			
			3747				
			NOTIFICATION DATE	DELIVERY MODE			
			01/12/2010	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):

patentdocket@choate.com

	Application No.	Applicant(s)										
	12/329,729	COHN ET AL.										
Office Action Summary	Examiner	Art Unit										
	Hai H. Huynh	3747										
The MAILING DATE of this communication a Period for Reply	ppears on the cover sheet with the	e correspondence address										
A SHORTENED STATUTORY PERIOD FOR REF WHICHEVER IS LONGER, FROM THE MAILING - Extensions of time may be available under the provisions of 37 CFR after SIX (6) MONTHS from the mailing date of this communication. - If NO period for reply is specified above, the maximum statutory perio - Failure to reply within the set or extended period for reply will, by stat Any reply received by the Office later than three months after the ma earned patent term adjustment. See 37 CFR 1.704(b).	 A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> 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 earmed patent term adjustment. See 37 CFR 1.704(b). 											
Status												
1) Responsive to communication(s) filed on 19	October 2009.											
2a) This action is FINAL . $2b$) This action is FINAL .	nis action is non-final.											
3) Since this application is in condition for allow	ance except for formal matters, r	prosecution as to the merits is										
closed in accordance with the practice unde	Ex parte Quayle, 1935 C.D. 11,	453 O.G. 213.										
Dispesition of Claims	, · , , , , , , , , , , , , , , , , , ,											
4) Claim(s) <u>1-32</u> is/are pending in the application	on.											
4a) Of the above claim(s) is/are withd	rawn from consideration.											
5) Claim(s) is/are allowed.												
6)⊠ Claim(s) <u>1-32</u> 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 Exami	ner											
10) The drawing(s) filed on $is/are: a)$ a	c_{cented} or b) objected to by the	e Examiner										
Applicant may not request that any objection to the	p_{α} drawing(s) be held in abovance	200.37 CEP 1 85(3)										
Replacement drawing chect(a) including the corr	e drawing(s) be neid in abeyance.	abiastad to See 27 CEB 1 121(d)										
11) The eath or dealaration is objected to by the	Examinar Note the attached Offic	$\frac{1}{2} = \frac{1}{2} $										
	Examiner. Note the attached One	ce Action of Ionn PTO-152.										
Priority under 35 U.S.C. § 119												
12) Acknowledgment is made of a claim for foreig	gn priority under 35 U.S.C. § 119	(a)-(d) or (f).										
1 Certified copies of the priority docume	nts have been received											
2 Certified copies of the priority docume	nts have been received.	ation No.										
2. Certified copies of the partitied copies of the pr	iority documents have been received	auton No										
3. Copies of the certified copies of the pr	ionty documents have been rece	ived in this National Stage										
application from the international Bureau (PCT Rule 17.2(a)).												
See the attached detailed Office action for a li	* See the attached detailed Office action for a list of the certified copies not received.											
Attachment(s)												
1) 🔟 Notice of References Cited (PTO-892)	4) 🔲 Interview Summa	ary (PTO-413)										
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail	Date										
3) Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date	6) Other:	η εαθηταρμισατίοη										
U.S. Patent and Trademark Office	-,											
PTOL-326 (Rev. 08-06) Office	Action Summary	Part of Paper No./Mail Date 20100104										

FORD Ex. 1019, page 176 IPR2019-01400 Application/Control Number: 12/329,729 Art Unit: 3747

DETAILED ACTION

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 1-32 are provisionally rejected on the ground of nonstatutory

obviousness-type double patenting as being unpatentable over claims 74-98 of

copending Application No. 11/840,719. Although the conflicting claims are not identical,

they are not patentably distinct from each other because they have the same scope.

This is a <u>provisional</u> 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 Reference	s Citod		Application/Control No. 12/329,729	Applicant(s)/ Reexaminati COHN ET A	s)/Patent Under nation ⁻ AL.		
		Nonce of Melerence	3 Oneu		Examiner				
					Hai H. Huynh	Page 1 of 1			
* Document Number Date Country Code-Number-Kind Code MM-YYYY					Name		Classification		
*	А	US-7,178,503 B1	02-2007	Brehob	, Diana D.		123/304		
*	в	US-7,581,528 B2	09-2009	Stein e	t al.	123/431			
*	с	US-2009/0043478 A1	02-2009	Labont	e, Daniel Joseph		701/103		
*	D	US-2009/0308367 A1	12-2009	Glugla,	Chris Paul	123/575			
*	Е	US-2008/0228382 A1	09-2008	Lewis e	et al.		701/111		
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*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.

U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20100104

FORD Ex. 1019, page 179 IPR2019-01400

					Ar	Application/Control No.					Applicant(s)/Patent Under Reexamination							
	Ind	lex of (Claim	IS	12	12329729						COHN ET AL.						
					Ex	Examiner /						Art Unit						
					Ha	Hai H Huynh						3747						
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Part of Paper No.: 20100104
	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	12329729	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

SEARCHED

Class	Subclass	Date	Examiner
123	1A	8/19/09	ННН
123	198A	8/19/09	ННН
123	431	8/19/09	ННН
123	575	8/19/09	ННН
123	435	8/19/09	ННН
update	search	1/4/10	ННН
123	299, 300, 305, 559.1	1/4/10	ННН

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	8/19/09	ННН
	1/4/10	ННН

	INTERFERENCE SEARCH		
Class	Subclass	Date	Examiner

U.S. Patent and Trademark Office

Part of Paper No.: 20100104

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	4	((first or main or primary) near inject \$3) same ((second\$3 or auxiliary) near inject\$3) same knock \$3 same control\$4 same (air\$1fuel near ratio)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 14:40
L2	1	("7314033").PN.	USPAT	OR	OFF	2010/01/04 14:45
L3	2	"11840719"	US-PGPUB; USPAT	OR	OFF	2010/01/04 14:46
L4	1	(12/329729).APP.	US-PGPUB; USPAT	OR	OFF	2010/01/04 14:51
L5	26	2006/0102146	US-PGPUB; USPAT	OR	OFF	2010/01/04 14:55
L6	28	2006/0102145	US-PGPUB; USPAT	OR	OFF	2010/01/04 14:55
L7	1	("6655324").PN.	USPAT	OR	OFF	2010/01/04 15:10
L8	50	((first or main or primary) near inject \$3) same ((second\$3 or auxiliary) near inject\$3) same knock \$3 same control\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:11
L9	2	((first or main or primary) near inject \$3) same ((second\$3 or auxiliary) near inject\$3) same knock \$3 same control\$4 same alcohol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:12
L10	4	((first or main or primary) near inject \$3) same ((second\$3 or auxiliary) near inject\$3) same knock \$3 same control\$4 same ethanol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:13

L11	1	((first or main or primary) near inject \$3) same ((second\$3 or auxiliary) near inject\$3) same knock \$3 same control\$4 same methanol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:13
L12	2662	((123/431) or (123/299) or (123/305) or (123/198A) or (123/1A)).CCLS.	USPAT	OR	OFF	2010/01/04 15:27
L13	4	11 and 18	US PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:27
L14	1	11 and 19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:27
L15	1	11 and 110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:27
L16	0	11 and 111	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/01/04 15:27
L17	1	("6655324").PN.	USPAT	OR	OFF	2010/01/04 16:08

EAST Search History (Interference)

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UNITED STATES PATENT AND TRADEMA		ARK OFFICE UNITED STA' United States Address: COMMI PO Bat Alexandria www.uspic	TES DEPARTMENT OF COMMERCE Patent and Trademark Office SIONER FOR PATENTS 450 1, Vinginia 22313-1450 gov
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/329,729	12/08/2008	Daniel R. COHN	11381 . 107294
			CONFIRMATION NO. 9459
91197		POA ACCI	EPTANCE LETTER
Technology Licensing Office Masachusetts Institute of Technology Five Cambridge Center			
		· (JC00000039575112"
Kendall Square			
Cambridge, MA 02142-14	93		

Date Mailed: 01/12/2010

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/30/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/vvan/

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

page 1 of 1

United St	ates Patent and Trademai	RK OFFICE UNITED STA United State Address: COMMI PO, Box Alexandi www.uspi	TES DEPARTMENT OF COMMERCE s Patent and Trademark Office SSIONER FOR PATENTS 1450 a, Virginia 22313-1450 ogov
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/329,729	12/08/2008	Daniel R. COHN	0492611-0883
			CONFIRMATION NO. 9459
24280		POWER C	OF ATTORNEY NOTICE
CHOATE, HALL & STEW	ART LLP		
TWO INTERNATIONAL F BOSTON, MA 02110	'LACE		OC00000039575069*
			Date Mailed: 01/12/2010

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/30/2009.

• The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/vvan/

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

page 1 of 1

PTO/S8/25 (07-09)

Approved for use U.S. Patent and Trademark Office:	through 07/31/2012. OMB 0651-0031 U.S. DEPARTMENT OF COMMERCE	
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it	displays a valid OMB control number.	
TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING	Docket Number (Optional)	
Filed: December 08, 2008		
FINEL DECEMBER 00, 2000	NEENGINES	
The owner, <u>Masachusetti institue of recinology</u> part of the statutory term of any patent granted on the instant applic except as provided below, the terminal part of the statutory term of any patent granted on the instant applic the expiration date of the full statutory term of any patent granted on pending reference Application Number on <u>August 17, 2007</u> , as such term is defined in 35 U.S.C. 154 and 173, and as the term of any p application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending hereby agrees that any patent so granted on the instant application shall be enforceable only for and during granted on the grantee, its successors or assigns.	and application hereby discarins, ation which would extend beyond <u>11/840719</u> , filed batent granted on said reference reference application. The owner such period that it and any patent on the instant application and is	
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 terminate prior to the expiration of its full statutory term as shortened by any termination certificate.		
Check either box 1 or 2 below, if appropriate.		
1. For submissions on behalf of a business/organization (e.g., corporation, partnership, university, gover etc.), the undersigned is empowered to act on behalf of the business/organization.	mment agency.	
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 lengratize the validity of the application or any patent issued thereon.		
2. If The undersigned is an attorney or agent of record. Reg. No. 29576		
L Bot 1		
- the work	January 25, 2010	
Signature	Date	
Sam Pasternack Typed or printed name		
	817 258 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 end authorization on PTO-2038.		
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*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		
This collection of information is required by 37 CFR 1321 The information is required to obtain or retain a benefit by the public process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14 This collection is estim including gathering, prepand, and submitting the completed application form to the USPTO. Time will vary depending upon the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chie Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandha, VA 22313-1450. DO NOT SEND FEES ADDRESS SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.	slic which is to file (and by the USPTO nated to take 12 minutes to complete, the individual case. Any comments on of Information Officer, U.S. Patent and OR COMPLETED FORMS TO THIS	

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ATTORNEY DOCKET NO.: 11381.107294

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel R. Cohn et al.	Examiner: HAI H. HUYNH
Serial No.:	12/329729	Art Unit: 3747
Filing Date:	December 8, 2008	Confirmation No.: 9459
Title:	FUEL MANAGEMENT SYSTE ENHANCEMENT OF GASOLIN	M FOR VARIABLE ETHANOL OCTANE IE ENGINES

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

Dear Sir:

Response to Office Action

Applicant hereby submits the following response to the Non-final Office Action mailed

January 12, 2010. Applicant respectfully requests consideration and entry of this response.

The Listing of Claims appears on page 2.

FORD Ex. 1019, page 187 IPR2019-01400

Listing of Claims

1. (Original) 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 hy 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. (Original) The engine system of claim 1, wherein the engine is turbocharged or supercharged.

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

4. (Original) The engine system of claim 3, wherein the alcohol is methanol.

5. (Original) The engine system of claim 3, wherein the alcohol is ethanol.

6. (Original) The engine system of claim 1 or 2, wherein the liquid from the second source is an alcohol-water mixture.

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

8. (Original) 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. (Original) 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. (Original) 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. (Original) 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. (Original) The engine system of claim 11 further including open loop control with a look up table.

13. (Original) 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. (Original) 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

³

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. (Original) The engine system of claim 14, wherein the fuel from the first source is port fuel injected.

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

17. (Original) The euglue system of claim 16, wherein the alcohol is methanol.

18. (Original) The engine system of claim 16, wherein the alcohol is ethanol.

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

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

21. (Original) 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. (Original) The engine system of claims 14 or 15, whereiu 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. (Original) The engine system of claim **22** further including open loop control with a look up table.

24. (Original) 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. (Original) The engine system of claims 14 or 15, wherein the engine is turbocharged.

26. (Original) The engine system of claims 14 or 15, wherein the engine is supercharged.

27. (Original) A turbocharged or supercharged spark ignition engine system which uses both port fuel injection of gasoline from a first source and direct fuel injection of 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. (Original) The engine system of elaim 27, wherein the alcohol is methanol.

29. (Original) The engine system of claim 27, wherein the alcohol is ethanol.

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

31. (Original) 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. (Original) 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.

<u>Remarks</u>

In response to the office action, enclosed herewith is a terminal disclaimer disclaiming the terminal portion of copending application number 11/840,719.

Since the only rejection is based on a provisional obviousness-type double patenting rejection, it is submitted that the enclosed terminal disclaimer places this application in condition for allowance.

Respectfully Submitted,

Both Sam Pasternack

Sam rasternack

Registration No.: 29576

Massachusetts Institute of Technology

Five Cambridge Center

Room NE25-230

Cambridge, MA 02412-1493

617.258.7171

7

Date: January 25, 2010

Electronic Acknowledgement Receipt		
EFS ID:	6869975	
Application Number:	12329729	
International Application Number:		
Confirmation Number:	9459	
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 . 107294	
Receipt Date:	25-JAN-2010	
Filing Date:	08-DEC-2008	
Time Stamp:	11:14:24	
Application Type:	Utility under 35 USC 111(a)	

Payment information:

Submitted wi	th Payment	no	no					
File Listin	g:							
Document Number	Document Description File Name File Size(Bytes)/ Mult Message Digest Part /.z							
1	Terminal Disclaimer Filed	11381107290a.pdf	23533	no	1			
		113011072904.pdf	0b4b6ac98e74438873369241a75699bed2 e04f14	no				
Warnings:								

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Information:					
2	Miscellaneous Incoming Letter	11381107294resp.pdf	43452	no	7
			ff7bc4b14f941a0445da6b41fb411e5ef5195 22a		

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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.

Application Number	Application/Control No.		Applicant(s)/Patent under Reexamination COHN ET AL.		
Document Code - DISQ	Internal D	ocument – DC	NOT MAIL		

TERMINAL DISCLAIMER		⊠ DISAPPROVED
Date Filed : 1/25/10	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:	
Felicia D. Roberts	
See TD Checklist for explanation	

U.S. Patent and Trademark Office

Rev. 05/19/09 Doc. Code: DISQ.CKLIST **TERMINAL DISCLAIMER INFORMAL CHECKLIST** APPL. S.N.: 12/329.729 DATE: **EXAMINER: ART UNIT: PARALEGAL:** /FELICIA ROBERTS/ MAIL ROOM DATE: NUMBER OF TD(s) FILED: 1 **INSTRUCTIONS:** The paralegal has reviewed the submitted TD with the results as set forth below. If you agree, please use the appropriate form paragraphs identified by this informal memo in your next Office action to notify applicant about the TD. If you disagree, please contact a QAS. THIS CHECKLIST IS AN INFORMAL, INTERNAL CHECKLIST ONLY. IT MUST NOT BE MAILED TO APPLICANT. IT WILL BE SOFT SCANNED AND NOT VIEWABLE TO THE PUBLIC. The TD is PROPER and has been accepted and recorded. (See FP 14.23.) The TD is NOT PROPER and has not been accepted for the reason(s) checked below. (See FP 14.24.) X The disclaimer fee under 37 CFR 1.20(d) in the amount of \$ 70.00 has not been submitted, nor is there any pre authorization in the application to charge to a deposit account. (See FP 14.24 and 14.26.07.) The LIE has not processed fee for TD (the Paralegal should ask LIE to process the fee). The TD does not satisfy 37 CFR 1.32(b) (3) in that the person who signed the TD has not stated either: (a) the extent of his/her ownership interest, or (b) the extent of the business/organization entity's ownership interest on whose behalf the person signed. (See FPs 14.26 and 14.26.01.) The TD lacks the – enforceable only during the period of common ownership – clause needed to overcome a double patenting 37 CFR 1.321(c). (See FP 14.27.01). The TD lacks 37 CFR 1.321(d) statement for joint research agreement under 35 U.S.C. 103(c) (2) & (3). It doesn't include the waiver and enforceability provisions of 37 CFR 1.321(d). (See FP 14.27.011.) TD is directed to a particular claim(s); this is not acceptable, since the disclaimer must be of a terminal portion of the entire patent to be granted, MPEP 1490. (See FPs 14.26 and 14.26.02). The person who signed the terminal disclaimer: ☐ failed to state his/her capacity to sign for the business/organization entity. (See FP 14.28.) is not recognized as an officer of the assignee. (See FP 14.29.) does not have power of attorney, and thus, is not of record. (See FP 14.29.01.) (Note: PoA can be given to a customer number, wherein all practitioners listed under the customer number have PoA. If PoA is established by a list of practitioners, the list may not comprise more than 10 practitioners. A representative of the assignee, who is not of record, cannot sign the TD unless it is established that the representative is a party authorized to act on behalf of the assignee.) The TD is not supported by evidence of chain of title to the assignee signing the TD due to a failure to submit either: (a) documentary evidence of a chain of title from the original inventor(s) to the assignee and a statement affirming that the documentary evidence was, or concurrently is being, submitted for recordation; or (b) the reel and frame number(s) where such documentary evidence is recorded in the Office. 37 CFR 3.73(b). (See FPs 14.30 and 14.34)

TERMINAL DISCLAIMER INFORMAL CHECKLIST – page 2

NOTE: This documentary evidence or the specifying of the reel and frame number may be found in the TD or in a separate paper submitted by applicant.)
The TD is not supported by adequate evidence of chain of title to the assignee signing the TD, because the person who signed the submission under 37 CFR 3.73(b):
has failed to state his/her capacity to sign for the business entity. (See FPs 14.30.02 and 14.16.02
is not recognized as an officer of the assignee. (See FP 14.30.02 and 14.16.03)
(Note: On the submission under 37 CFR 3.73(b), the signature of an attorney or agent registered to practice before the Office is not sufficient, unless the attorney or agent is authorized to act on behalf of the assignee.)
The TD is not signed (See FPs 14.26 and 14.26.03)
The serial number of the application (or the number of the patent) which forms the basis for the double patenting is not identified (i.e., missing or incorrect) in the TD. (See FP 14.32)
The serial number of the application being examined (or the number of the patent under reexam or reissue) is not identified or incorrect. (See FPs 14.26 and 14.26.04 or 14.26.05)
The TD is not signed by all owners. See FPs 14.26 and 14.26.06.
The period disclaimed is incorrect or not specified. (See FPs 14.24, 14.27.02 or 14.27.03)
Other



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS P.O. Box, 1450 Alexandria, Virginia 22313-1450 www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

91197 7590 05/28/2010

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

EXAMINER					
HUYNH, HAI H					
ART UNIT PAPER NUMBER					
3747	-				

DATE MAILED: 05/28/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/329,729	12/08/2008	Daniel R. COHN	11381 . 107294	9459

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

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	08/30/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. <u>PROSECUTION ON THE MERITS IS CLOSED</u>. 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 <u>THREE MONTHS</u> FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. <u>THIS</u> <u>STATUTORY PERIOD CANNOT BE EXTENDED</u>. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:	If the SMALL ENTITY is shown as NO:
A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.	A. Pay TOTAL FEE(S) DUE shown above, or
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	B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u> Mail Stop ISSUE FEE Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450

			or <u>Fax</u> (571)-273-2885			
INSTRUCTIONS: This for appropriate. All further co- indicated unless corrected maintenance fee notificatio	orm should be used for prespondence includin below or directed oth ons	or transmitting the ISSU g the Patent, advance o erwise in Block 1, by (UE FEE and PUBLICA orders and notification of a) specifying a new cor	TION FEE (if requ maintenance fees v respondence address	iired). B will be i ; and/or	Blocks 1 through 5 sh mailed to the current of (b) indicating a separ	ould be completed where correspondence address as rate "FEE ADDRESS" for
CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)				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.			
91197 7590 05/28/2010 Technology Licensing Office Masachusetts Institute of Technology Five Cambridge Center			I Si ac tr	Certificate of Mailing or Transmission I hereby certify that this Fee(s) Transmittal is being deposited with the Unite States Postal Service with sufficient postage for first class mail in an envelop addressed to the Mail Stop ISSUE FEE address above, or being facsimil transmitted to the USPTO (571) 273-2885, on the date indicated below.			
Combridge MA 0	2142 1403						(Depositor's name)
Cambridge, WA 0	2142-1495		Γ				(Signature)
			Г				(Date)
APPLICATION NO.	FILING DATE		FIRST NAMED INVENTO	DR	ATTO	RNEY DOCKET NO.	CONFIRMATION NO.
12/329 729	12/08/2008		Daniel R. COHN		1	1381 107294	9459
TITLE OF INVENTION: H	FUEL MANAGEMEN	T SYSTEM FOR VARL	ABLE ETHANOL OCT.	ANE ENHANCEME	INT OF	GASOLINE ENGINE	s
APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DU	E PREV. PAID ISSU	E FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0		\$1055	08/30/2010
EXAMIN	IER	ART UNIT	CLASS-SUBCLASS				
HUYNH, I	HAI H	3747	123-431000				
 1. Change of correspondence address of indication of "Fee Address" (3) 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. 			(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1				
3. ASSIGNEE NAME AND PLEASE NOTE: Unles recordation as set forth i	D RESIDENCE DATA as an assignee is identi in 37 CFR 3.11. Comp	TO BE PRINTED ON fied below, no assignee letion of this form is NO	THE PATENT (print or data will appear on the T a substitute for filing a	ype) patent. If an assign n assignment.	nee is id	entified below, the do	cument has been filed for
(A) NAME OF ASSIGN	NEE	categories (will not be p	(B) RESIDENCE: (CI	IY and STATE OR	orporati	NY) on or other private grou	up entity 🗖 Government
4a. The following fee(s) are submitted: 4 Issue Fee Issue Fee Publication Fee (No small entity discount permitted) Advance Order - # of Copies			 b. Payment of Fee(s): (P A check is enclosed Payment by credit of The Director is here overpayment, to De 	ease first reapply a l. ard. Form PTO-203 by authorized to cha posit Account Numb	ny prev 8 is atta rge the r er	iously paid issue fee s ched. required fee(s), any def (enclose an	hown above) ïciency, or credit any extra copy of this form).
5. Change in Entity Statu a. Applicant claims s	s (from status indicated SMALL ENTITY statu	l above) s. See 37 CFR 1.27.	b. Applicant is no b	onger claiming SMA	LL ENT	TITY status. See 37 CF	R 1.27(g)(2).
NOTE: The Issue Fee and I interest as shown by the rec	Publication Fee (if requ cords of the United Star	nired) will not be accepte tes Patent and Trademark	ed from anyone other that c Office.	n the applicant; a reg	istered a	attorney or agent; or the	e assignee or other party in
Authorized Signature				Date			
Typed or printed name				Registration 1	No		
This collection of informat an application. Confidentia submitting the completed a this form and/or suggestion Box 1450, Alexandria, Vir Alexandria, Virginia 22313 Under the Paperwork Redu	ion is required by 37 C lity is governed by 35 upplication form to the is for reducing this bur ginia 22313-1450. DO 3-1450. ction Act of 1995, no p	FR 1.311. The informati U.S.C. 122 and 37 CFR USPTO. Time will vary den, should be sent to th NOT SEND FEES OR versons are required to re	on is required to obtain on 1.14. This collection is y depending upon the in- the Chief Information Off COMPLETED FORMS respond to a collection of i	r retain a benefit by estimated to take 12 lividual case. Any c icer, U.S. Patent and TO THIS ADDRES nformation unless it	the publ minutes omment: Tradem S. SENI displays	ic which is to file (and to complete, including s on the amount of tim nark Office, U.S. Depay D TO: Commissioner for s a valid OMB control i	by the USPTO to process) g gathering, preparing, and he you require to complete rtment of Commerce, P.O. or Patents, P.O. Box 1450, number.

OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FORD Ex. 1019, page 200 IPR2019-01400

	NITED STATES PATE	ENT AND TRADEMARK OFFICE	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 223 www.uspto.gov	TMENT OF COMMERCE Trademark Office OR PATENTS 313-1450
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/329,729	12/08/2008	Daniel R. COHN	11381 . 107294	9459
91197	7590 05/28/2010		EXAM	IINER
Technology Lic	ensing Office		HUYNH	I, HAI H
Masachusetts Ins	titute of Technology		ART UNIT	PAPER NUMBER
Five Cambridge Kendall Square Cambridge, MA	Center 02142-1493		3747 DATE MAILED: 05/28/201	0

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 3 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 3 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.

Page 3 of 3

	Application No.	Applicant(s)								
	12/329.729	COHN ET AL								
Notice of Allowability	Examiner	Art Unit								
	Haith Huyph	3747								
	пагп. пиупп	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 nerewith (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 <u>Terminal Disclaimer</u>	<i>filed 1-25-10</i> .									
2. 🔀 The allowed claim(s) is/are <u>1-32</u> .										
 3. Acknowledgment is made of a claim for foreign priority u a) All b) Some* contents have 	nder 35 U.S.C. § 119(a)-(d) or (f).									
$2 \prod$ Certified copies of the priority documents have	a been received in Application No.									
$3 \square$ Copies of the certified copies of the priority documents have	ocuments have been received in 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 Draftsper	son's Patent Drawing Review(PT	O-948) attached								
1) 🔲 hereto or 2) 🔲 to Paper No./Mail Date										
(b) including changes required by the attached Examiner Paper No./Mail Date	's Amendment / Comment or in the	e Office action of								
Identifying indicia such as the application number (see 37 CFR each sheet. Replacement sheet(s) should be labeled as such in	l.84(c)) should be written on the dra the header according to 37 CFR 1.12	wings in the front (not the back) of /1(d).								
6. DEPOSIT OF and/or INFORMATION about the depo attached Examiner's comment regarding REQUIREMENT	osit of BIOLOGICAL MATERIAI FOR THE DEPOSIT OF BIOLOG	_ must be submitted. Note the ICAL MATERIAL.								
Attachment(s)	5. 🗖 Notice of Informa	Patent Application								
2. Notice of Draftperson's Patent Drawing Review (PTO-948)	6. 🗌 Interview Summa	ry (PTO-413),								
3. Information Disclosure Statements (PTO/SB/08),	Paper No./Mail [7.	Date Idment/Comment								
Paper No./Mail Date 4. Examiner's Comment Regarding Requirement for Deposit 8. Examiner's Statement of Reasons for Allowance										
	9. 🗌 Other									
/Hai H. Huynh/										
Primary Examiner, Art Unit 3747										
U.S. Patent and Trademark Office PTOL-37 (Rev. 08-06) N	otice of Allowability	Part of Paper No./Mail Date 20100525								

Examiner Art Unit Page 1 of 1	Notice of References Cited	Application/Control No. 12/329,729	Applicant(s)/Patent Under Reexamination COHN ET AL.			
	Notice of Neterences Cited	Examiner	Art Unit			
Hai H. Huynn 3/4/		Hai H. Huynh	3747	Page 1 of 1		

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	А	US-2009/0076705 A1	03-2009	Colesworthy et al.	701/103
	В	US-			
	С	US-			
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U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20100525

FORD Ex. 1019, page 203 IPR2019-01400

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	12329729	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

	ORIGINAL									INTERNATIONAL	CLA	SS	IFIC	ATI	ON
	CLASS SUBCLASS						CLAIMED					NON-CLAIMED			
123 431						F	0	2	В	7 / 02 (2006.01.01)					
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CLASS	SU	BCLASS (ONI	E SUBCLAS	S PER BLO	CK)										
123	1A	198A	575												

⊠	Claims renumbered in the same order as presented by applicant								СР	A [] T.D.	C] R.1.	47	
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NONE		Total Clain	ns Allowed:
(Assistant Examiner)	(Date)	3	2
/Hai H Huynh/ Primary Examiner.Art Unit 3747	5-25-10	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No. 20100525

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(((first or primary) and second\$3) near inject\$3) same knock \$3 same close \$2loop same stoichiometric	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/05/25 09:41
L2	0	(((first or primary) and second\$3) near inject\$3) same knock \$3 same close \$2loop	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/05/25 09:42
L3	0	(((first or primary) and second\$3) near inject\$3) same knock \$3 same (closed near loop)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/05/25 09:42
L4	12	(((first or primary) and second\$3) same inject\$3) same knock \$3 same (closed near loop)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/05/25 09:43
L5	2776	((123/1A) or (123/27GE) or (123/525) or (123/431) or (123/575) or (123/198A)).CCLS.	US-PGPUB; USPAT	OR	OFF	2010/05/25 09:51
L8	5	14 and 15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/05/25 09:53

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default	Plurals	Time Stamp
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L6	17	((123/1A) or (123/27GE) or (123/525) or (123/431) or (123/575) or (123/198A)).CCLS.	UPAD	OR	OFF	2010/05/25 09:52
L7	4	(((first or primary) and second\$3) same inject\$3) same knock\$3 same (closed near loop)	USPAT; UPAD	OR	OFF	2010/05/25 09:52

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Part of Paper No.: 20100525

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	12329729	COHN ET AL.
	Examiner	Art Unit
	Hai H Huynh	3747

SEARCHED

Class	Subclass	Date	Examiner
123	1A	8/19/09	ННН
123	198A	8/19/09	ННН
123	431	8/19/09	ННН
123	575	8/19/09	ННН
123	435	8/19/09	ННН
update	search	1/4/10	ННН
123	299, 300, 305, 559.1	1/4/10	ННН
		5/25/10	HHH

SEARCH NOTES					
Search Notes	Date	Examiner			
EAST	8/19/09	ННН			
	1/4/10	ННН			
	5/25/10	ННН			

	INTERFERENCE SEARCH		
Class	Subclass	Date	Examiner
above	search	5/25/10	HHH

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ASSIGNEE NAME AT PLEASE NOTE: Unit recordation as set forth (A) NAME OF ASSIC MASSA CHUSEH	ND RESIDENCE I sss an assignee is in 37 CFR 3.11. SNEE <i>INSTITUT</i>	DATA TO BI identified be Completion c \mathcal{H} of \mathcal{T}	E PRINTED ON low, no assigned if this form is NO <i>ICHNOLOG</i>	THE PATENT (print or t e data will appear on the DT a substitute for filing a (B) RESIDENCE: (CII	ype) patent. If an assign n assignment. 'Y and STATE OR C MoridGL, J	ee is id COUNT MA	lentified below, the do RY) L	ocument has been fi
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	12/329729					
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Applicant/Inventor	Asm Bolerock					
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Assignee of record of the entire interest. See 37 CFF Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)	₹ 3.71. 617.258.7171 Requester's telephone number					
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Electronic Patent Application Fee Transmittal									
Application Number:	12329729								
Filing Date:	08-Dec-2008								
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 . 107294								
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:									
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Extension-of-Time:						
Miscellaneous:						
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Electronic Acknowledgement Receipt							
EFS ID:	7822599						
Application Number:	12329729						
International Application Number:							
Confirmation Number:	9459						
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 . 107294						
Receipt Date:	16-JUN-2010						
Filing Date:	08-DEC-2008						
Time Stamp:	10:34:34						
Application Type:	Utility under 35 USC 111(a)						

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	•	12329729		
	Filing Date		2008-12-08	<u> </u>	
	First Named Inventor Danie		iel R. Cohn		
	Art Unit		1797		
	Examiner Name not ye		yet assigned		
	Attorney Docket Num	ber	0492611-0883		

U.S.PATENTS					Remove]	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	
	1	6340015		2002-01-22	Benedikt et al.		
	2	6536405		2003-03-25	Rieger et al.		-
	3	6745744		2004-06-08	Suckewer et al.		-
	4	6748918		2004-06-15	Rieger et al.		
	5	6755175		2004-06-29	McKay et al.		
	6	6955154		2005-10-18	Douglas, Denis		
	7	7013847		2006-03-21	Auer, Gerhard		A.
	8	7077100		2006-98-18	Vogel et al.		\$18f

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /HHH/ EFS Web 2.1.4



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Bib Data Sheet

CONFIRMATION NO. 9459

SERIAL NUMB 12/329,729	ER	FILING OR 371(c) DATE 12/08/2008 RULE	C	L ASS 123	GROUP ART UNIT 3747		UNIT	ATTORNEY DOCKET NO. 11381 . 107294		
APPLICANTS Daniel R. COHN, Chestnut Hill, MA; Leslie BROMBERG, Sharon, MA; John B. HEYWOOD, Newton, MA;										
** CONTINUING This applic: which is a (** CONTINUING DATA ***********************************									
** FOREIGN APP IF REQUIRED, F(** 12/16/2008	** FOREIGN APPLICATIONS ************************************									
Foreign Priority claime 35 USC 119 (a-d) con met Verified and Acknowledged	Foreign Priority claimed yes no 35 USC 119 (a-d) conditions yes no Met after Met Allowance Met after Allowance Met after Allowance Met after MA									
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/329,729	07/27/2010	7762233	11381 . 107294	9459

91197759007/07/2010Technology Licensing OfficeMasachusetts Institute of TechnologyFive Cambridge CenterKendall SquareCambridge, 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 3 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).

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APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Daniel R. COHN, Chestnut Hill, MA; Leslie BROMBERG, Sharon, MA; John B. HEYWOOD, Newton, MA;