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**COMMERCE AND INTELLECTUAL PROPERTY OFFICE**

**PATENTS ACT, CAP. 314**

(Section 43; Regulation 26 (3))

**NOTICE OF GRANT OF PATENT**

**Volume 4 No: 9**

**TAKE NOTICE** that the following Patent has been granted:

**Title: METHOD FOR MODIFYING THE VOLATILITY OF PETROLEUM  
TO ETHANOL ADDITION**

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Name of Applicant:	MCE Blending International LLC.
Address of Applicant:	11757 Katy Freeway, Suite 1400, Houston, Texas 77079, US
Names and Addresses of Inventors:	<ul style="list-style-type: none"><li>• Mattingly Larry D. 216 Woods Trial, Sanford Florida 32771, USA</li><li>• Steven M. Vanderbur 13514 Winter Creek Court, Houston, Texas 77077 USA</li></ul>
Agent:	L.A. Douglas Williams and/or Zoe Williams
Address of Agent:	Hinds Building, Market Square, Kingstown St. Vincent and the Grenadines
Documents/References cited Of Prior Arts:	<ul style="list-style-type: none"><li>• US 7,032,629 B1</li><li>• US 4,523,928 A</li><li>• US 2005/0022446 A1</li><li>• US 2005/0058016 A1</li></ul>

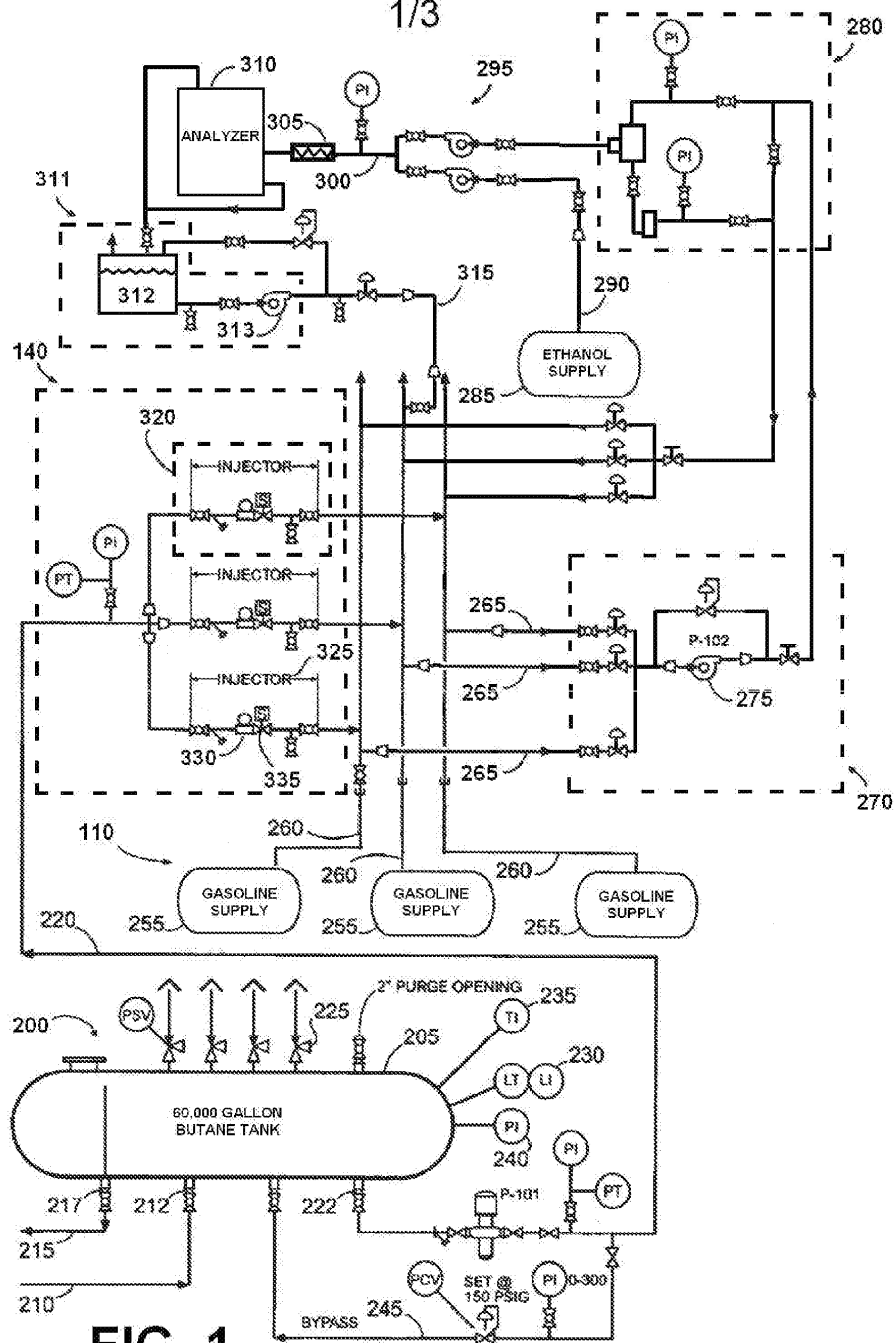
**Effective Date of Grant of Patent:** 29th April, 2019

**Abstract:** The invention relates to systems and methods for modifying the volatility of petroleum prior to ethanol addition. The methods can include (a) providing (i) a supply of gasoline, (ii) an ethanol standard, and (iii) a supply of butane; (b) analyzing the volatility of a sample formed by mixing the gasoline and ethanol standard; (c) calculating from the volatility a ratio of butane that can be blended into the sample without causing the sample to pass the one or more fixed volatility limits; and (d) blending butane from the butane supply with gasoline from the gasoline supply at or below the ratio calculated in step (c).

## Claims

1. A method of blending butane into a refined petroleum product supply, wherein the refined petroleum product is suitable to flow through a petroleum pipeline, wherein the refined petroleum product supply is also mixed with a fixed ratio of ethanol after or at the same time as blending butane into said refined petroleum product supply, in an amount that does not cause the refined petroleum product/ethanol mix to pass one or more fixed volatility limits selected from vapor pressure (measured according to ASTM standard method D 5191-07), vapor liquid ratio (determined according to ASTM standard method D 5191-07), T(10) and T(50) (measured according to ASTM standard method D 86-07b), wherein the refined petroleum product supply varies over time in terms of content and volatility potential, comprising:
  - a. providing (i) a supply of the refined petroleum product, (ii) a first ethanol supply, and (iii) a supply of butane;
  - b. analyzing the volatility of a sample formed by mixing the refined petroleum product and ethanol from the first ethanol supply;
  - c. calculating from the volatility a ratio of butane that can be blended into the sample without causing the sample to pass the one or more fixed volatility limits; and
  - d. blending butane from the butane supply with the refined petroleum product for the refined product supply at or below the ratio calculated in step (c).
2. The method of claim 1, wherein the method further comprises blending ethanol from a second ethanol supply with the refined petroleum product from said refined petroleum product supply, wherein the second ethanol supply may or may not be the same as the first ethanol supply; or wherein said one or more fixed volatility limits comprise limits on vapor pressure (measured according to ASTM standard method D 5191-07), vapor liquid ratio (determined according to ASTM standard method D 5191-07), T(10) and T(50) (measured according to ASTM standard method D 86-07b), and the ratio of butane that can be blended into the sample is calculated so that the sample does not pass any of said limits; or wherein said volatility of said sample is measured for vapor pressure, T(50) and T(10), said one or more fixed volatility limits comprise limits on vapor pressure, vapor liquid ratio, T(10) and T(50), and the ratio of butane that can be blended into the sample is calculated so that the sample does not pass any of said limits.
3. The method of claim 1, wherein step (d) is performed along a petroleum pipeline upstream of the final destination of said petroleum on said pipeline, further comprising:
  - e. storing said first ethanol supply in an ethanol storage tank, and drawing said first ethanol supply from said ethanol storage tank for mixing into a sample according to step (b); and
  - f. transmitting said refined petroleum product from step (d) to a storage tank at a downstream tank farm.
4. The method of claim 1, where in step (d) is performed at or immediately before a rack used to load the refined petroleum product onto transport vehicles, further comprising;

- e. providing said first ethanol supply,
  - f. mixing the refined petroleum product from the refined petroleum product, supply with ethanol from said first ethanol supply before, after, or at the same time as step (d), and
  - g. dispensing said refined petroleum product onto a refined petroleum product transport vehicle.
5. The method of claim 1, further comprising:
- e. providing an information processing unit (IPU) on which the calculating of step (c) is performed;
  - f. transmitting the volatility of the sample and the one or more fixed volatility limits to the IPU; and
  - g. calculating the ratio of butane on the IPU based upon the volatility of the butane and the one or more fixed volatility limits.
6. The method of claim 5, further comprising:
- a. providing an blending unit to perform the butane blending in step(d);
  - b. transmitting a signal that corresponds to the ratio of butane from the IPU to the blending unit; and
  - c. blending the butane from the butanes supply and the refine petroleum product from the refined petroleum product supply based upon the signal from the IPU.
7. The method of claim 1, wherein the refined petroleum product supply comprises a plurality of batches of refined petroleum product varying in terms of content and volatility potential; or wherein said refined petroleum product supply is selected from traditional gasoline having an octane rating 80 or higher, jet fuel, blendstock of oxygenated blending (BOB), and diesel fuel; or wherein optionally the plurality of batches of different ethanol types, wherein optionally the plurality of batches of different ethanol types comprise two or more ethanol types selected from starch; starch based ethanol, sugar based ethanol, and cellulose based ethanol.
8. The method of claim 1, wherein said refined petroleum product/ethanol mix comprises a refined petroleum product: ethanol ratio in the range of 95:5 to 5:95, or wherein said refined petroleum product/ethanol mix comprises a refined petroleum product: ethanol volumetric ratio in the range of 90:10 to 60:40, or wherein said refined petroleum product/ethanol mix comprises a refined petroleum product: ethanol volumetric ratio in the range of 90:10 to 80:20.



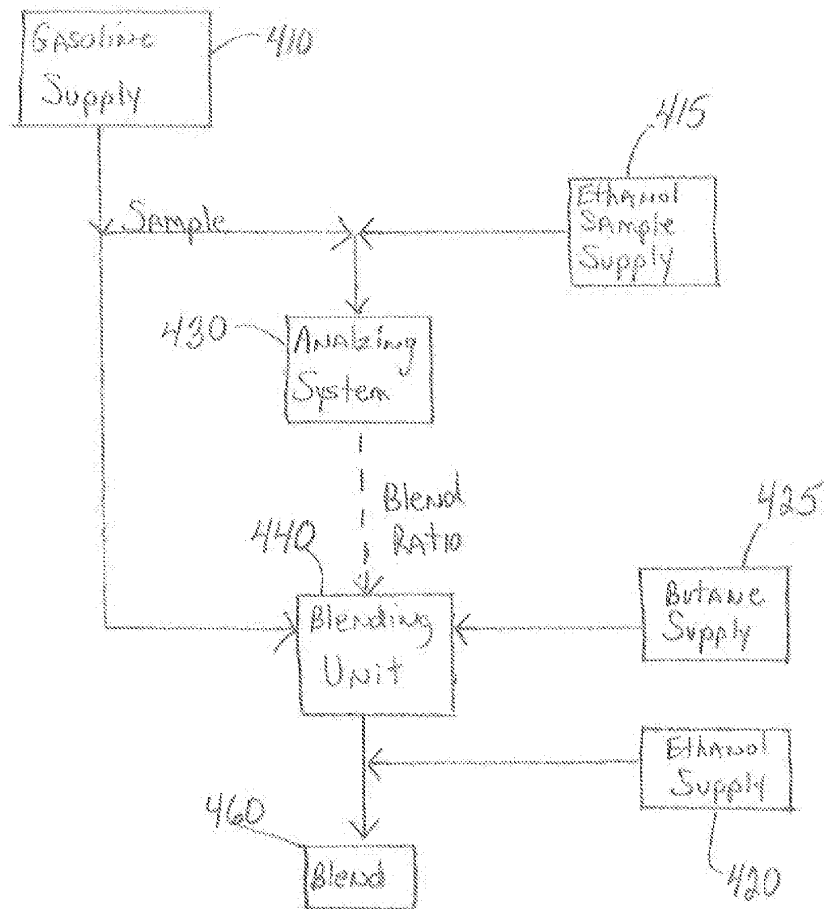


FIG. 2

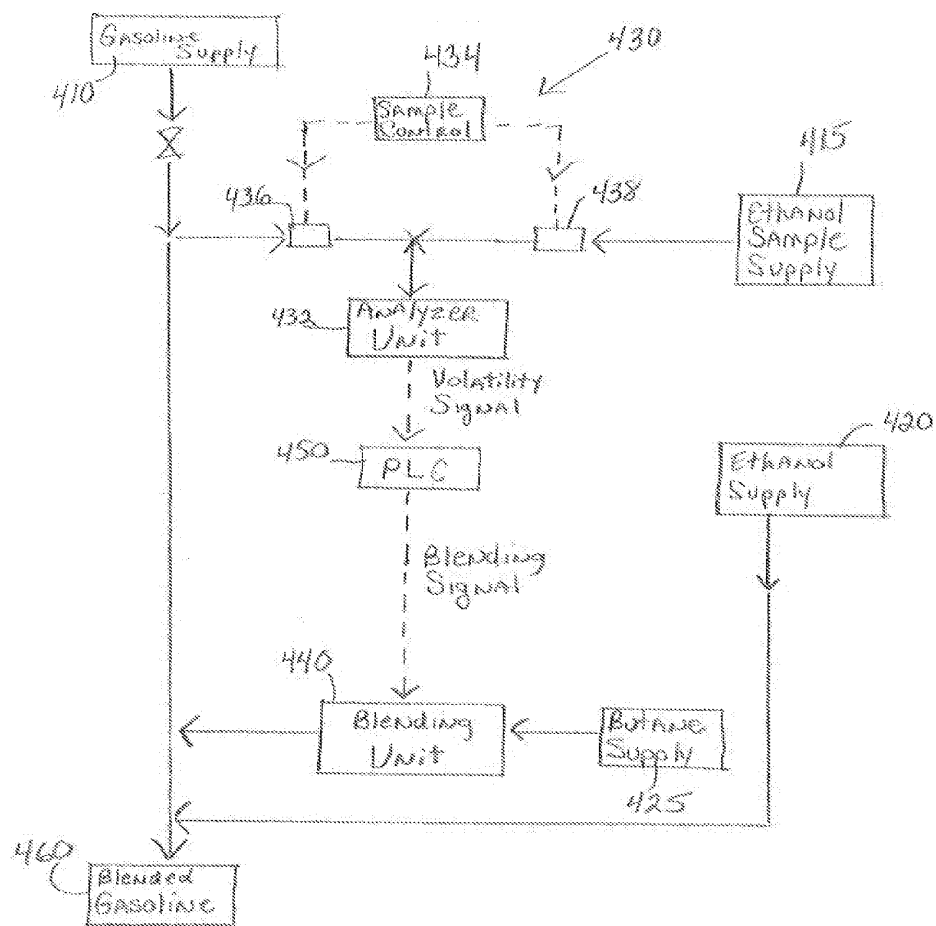


FIG. 3