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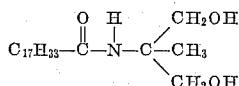
N-ACYLATED AMINOHYDROXY COMPOUND AS A MULTI-FUNCTIONAL GASOLINE ADDITIVE

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4 Claims. (Cl. 44-56)

This invention relates to hydrocarbon fuels of the gasoline boiling range, containing a minor amount of a multi-functional additive having the formula:



The novel fuels contemplated by this invention have been found to possess carburetor detergency, anti-rust and fuel line anti-icing properties.

CARBURETOR DETERGENCY

In the course of operation of an internal combustion engine, deposits build up in the throat of a carburetor, particularly in the area adjacent the throttle plate. These deposits have a choking effect on the engine, thereby causing rough idling, and in many cases, the occurrence of frequent stalling.

It is a generally accepted theory that these deposits form from solid particulate matter borne by the copious quantities of intake air an operating carburetor breathes. This solid matter is fed to the air by industrial stacks, and by exhaust pipes and crankcase breathers of motor vehicles, and other sources of fumes and smoke. It is, therefore, an object of this invention to provide novel fuels which are effective in preventing deposits from forming in the carburetor of an internal combustion engine.

ANTI-RUST

Since water is almost invariably present in the bottom of gasoline storage facilities, the possibilities of rusting and rust contamination of the fuel are excellent, and these are matters of great concern. The sloshing of fuel in storage tanks can slough rust scale off the tank walls, leading to the suspension of rust particles in the fuel itself. The larger of these particles can clog fuel filters, while smaller particles can wedge their way into the combustion chambers of an engine and score cylinder walls and valves. The inhibition of rusting is therefore an important desideratum, and one which can be realized by using the novel fuels of this invention.

FUEL LINE ANTI-ICING

It is, of course, well known that commercial gasolines themselves contain small amounts of dissolved water. Some additional moisture tends to accumulate in the fuel tanks of cars, hence water is always present in the fuel passing through the engine's fuel supply system. When exposed to temperatures below 32° F., and particularly at temperatures below 20° F., the water content of a fuel freezes and tends to form ice crystals in the supply system. These ice crystals can restrict and even block the small diameter fuel line or the small openings present in the fuel filter, thus impairing and ultimately disrupting engine operation.

The lower aliphatic alcohols or mixtures thereof, particularly methanol and isopropanol, have received widespread acceptance for use in gasoline to protect against this fuel system freezing problem. The alcohol serves as a freezing point depressant and its effectiveness as such varies linearly with concentration. For this reason, the protection of fuel lines against freezing at low tempera-

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tures requires considerable amounts of alcohol, making the economics of obtaining such protection unattractive.

It has surprisingly been found that fuels modified with the aforescribed additive, while exhibiting no freeze point depressing property in themselves, very effectively prevent low temperature freezing when combined with only minor amounts of a lower aliphatic alcohol, such as methanol. It is apparent that some coaction takes place between the alcohol and the fuel additive, since the small amount of alcohol, which in combination with the additive provides low temperature (below zero) protection, does not by itself provide low temperature protection.

The gasoline additive used in the fuels of this invention may be prepared by reacting commercially available 2-amino-2-methyl propanediol-1,3 with oleic acid, or with the corresponding acid chloride.

Example I

56.9 grams of oleic acid and 21.5 grams of 2-amino-2-methyl propanediol-1,3 were added to a flask along with 75 milliliters of para-xylene. The mixture was stirred and heated at reflux until 3.6 milliliters of water had been removed by azeotropic distillation. The remaining xylene solvent was then stripped off to produce the solvent-free amide.

Example II

To a stirred and refluxed suspension of 32.3 parts of 2-amino-2-methyl propanediol-1,3 in 58.3 parts of triethylamine and 300 parts of chloroform was added 86.4 parts of oleylchloride over a period of 30 minutes. Refluxing was continued for an additional hour, after which time the chloroform was stripped off. 245 parts of benzene were then added to precipitate triethylamine hydrochloride which was filtered off. The filtrate was evaporated to produce the amide.

The additive used in this invention may be dissolved directly in gasoline. As an alternative procedure a liquid concentrate of the additive may be prepared using as a solvent a hydrocarbon which is either compatible with, or a conventional component of, gasoline compositions. Suitable solvents include toluene, catalytic reformat, neutral oil and the like. The liquid concentrate may then be added to gasoline.

The advantages described above can be realized where the concentration of additive is as little as 0.001 wt. percent based on the fuel. Generally, additive concentrations greater than 0.05 wt. percent cannot be economically justified.

Gasoline base stocks which may be used in the practice of this invention include any of those conventionally used in preparing a motor fuel for a spark-ignited internal combustion engine, such as catalytic distillate, motor polymer, alkylate, catalytic reformat, isomerate, naphthas, etc. The gasoline will preferably contain an anti-knock agent of the tetra-alkyl lead type, such as tetraethyl lead, tetramethyl lead or chemical or physical mixtures thereof, and a scavenger agent such as ethylene dichloride and/or ethylene dibromide. The amount of anti-knock agent will usually be at a level of approximately 3 ml./gal., but may range from 1/2 ml./gal. to 6 ml./gal. The gasoline may also include other conventional additives such as solvent oils, dyes and the like.

The ability of the novel fuels of this invention to keep a carburetor clean was demonstrated by the following test:

A 1954 Oldsmobile test engine was equipped with a cleaned, standard four-barrel Rochester carburetor, and an air filter with the filter element removed. The air filter inlet was fed a mixture composed of blow-by gases from the crankcase of the test engine, and exhaust gases from a slave engine.

The slave engine, a 1955 Chrysler (11:1 C.R.), was

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run at 700 r.p.m., unloaded with an air:fuel ratio set and controlled at 11.5:1.

Prior to running test cycles, the test carburetor was stabilized with a candidate fuel by running the Oldsmobile engine at 1500 r.p.m. for 15 minutes, throttling back, and running the engine unloaded at 850 r.p.m. for 5 minutes.

The test for each candidate fuel extended over a two-hour period during which four cycles were run. Each cycle consisted of 30 minutes of idle operation followed by 5 full throttle accelerations to 3000 r.p.m. At the end of each test the carburetor was removed, disassembled and photographed in color. A five-man panel rated the carburetor from the photographs, using a 1-10 merit rating scale; the higher the number, the cleaner the carburetor.

The base fuel used throughout had the following composition and specifications:

Catalytic distillate	75 vol. percent.
Straight run naphtha	25 vol. percent.
TEL	0.88 cc./gal.
Octane rating (F ₂)	85.3.

The test results are recorded in the table below:

Additive	Conc. (Wt. percent)	Rating ¹
None		2.8
Example I	0.01	6.0

¹ The higher the number, the cleaner the carburetor.

The rust inhibiting capacity of the fuels of this invention was demonstrated by a "static" rust test, which proceeded as follows:

A number of 12-penny common nails test pieces were cleaned with emery paper, washed with straight run naphtha, then acetone, and dried. Six test pieces were then selected and each was placed in a separate screw-cap bottle. 75 cc. iso-octane was then added to each bottle. To three of the bottles 0.1 wt. percent of Example I additive was also added. Each of the six bottles was then capped and shaken for two minutes. Immediately following this, the six bottles were opened and 2 cc. of water were added to each. The bottles were again capped and shaken for two minutes, and then shelved for one week at room temperature. At the end of the test period, the nails were removed from the bottles, dried and examined. The nails exposed to water and iso-octane only were extensively rusted, while the nails exposed to water, iso-octane and Example I additive were substantially rust-free.

To demonstrate the coaction of the novel fuels of this invention with lower aliphatic alcohols in preventing operational distress due to ice formation in the fuel system, a fuel handling system simulating that associated with an automotive engine was devised and adapted to be run in a cold box having a volume of approximately 2 cubic feet. This cold box was cooled with Dry Ice and a blower was present within the box so that the cold air could be circulated and the temperature maintained uniform. In the fuel system provided in the box a fuel tank was connected to a fuel filter by approximately 190 inches of 5/16 inch copper tubing, a fuel line length, similar to the fuel line in an automobile. A U-tube section was located in the fuel line immediately after the fuel tank, similar to the type provided in the fuel system of a car as a water trap. The fuel filter had a glass bowl so that ice formation at this point in the system could be visually detected. An electric pump was connected to the fuel filter by a short section of copper tubing. The outlet side of the pump was connected to a single-barrel carburetor by another short

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section of tubing in which a flowmeter (Rotameter) was located to measure the flow rate of fuel through the system. A flow valve was adapted to the carburetor to return fuel to the fuel tank. Windows were provided in the cold box at the areas where the fuel filter and the flowmeter were located so that each of these elements could be observed by the operator during the test.

The base fuel used throughout the test was iso-octane, containing 1% water. The results of the test are shown below:

Additive	Conc. (Wt. percent)	Distress Temp. (° F.)
None		+29
Example I	0.0025	+29
Methanol	0.25	+15
Example I+methanol	0.0025 0.25	-6

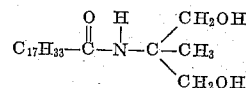
The above data shows that the freeze-point depressing effect of the combined additives far exceeds a mere summation of the effects of the two additives taken individually.

The amount of alcohol required for the synergy increases with the molecular weight of the alcohol. Generally at least 0.1 wt. percent alcohol is required, while amounts over 2 wt. percent cannot be economically justified. The preferred range will be from 0.1 to 1 wt. percent. The oleylamide additive should be present in an amount within the range of 0.001 to 0.0025 wt. percent. As a practical matter, the two additives may be pre-mixed or added separately to the fuel.

It is understood that various modifications of the foregoing invention will occur to those skilled in the art upon reading the above description. All such modifications are intended to be included as may be reasonably covered by the appended claims.

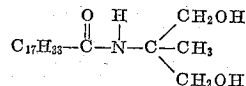
I claim:

1. A hydrocarbon fuel of the gasoline boiling range containing from 0.001 to 0.05 wt. percent of



2. The fuel of claim 1 which additionally contains from 0.1 to 2 wt. percent of a member selected from the group consisting of the lower saturated aliphatic alcohols.

3. A leaded hydrocarbon fuel of the gasoline boiling range containing from 0.5 to 6 ml./gal. of a tetraalkyl lead compound and from 0.001 to 0.05 wt. percent of



4. The fuel of claim 3 which additionally contains from 0.1 to 2 wt. percent of a member selected from the group consisting of the lower saturated aliphatic alcohols.

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