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2,929,696

RUST INHIBITED FUELS

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This invention is directed to motor fuel compositions having certain agents therein effective as antirusting agents.

Subsequent to their preparation, motor fuel compositions (i.e., gasolines, diesel fuels, and jet fuels) are stored in vessels which are for the most part prepared from ferrous metals. Variation in temperature results in air being drawn into the storage vessel, with subsequent condensation of liquid water. Liquid water is also introduced during manufacturing processes, such as sweetening. Thus, the storage vessels which, as noted hereinabove, are commonly of ferrous metals, rust. The rusting is sufficient in the storage and piping equipment to result in the formation of large rust particles which flake from the metal surfaces. Not only is the life of the storage vessel and the piping equipment reduced by such rusting process, but the resulting rust particles often become carried into the fuel tanks of the service stations which serve the ultimate consumer. The rust particles may find their way into the gasoline tank of an automobile or the fuel tank of a diesel powered truck, causing plugging of fuel lines and filters. Also, this rusting and flaking in pipe lines causes the inner pipe surfaces to become irregular and rough, increasing the friction between the flowing fuel and the pipe. This increase in friction reduces the volume of fuel which can flow through the pipe lines.

The petroleum industry has been trying to find a solution to this problem for a great many years, and it is well known that many different types of procedures have been used in attempts to eliminate this rusting problem.

Therefore, it is an object of this invention to provide motor fuel compositions useful in internal combustion engines, which fuel compositions have rust inhibiting properties such that the usual rusting of ferrous metal containers for motor fuels is appreciably reduced in the presence of water and of oxygen.

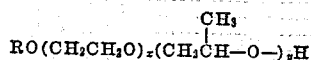
In accordance with this invention, it has been discovered that rust inhibited motor fuel compositions are obtained by incorporating oleic acid and polyglycols therein. Thus, the motor fuel compositions of this invention comprise a major proportion of a hydrocarbon (or mixture of hydrocarbons) suitable as a fuel for internal combustion engines, and a minor amount, sufficient to inhibit rusting of said fuel in the presence of water and oxygen, of the combination of oleic acid and a polyglycol.

The base fuels are hydrocarbon distillates (e.g., petroleum distillates) such as gasolines, diesel fuels, and jet fuels currently produced for commercial use from petroleum stocks. Such base fuels may be derived from cracked or straight-run stocks or a blend of such stocks, and include the hydrocarbons derived from shales and

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like bituminous materials or produced by reacting carbon monoxide and hydrogen as in the Fischer-Tropsch synthesis. For the most part, the base fuels herein comprise a mixture of hydrocarbons which boil in the range of about 50° F. to about 850° F.

The polyglycols which are used herein in combination with oleic acid as rust inhibitors in fuel compositions for internal combustion engines are those exemplified by the formula.



wherein R is hydrogen or a hydrocarbon radical having less than 19 carbon atoms, x and y are numbers from 0 to about 200. Preferred are polymers containing a total of about 6 to about 90 alkylene oxide units. More particularly preferred are the polymers containing a total of about 14 to 25 alkylene oxide units, made up of about an equal molar ratio of ethylene oxide and propylene oxide units, and wherein R in the above formula is a butyl radical. Thus, it is preferred that the sum of x and y be from about 14 to about 25, with the mol ratio of ethylene oxide and propylene oxide being about 1:1.

Where R is not hydrogen, it is an aliphatic hydrocarbon radical containing no more than 18 carbon atoms, exemplified by the following radicals: methyl, ethyl, propyl, isopropyl, butyl, pentyl, hexyl, heptyl, n-octyl, isooctyl, 2-ethylhexyl, nonyl, dodecyl, tetradecyl, hexadecyl, octadecyl, etc.

As is seen from the formula hereinabove for the polyglycols used herein in combination with oleic acid, the polyglycols may be derived from ethylene oxide, propylene oxide or a combination of ethylene and propylene oxides. The polyglycols which are effective herein are those having molecular weights ranging from about 300 to about 10,000. However, because of the greater effectiveness thereof, it is preferred that the molecular weights range from about 500 to about 4000.

The weight ratio of oleic acid to polyglycol employed in the fuel composition is from about 50:1 to about 2:1. Preferred are ratios from about 25:1 to about 5:1. The concentration of the combination added to the fuel may vary from about 5 p.p.m. to about 250 p.p.m. The preferred concentration of the combination of oleic acid and polyglycol varies from about 10 p.p.m. to 75 p.p.m.

Table I hereinbelow presents data showing the effectiveness of the combination of oleic acid and polyalkylene glycols as rust inhibitors in motor fuel compositions.

The rust ratings were obtained by the ASTM procedure D-665 modified to a test duration of 20 hours and carried out at 100° F. In this test, the test metal specimen was immersed in kerosene, which served as the base fuel. Synthetic sea water was used. The resultant specimens were visually rated as to the amount of corrosion. A rating of 7 means that the panel was fully rusted and rating of 1 indicates no rust on the panel.

The kerosene used had a distillation range (i.e., a boiling range) from about 340° F. to 540° F. In each instance the kerosene contained 20 p.p.m. of oleic acid plus 2 p.p.m. of the noted polyglycol.

In the test wherein kerosene alone (without any additive) was used, the test panel became completely covered with rust for a rating of 7; and the kerosene composition containing 20 ppm. of oleic acid gave a test rating of 5.

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Table I

Test No.	"R" Radical	Polyalkylene Oxide Chain			Rust Rating
		x	y	Molecular Weight	
1.	n-C ₄ H ₉	2	2	480	3 1/4
2.	n-C ₄ H ₉	3	3	820	2 1/2
3.	n-C ₄ H ₉	6	6	1,280	1 1/2
4.	n-C ₄ H ₉	7	7	1,520	2 1/4
5.	n-C ₄ H ₉	10	10	2,100	2
6.	n-C ₄ H ₉	10	10	2,180	2
7.	n-C ₄ H ₉	13	13	2,680	2
8.	2-ethylhexyl	1	1	340	4 1/4
9.	n-C ₄ H ₉	0	8	550	3 3/4
10.	n-C ₄ H ₉	0	52	3,050	2
11.	CH ₃	17	0	750	4 1/2
12.	C ₁₈ H ₃₇	14	0	880	2
13.	H	46	0	2,000	3 1/4
14.	H	91	0	4,000	3 1/4
15.	H	204	0	9,000	4 1/4
16.	H	0	35	2,000	2 1/4
17.	H	0	52	3,000	1 3/4
18.	H	0	69	4,000	2

Table II hereinbelow shows the effect obtained on the rust inhibition by varying the amount of oleic acid with respect to the polyglycol. This test was run in the same manner as the one described hereinabove for Table I.

The polyglycol used in this test was the polyglycol described in test No. 6 of Table I hereinabove.

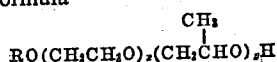
Table II

Oleic Acid, p.p.m.	Polyglycol, p.p.m.	Rust Rating
0	0	7
20	0	5
30	0	4
0	8	6 1/4
20	1	3
20	2	2
20	8	2 1/4
40	2	1 1/2
40	4	1 1/4
100	10	1

The use of the combination of oleic acid and polyglycols as rust inhibitors in gasolines can be further exemplified by incorporating the combination of 20 p.p.m. of oleic acid and 2 p.p.m. of the polyglycol described in Test No. 6 of Table I, hereinabove, in a gasoline having a distillation range (i.e., a boiling range) from about 100° F. to about 400° F.

We claim:

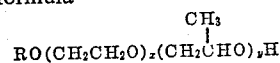
1. A rust inhibited fuel composition consisting essentially of an internal combustion engine liquid hydrocarbon fuel having incorporated therein from 10 p.p.m. to 75 p.p.m. of the combination of oleic acid and a polyglycol of the formula



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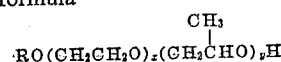
wherein R represents an octadecyl radical, and x plus y has a value from about 14 to about 25, and wherein the weight ratio of oleic acid to said polyglycol has a value from 25:1 to 5:1.

2. A rust inhibited fuel composition consisting essentially of an internal combustion engine liquid hydrocarbon fuel having incorporated therein from 10 p.p.m. to 75 p.p.m. of the combination of oleic acid and a polyglycol of the formula



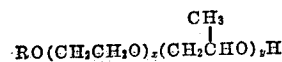
wherein R represents a butyl radical, and x plus y has a value from about 14 to about 25, and wherein the weight ratio of oleic acid to said polyglycol has a value from 25:1 to 5:1.

3. A rust inhibited fuel composition consisting essentially of an internal combustion engine liquid hydrocarbon fuel having incorporated therein from 10 p.p.m. to 75 p.p.m. of the combination of oleic acid and a polyglycol of the formula



wherein R represents a lauryl radical, and x plus y has a value from about 14 to about 25, and wherein the weight ratio of oleic acid to said polyglycol has a value from 25:1 to 5:1.

4. A rust inhibited fuel composition consisting essentially of a major proportion of a gasoline having incorporated therein from 5 p.p.m. to about 250 p.p.m. of the combination of oleic acid and a polyglycol of the formula



wherein R is an aliphatic radical having no more than 18 carbon atoms, x and y are numbers having a total value ranging from about 14 to about 25 and wherein the weight ratio of oleic acid to said polyglycol is from about 25:1 to about 5:1.

5. The composition of claim 4, wherein R is a butyl radical.

6. The composition of claim 4, wherein R is a lauryl radical.

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