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2,862,800

GASOLINE FUELS

Troy L. Cantrell, Drexel Hill, and Earl E. Fisher, Glenolden, Pa., assignors to Gulf Oil Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

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This application relates to novel, non-stalling gasoline fuel compositions that are adapted to improve the operation of internal combustion engines under cool, humid atmospheric conditions. More particularly, the invention relates to gasoline fuel compositions that contain a small amount, sufficient to reduce the tendencies of the composition to promote engine stalling in an internal combustion engine of the spark ignition type, of a combination of a fatty acid containing from 12 to 24 carbon atoms per molecule, and a salt of a fatty acid of the foregoing type and a low molecular weight amine selected from the group consisting of di- and trialkylol amines.

When an internal combustion engine is operated under cool, humid atmospheric conditions, using a gasoline fuel having a relatively low 50 percent ASTM distillation point, excessive engine stalling is apt to be encountered at idling speeds during the warm-up period, especially where engine idling occurs following a period of light load operation. Engine stalling under such conditions has been attributed to the partial or complete blocking of the narrow air passage that exists between the carburetor throat and the carburetor throttle valve during engine idling, by ice particles and/or solid hydrocarbon hydrates that deposit upon and adhere to the metal surfaces of the carburetor parts. Such icing of carburetor parts occurs as a result of the condensation of moisture from the air drawn into the carburetor and as a result of the solidification of such condensed moisture. The aforesaid condensation and solidification of moisture are caused by the refrigerating effect of rapidly evaporating gasoline. Accordingly, excessive engine stalling due to carburetor icing occurs as a practical matter only in the instance of gasolines containing a large proportion of relatively highly volatile components.

Excessive engine stalling is, of course, a source of annoyance owing to the resulting increased fuel consumption, battery wear and inconvenience of frequent restarting. It is therefore important that the inherent engine stalling characteristics of gasoline fuels be reduced substantially, where the 50 percent ASTM distillation point of such gasoline fuels is sufficiently low to cause a problem in this respect.

We have found that the stalling characteristics of gasoline fuel compositions that normally tend to promote engine stalling due to carburetor icing, i. e., those having a 50 percent ASTM distillation point of not more than 220° F., are markedly improved by the incorporation therein of a small, anti-stalling amount of a mixture of a fatty acid containing 12 to 24 carbon atoms per molecule and a salt of a fatty acid of the same class and a low molecular weight amine selected from the group consisting of dialkylol and trialkylol amines whose alkylol groups contain 2 to 4 carbon atoms each, the fatty acid:amine salt weight ratio being at least about 0.25:1. In the preferred embodiment the gasoline compositions of this invention also contain a small amount of a light lubricating oil.

The anti-stalling additive mixture of this invention com-

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prises a mixture of polar components possessing various types and degrees of surface activity. While the invention is not limited to any particular theory of operation, it appears that the respective components of the mixture coact in some unique and not fully understood manner, thereby tending to orient themselves upon the metal surfaces of the throttle valve and other critical carburetor parts contacted by the gasoline composition, thus forming a relatively water impervious residual coating on said carburetor parts, which coating tends to prevent the adherence to said metal surfaces of accumulations of ice of magnitudes sufficient to block the narrow air passages that exist in carburetors at engine idling conditions. It is also considered that the above-indicated components of the composition may tend to orient themselves about small, individual water or ice particles, thus tending to prevent formation of macrocrystals of ice of a size sufficient to block carburetor air passages at engine idling conditions.

When the herein described anti-stalling additive combination is utilized in gasoline compositions that contain a small amount of a light lubricating oil, the additive mixture, by virtue of its affinity for the lubricating oil, tends to attract the oil to the place where it is needed and to increase the spreading and metal wetting characteristics of the oil, thus promoting the formation of an adherent oil film on the metal surfaces of the carburetor parts. The oil film thus appears to function similarly as the protective coating formed by the anti-stalling additive mixture itself, but the superior metal wetting properties imparted to the oil by the additive mixture enable the oil to displace moisture from the metal surfaces that it would not thoroughly displace alone. When used in conjunction with a gasoline containing a small amount of a light lubricating oil, lower concentrations of the disclosed anti-stalling additive mixture can often be used.

Fatty acids that are suitable as such for the purposes of this invention are those containing a long, uninterrupted carbon chain of the type found in fatty acids derived from naturally occurring fats and oils. Saturated and unsaturated fatty acids containing from 12 to 24 carbon atoms in a normal chain are effective agents and can be used for the purposes of this invention. Examples of such acids are lauric, myristic, palmitic, stearic, oleic, linoleic, arachidic, behenic and tetracosanoic acids. Although fatty acids having only hydrocarbon radicals attached to the carboxyl group form a preferred class of salts for the purposes of this invention, salts of fatty acids having substituents that contain halogens, oxygen, sulfur, nitrogen and phosphorus and that do not adversely affect the oil-solubility or the polarity of the ultimate mixture can be used. Examples of suitable substituted acids are 9- and 10-chlorostearic acids and ricinoleic acid.

The amine salts, or soaps, employed in the compositions of this invention are addition salts formed by the spontaneous neutralization of fatty acids with low molecular weight dialkylol and trialkylol amines. Fatty acids that form suitable amine salts for the purposes of this invention are of the same kind and type as those disclosed above for use as such in the compositions of this invention. Amines that form suitable salts for the purposes of this invention are low molecular weight secondary and tertiary alkylol (hydroxyalkyl, or alkanol) amines. Representative examples of such amines are those commonly referred to as di- and triethanol, di- and triisopropanol, and di- and triisobutanol amines.

Specific examples of amine salts that can be advantageously employed in the gasoline compositions of this invention are the addition salts of diethanol, diisopropanol, triisopropanol, and triethanol amines and lauric, myristic, stearic, oleic and linoleic acids.

In addition to the above-described components the gasoline compositions of this invention can also contain an alkali metal salt of an oil-soluble hydrocarbon sulfonic acid; for example, the alkali metal salts of oil-soluble aliphatic hydrocarbon sulfonic acids containing 8 or more carbon atoms per molecule, including naphthenyl sulfonic acids, or the corresponding salts of oil-soluble alkyl-substituted aromatic hydrocarbon sulfonic acids whose alkyl substituents contain 8 or more carbon atoms can be used. Examples of such acids are octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl sulfonic acids, the higher molecular weight naphthenyl sulfonic acids such as octyl-, decyl-, dodecyl-cyclopentyl sulfonic acids and similarly substituted cyclohexyl sulfonic acids, and alkaryl sulfonic acids such as dinonyl naphthalene sulfonic acid, octyl- and cetyl benzene sulfonic acids, "wax" alkyl, and "kerosene" alkyl, or keryl, benzene sulfonic acids. Commercial mixtures of alkali metal salts of oil-soluble hydrocarbon sulfonic acids, such as sodium petroleum, or "mahogany," sulfonates, are especially suitable for the purposes of this invention. The alkali metal salts of oil-soluble petroleum sulfonic acids can be prepared by neutralization of petroleum sulfonic acids obtained from the sulfuric acid treatment of lubricating oil distillates.

When used in the proportions disclosed herein the foregoing alkali metal salts of oil-soluble sulfonic acid appear to enhance the anti-stalling characteristics of the mixture of fatty acid and fatty acid amine salt. Where some difficulty is experienced in dissolving the mixture of fatty acid and fatty acid amine salt in the gasoline, the alkali metal salts of oil-soluble sulfonic acids are also useful in that they tend to improve the miscibility of the other components with each other and with the base gasoline. Where such difficulty is encountered the alkali metal salts should be employed in an amount sufficient to render the gasoline composition homogeneous or "bright."

When employed in admixture in the proper proportions the mixtures of the fatty acid and the fatty acid salt of the alkylol amine are effective to reduce the stalling tendencies of gasoline compositions. Under ordinary circumstances, the weight ratio of the fatty acid to the amine salt should be at least 0.25:1 in order to produce a significant improvement in the engine stalling characteristics of the gasoline. A substantial improvement in the stalling characteristics of gasoline fuel compositions will be obtained when the weight ratio of the fatty acid and the amine salt is between about 0.33:1 and about 0.66:1, and for this reason such concentrations are preferred. While larger weight ratios of fatty acid and amine salt, for example 1.5:1 and 4:1, can be employed, no additional advantage appears to be obtained thereby. In fact, the presence of additional fatty acid merely tends to dilute the effectiveness, on a weight basis, of the anti-stalling mixture, thus necessitating the use of proportionately larger amounts of the additive mixture. When an alkali metal salt of an oil-soluble sulfonic acid is employed, it too can be used in weight ratios comparable to those of the fatty acid, that is between about 0.25:1 and about 4:1, based on the weight of the amine salt.

The anti-stalling additive mixtures of this invention can also contain a solvent, or blending agent, such as butanol, isopropanol, ethanol, methanol, 2-butoxyethanol, diethylene glycol monobutyl ether, benzene, toluene, heptane, kerosene, gasoline, or the like. These solvents may or may not themselves contribute further to the anti-stalling properties of the additive mixture, but in all cases, the basic mixture of the fatty acid and the alkylol amine salt is effective to achieve the desired result without such additional contribution. The above-mentioned solvents, or blending agents, are chiefly of advantage in preparing concentrates of the anti-stalling additive mixtures of this invention, wherein these agents assist in the formation of concentrates that are highly stable to separation on standing, or storing, even at relatively low temperatures.

These solvents can be present in the concentrates referred to in any concentration sufficient to make up the balance to 100 percent. In most instances the solvents will be used in the additive mixture in concentrations ranging from about 1 to about 50 weight percent, and preferably between about 10 and about 40 weight percent.

As previously indicated, the gasoline compositions of this invention are additionally benefited with respect to non-stalling characteristics by the inclusion therein of a small amount of a lubricating oil having a viscosity at 100° F. of between about 50 and about 500 Saybolt Universal seconds; for example, an oil having a viscosity of about 100 S. U. S./100° F. can be used with advantage. Although highly paraffinic lubricating distillates can be used, lubricating distillates obtained from Coastal or naphthenic type crude petroleum oils are preferred because of their superior solvent properties. The lubricating oils utilized in the gasoline compositions of this invention can have been solvent-treated, acid-treated or otherwise refined prior to incorporation into the gasoline compositions of this invention. The lubricating distillates referred to are useful in the gasoline compositions of this invention in amounts of from about 0.25 to about 0.75 percent by volume of the composition, for example, 0.5 volume percent. Greater amounts of the lubricating oil can be used but without appreciable further improvement in the stalling tendencies of the gasoline composition; however, the amount of lubricating oil used should not be so great as to adversely affect the solubility and combustion characteristics of the ultimate gasoline compositions.

The anti-stalling additive mixtures included by this invention are useful when incorporated in gasoline compositions in amounts sufficient to impart substantially improved non-stalling characteristics thereto. For example, concentrations between about 0.002 and about 0.25 percent by weight of the anti-stalling additive mixture, with or without the alkali metal salt of oil-soluble sulfonic acids, can be used. For conventional, commercial motor gasolines having appreciable engine stalling tendencies, from about 0.004 to about 0.05 percent by weight of the gasoline composition of the anti-stalling additive mixture will ordinarily be sufficient to produce a marked reduction in engine stalling tendencies.

With respect to the particular concentration ranges mentioned above, it will be appreciated that the optimum concentration of the anti-stalling additive combination can vary according to the specific component materials used, their proportions in the additive mixture, and according to the severity of the atmospheric conditions encountered in the area when the gasoline is used. With regard to the last mentioned factor, the problem of engine stalling due to carburetor icing resulting from the refrigeration of moisture condensed from the atmosphere by evaporating gasoline has been observed to be significant at atmospheric temperatures of between about 30° and 60° F., e. g., 35°, 40°, 45°, 50° F., and when the relative humidity is in excess of about 65 percent, e. g., 75, 85, 95, 99 percent. The optimum concentration of anti-stalling additive should be sufficient to effect a substantial reduction in the stalling tendencies of the fuel at the atmospheric conditions of temperature and humidity which are likely to be encountered in service.

The optimum concentration of the anti-stalling additive combination varies primarily according to the particular gasoline employed, since the problem of engine stalling is a function of the 50 percent ASTM distillation point of the gasoline fuel. Greater concentrations of the additive combination are normally desirable with decreasing 50 percent distillation points.

Practically speaking, the problem of engine stalling due to carburetor icing during rapid evaporation of gasoline occurs only in connection with gasolines having a relatively low 50 percent ASTM distillation point. Accordingly, this invention relates only to gasolines of this

type. While occasional engine stalling may occur as a result of carburetor icing at severe atmospheric conditions of temperature and humidity with gasolines having somewhat higher 50 percent ASTM distillation points, experience has indicated that the problem does not assume significant magnitude except with gasolines of the character indicated. The problem of engine stalling due to carburetor icing is especially severe in connection with gasolines having a 50 percent ASTM distillation point of less than about 220° F. The invention is particularly useful in connection with such gasolines. The term "gasoline" is used herein in its conventional sense to include hydrocarbon mixtures having a 90 percent ASTM distillation point of not more than about 392° F. and a 10 percent ASTM distillation point of not less than about 140.

The anti-stalling additive mixtures included by this invention can be incorporated into the base gasoline fuel compositions in any suitable manner. Thus, the additive mixtures can be added as such or in the form of solutions in solvents such as those named hereinabove. Alternatively, the individual components of the anti-stalling mixtures can be separately added to the gasoline compositions. If desired, the anti-stalling mixtures included by this invention can be incorporated in gasoline fuel compositions in admixture with other gasoline improvement agents, such as antioxidants, anti-knock agents, ignition control additives, dehazing agents, corrosion inhibitors, dyes, etc.

The gasoline compositions of this invention can be further illustrated by the following typical example:

EXAMPLE I

An anti-stalling additive mixture is prepared having the following make-up:

	Percent by wt.
Triethanol amine.....	25
Oleic acid.....	75

In the foregoing additive mixture the oleic acid was added to the triethanol amine in the amount indicated, which amount was approximately 1.8 times that theoretically required to neutralize the triethanol amine to form triethanol amine oleate. The foregoing composition is incorporated in a leaded gasoline having a strong tendency to promote engine stalling, in the amount of 0.01 percent by weight. A typical sample of the base gasoline employed in this example had the following volatility characteristics:

Vapor pressure: Reid, lb.....	6.8
Distillation, gasoline (ASTM):	
Over point, ° F.....	122
End point, ° F.....	290
10% Evap. at ° F.....	145
50% Evap. at ° F.....	180
90% Evap. at ° F.....	220

EXAMPLE II

Another gasoline composition having excellent non-

stalling properties is prepared by admixture of the additive combination of Example I in the amount of 0.0075 percent by weight, with the same base gasoline described in Example I, to which there is previously added 0.5 percent by volume of an approximately 100 S. U. S./100° F. Texas lubricating distillate, a typical sample of which had the following inspections:

Gravity: ° API.....	24.5
Viscosity, SUV, Sec.:	
100° F.....	106.0
210° F.....	38.3
Viscosity index.....	16
Pour point.....	-60
Color, ASTM Union.....	2.0
Carbon residue, Conradson, percent.....	0.02

EXAMPLE III

Another gasoline composition having excellent non-stalling properties is prepared by incorporation into the base gasoline of Example I 0.0075 percent by weight of an additive mixture having the following make-up:

Sodium mahogany sulfonate (65 wt. percent solution)	29.3
Triethanol amine.....	14.5
Oleic acid.....	56.2

In the foregoing additive mixture the oleic acid was added to the triethanol amine in an amount approximately equal to 2.02 times that theoretically required to neutralize the triethanol amine to form triethanol amine oleate. The sodium mahogany sulfonate had an average molecular weight of 465 and was employed in the form of a solution of approximately 65 weight percent sulfonate in a mineral oil solvent.

EXAMPLE IV

Another suitable gasoline composition having excellent non-stalling properties is prepared by admixture of the additive combination of Example III, in the amount of 0.005 percent by weight, with the same base gasoline described in Example I, to which there is previously added 0.5 percent by volume of the light lubricating oil described in Example II.

The foregoing specific embodiments of the compositions of this invention are considered illustrative only, and other suitable compositions can be prepared by substitution into the foregoing specific embodiments of various equivalent compounds disclosed herein, in the same or equivalent proportions. Thus, for example, for the sodium mahogany sulfonates of the foregoing examples there can be substituted the potassium and lithium salts of mahogany acids; instead of triethanol amine oleate there can be substituted the diethanol, diisopropanol, triisopropanol, and diisobutanol amine salts of lauric, stearic, oleic and linoleic acids; instead of the oleic acid there can be substituted lauric, myristic and linoleic acids.

Specific examples of other compositions included by the invention are set forth in the following table:

Table A

Make-up	Example V	Example VI	Example VII	Example VIII
Base Gasoline of Example I (180° F. ASTM 50% point: percent by Vol.).....	100	100	100	100
Alkylol Amine Salt: Percent by Wt. (added):				
Triethylolamine Oleate.....	0.033	0.01	0.01	-----
Diethylolamine Laurate.....	-----	-----	-----	0.02
Tripropylolamine Stearate.....	-----	-----	-----	-----
Fatty Acid: Percent by Wt. (added):				
Oleic Acid.....	0.017	0.03	-----	-----
Linoleic Acid.....	-----	-----	-----	0.01
Lauric Acid.....	-----	-----	0.01	-----
Alkali Metal Mahogany Sulfonate: Percent by Wt. (added):				
Sodium Mahogany Sulfonate.....	-----	-----	-----	0.01
Potassium Mahogany Sulfonate.....	-----	-----	0.01	-----

When added to gasoline compositions tending to promote engine stalling due to carburetor icing, in amounts disclosed herein, the anti-stalling additive mixtures included by this invention produce an appreciable improvement in the stalling characteristics of said gasoline. To

ened by about $\frac{7}{8}$ inch so as to produce greater fuel volatilization and a consequent temperature reduction. The severity of this test was such that 1.8 percent by volume of isopropyl alcohol in the test fuel indicated was just sufficient to pass the test.

Table B

Composition	Base Fuel	Additive	Concentration, percent by Weight	Engine Test, Stalls Per 5 Operating Cycles
1.-----	Base Gasoline, 180° F. 50% ASTM Distillation Point (Example I Base Fuel).	None-----	-----	• 5
2.-----	Base Gasoline-----	Triethanol Amine Oleate----	0.01	• 5
3.-----	do-----	Oleic Acid-----	0.01	• 5
4.-----	do-----	Sodium Mahogany Sulfonate of Example III.	0.01	• 5
5.-----	do-----	None-----	-----	• 5
6.-----	do-----	Additive Mixture of Example I.	0.01	• 1
7.-----	Base Gasoline + 0.5 Vol. percent 100 SUS/100° F. Texas oil of Example II.	Additive Mixture of Example II.	0.0075	• 1
8.-----	Base Gasoline-----	Additive Mixture of Example III.	0.0075	• 1
9.-----	Base Gasoline + 0.5 Vol. percent 100 SUS/100° F. Texas oil of Example II.	Additive Mixture of Example IV.	0.005	• 0

• Test Procedure A.

• Test Procedure B.

illustrate the effectiveness of such anti-stalling additive mixtures, there are presented in the following table the results obtained with engine tests made upon gasoline fuel compositions of the character indicated herein. The relative effectiveness of the herein disclosed additive mixtures is demonstrated by comparison with test results obtained upon uninhibited gasoline compositions and upon gasoline compositions containing the unmixed components of the additive mixtures disclosed herein.

In testing the compositions set forth in the table two slightly different test procedures were followed. According to the first test procedure, Test Procedure A, the fuel compositions to be tested were fed to a standard 216 cubic inch, six cylinder, overhead valve, Chevrolet engine, drawing air through a bed of approximately 2 inch chunks of cracked ice packed in a standard ASTM-CFR ice tower. The engine was equipped with a standard Carter Model W-1 carburetor having a standard Power Glide type throttle damper. The carburetor and fuel system were insulated from the engine by means of a $\frac{1}{4}$ inch thick asbestos cement board shield, 10 inches in width, which extended the length of the manifold.

The conditions at which the engine was operated are set forth below:

Cooling water temperature, ° F.:

In ----- 75-80

Out ----- 90-95

Crankcase oil temperature, ° F.----- 140-150

Carburetor air intake temperature, ° F.----- 39-41

Relative humidity, percent----- 82-85

The operating cycle of the engine included, after temperatures became stabilized, operation for five minutes at 1500 R. P. M. at 5 brake horsepower (B. H. P.) load. During this period the carburetor throttle plate becomes chilled and ice formations are allowed to build up. After this five-minute run, the throttle was closed to the present position to allow 450 R. P. M. idle speed. If the engine idled satisfactorily for 30 seconds the fuel was considered non-stalling during that operating cycle. A fuel is regarded as passing if five consecutive cycles could be repeated without producing more than one stall. The severity of this test is such that 1.25 percent by volume of isopropyl alcohol in the test fuel indicated was just sufficient to pass the test.

Test Procedure B was carried out identically as indicated above, except that the carburetor throat was length-

From the results presented in the foregoing Table it will be seen that gasolines containing a 50 percent ASTM distillation point of the character disclosed possess poor stalling characteristics as do those containing only the individual components of the disclosed anti-stalling mixture. By way of contrast, a gasoline having a 50 percent ASTM distillation point of 240° F. produced a number of stalls approaching zero when subjected to test procedure A.

Comparison of the stalling characteristics of compositions 6, 7, 8 and 9 included by this invention with the stalling characteristics of compositions 1 to 5 indicates that a major reduction in the stalling tendencies of gasolines of the type disclosed will be obtained by the incorporation in such gasolines of small amounts of the herein disclosed anti-stalling additive mixture.

The data set forth in the foregoing table are considered illustrative only, and other herein disclosed gasoline compositions will also produce beneficial results.

To the gasoline fuel compositions of the present invention there can be added one or more additional additive agents designed to improve one or more characteristics of the gasoline fuel. For example, antioxidants, anti-knock agents, ignition control additives, other de-icing agents, anti-rust agents, dyes, lead scavenging agents and the like can be added to the gasoline compositions of this invention, and the invention specifically includes gasoline compositions containing such additives.

Numerous additional embodiments of the invention will readily suggest themselves to those skilled in the art. Accordingly, we do not intend to be limited by the foregoing description, but rather only by the terms of the claims appended hereto.

We claim:

1. A gasoline fuel composition comprising a major amount of a hydrocarbon mixture that boils in the gasoline range, that has a 50 percent ASTM distillation point of not more than about 220° F., and that normally tends to promote stalling of internal combustion engines, and a small amount, sufficient to reduce the stalling tendencies of the composition, of a mixture of a fatty acid containing 12 to 24 carbon atoms and a salt of a fatty acid of the class indicated and a low molecular weight amine selected from the group consisting of dialkylol and trialkylol amines whose alkylol groups contain 2 to 4 carbon atoms each, the fatty acid:amine salt weight ratio being in the range of about 0.25:1 to 4:1, said small amount being

about 0.002 to about 0.25 percent by weight of the composition.

2. The composition of claim 1 wherein said hydrocarbon mixture also has incorporated therein from about 0.25 to about 0.75 percent by volume of the composition of a light lubricating oil having a viscosity at 100° F. of from about 50 to about 500 Saybolt Universal seconds.

3. The composition of claim 1 wherein said small amount is about 0.004 to about 0.05 percent by weight of the composition and wherein the fatty acid:amine salt weight ratio is from about 0.33:1 to about 0.66:1.

4. A gasoline fuel composition comprising a major amount of a hydrocarbon mixture that boils in the gasoline range, that has a 50 percent ASTM distillation point of not more than about 220° F., and that normally tends to promote stalling of internal combustion engines, and a small amount, sufficient to reduce the stalling tendencies of the composition and in the range of about 0.002 to about 0.25 percent by weight of the composition, of a mixture of a fatty acid containing from 12 to 24 carbon atoms, a salt of a fatty acid of the class indicated and a low molecular weight amine selected from the group consisting of dialkylol and trialkylol amines whose alkylol groups contain 2 to 4 carbon atoms each, and an alkali metal salt of an oil-soluble hydrocarbon sulfonic acid, the weight ratio of each of the alkali metal salt and the fatty acid with respect to the salt of the amine and the fatty acid being between about 0.25:1 and about 4:1.

5. A gasoline fuel composition comprising a major amount of a hydrocarbon mixture that boils in the gasoline range, that has a 50 percent ASTM distillation point of not more than about 220° F., and that normally tends to promote stalling of internal combustion engines, and a small amount, sufficient to reduce the stalling tendencies

of the composition, of a mixture of oleic acid and triethanol amine oleate, the oleic acid:triethanol amine oleate weight ratio being from about 0.25:1 to about 4:1, said small amount being about 0.002 to about 0.25 percent by weight of the composition.

6. A gasoline fuel composition comprising a major amount of a hydrocarbon mixture that boils in the gasoline range, that has a 50 percent ASTM distillation point of not more than about 220° F., and that normally tends to promote stalling of internal combustion engines, and a small amount, sufficient to reduce the stalling tendencies of the composition, of a mixture of oleic acid, triethanol amine oleate being between about 0.25:1 and about 4:1, mahogany sulfonic acids, the weight ratio of each of said oleic acid and said sodium salt of oil-soluble petroleum mahogany sulfonic acids with respect to the triethanol amine oleate being between about 0.25:1 and about 4:1, said small amount being about 0.002 to about 0.25 percent by weight of the composition

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,862,800

December 2, 1958

Troy L. Cantrell et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 15, for "less" read -- more --; column 10, line 13, for "being between about 0.25:1 and about 4:1," read -- and the sodium salt of oil-soluble petroleum --.

Signed and sealed this 31st day of March 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents