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ANTI-STALL GASOLINE

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This invention relates to gasoline compositions for use in internal combustion engines and is particularly concerned with new gasoline compositions adapted to provide improved engine operation under cool and humid weather conditions.

A well known difficulty encountered in the operation of automobile engines in cool and humid weather is that of frequent stalling during the warm-up period. It has now been recognized that the cause of this stalling is ice formation in the carburetor. The trouble has become more prevalent in post-war cars since the use of automatic transmissions and automatic chokers and the elimination of the hand throttle gives the driver less control over the engine during warm-up. In addition to the inconvenience of restarting, this type of stalling is a serious safety hazard. The stalling mechanism is generally agreed to be as follows: As the fuel evaporates, it removes heat from the surrounding metal parts thereby lowering their temperature. The temperature is quickly lowered below 32° F. if the ambient temperature is low enough and the fuel is sufficiently volatile. Moisture in the incoming air that comes in contact with these cold parts begins to form a coating of ice. The ice first appears on the throttle plate and carburetor barrel near it. If enough moisture is present in the incoming air, the ice continues to build up on the top and edges of the throttle plate. When the throttle plate is closed, as during idling, the ice chokes off the air flow through the small clearance between the plate and carburetor wall. This causes the engine to stall. The engine can usually be restarted since heat from the exhaust manifold melts the ice. However, stalling will continue until the engine is warmed up. This may require 10 to 20 minutes under severe conditions. Atmospheric conditions conducive to stalling are ambient temperatures of 30° F. to 60° F. and relative humidity above 65%. The most critical conditions are 35° F. to 40° F. ambient temperature at 100% relative humidity.

As is well known, a gasoline is a mixture of hydrocarbons having an initial boiling point falling between about 75° F. and about 135° F. and an end point falling between about 250° F. and about 450° F. and which boils substantially continuously therebetween.

It has been recognized in the prior art that the volatility characteristics of any given gasoline will affect its susceptibility to stalling to a certain extent. For example, it has been found that gasolines having relatively high mid-boiling points are generally less susceptible to stalling than gasolines having lower mid-boiling points. It will be appreciated, however, that control of stalling by means of fuel volatility alone is not feasible since other performance properties are involved. Thus, the relatively low volatility gasolines generally exhibit poorer starting and slower warm-up characteristics than those of higher volatility. Furthermore, even the lower volatility fuels are prone to produce stalling under stall-inducing conditions. Accordingly, it will be appreciated that some more practicable means of overcoming the stalling problem

than volatility control would be highly desirable. Such a means is provided by the present invention which is predicated on the discovery that carboxylic acid salts of certain aliphatic hydroxy amines when added to the gasoline in small amounts will overcome stalling difficulties due to ice formation in the carburetor of an engine. It is, therefore, the primary object of this invention to provide gasoline compositions containing minor amounts of these carboxylic acid-aliphatic hydroxy amine salts. Other and further objects of the invention will become apparent from the following detailed description thereof.

The aliphatic hydroxy amines employed in the preparation of the carboxylic acid salts of the present invention are formed by the reaction of either ethylene oxide or propylene oxide with an amino compound having at least one hydrogen atom attached to an amino nitrogen thereof. Amino compounds from which the aliphatic hydroxy amines may be produced include ammonia and primary and secondary aliphatic amines having aliphatic groups of from 1 to about 20 carbon atoms. The aliphatic groups of the amines may be straight-chained, branch-chained or cyclic in structure and they may be saturated or unsaturated. Specific examples of suitable amines include the following: methyl amine, propyl amine, butyl amine, tertiary butyl amine, di-butyl amine, cyclohexyl amine, octyl amine, di-octyl amine, tertiary octyl primary amine, decyl amine, dodecyl amine, didodecyl amine, tetradecyl amine, hexadecyl amine, octadecyl amine, di-octadecyl amine, octadecenyl amine and dehydroabietyl amine.

Mixtures of amines are also suitable. Such a mixture is one composed of about 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl amines. This mixture of amines is designated hereinafter as "Amine Mixture A."

The aliphatic hydroxy amines may also be prepared from aliphatic diamines corresponding to the formula $R(H)NCH_2(CH_2)_n—NH_2$, where R is either hydrogen or an aliphatic radical having from 1 up to about 20 carbon atoms and n is an integer from 1 to 2. Where R is an aliphatic radical (rather than H), it may be straight-chained, branch-chained or cyclic in structure. It may be saturated or unsaturated. Typical diamines contemplated are, for example, ethylene diamine (where R is hydrogen) and diamines in which R is an aliphatic group, such as the following:

N-methyl-1,3-trimethylene diamine
N-ethyl-1,3-trimethylene diamine
N-hexyl-1,3-trimethylene diamine
N-octyl-1,3-trimethylene diamine
N-decyl-1,3-trimethylene diamine
N-dodecyl-1,3-trimethylene diamine
N-tetradecyl-1,3-trimethylene diamine
N-hexadecyl-1,3-trimethylene diamine
N-octadecyl-1,3-trimethylene diamine
N-octadecenyl-1,3-trimethylene diamine
N-dehydroabietyl-1,3-trimethylene diamine

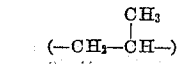
Mixtures of diamines may also be used. Typical of such mixtures is one comprised of about 2% N-tetradecyl-, 24% hexadecyl-, 28% octadecyl- and 46% octadecenyl-1,3-trimethylene diamine. This amine mixture is identified hereinafter as "Amine Mixture B."

It will be evident that the aliphatic hydroxy amines utilizable herein will conform to one of the following type formulae, depending upon the amino compound from which they are prepared:

(1) $R_aN(R'OH)_b$

where R is an aliphatic radical of from 1 to about 20 carbon atoms, as already defined hereinabove, and R' is an

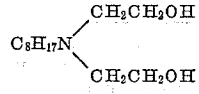
alkylene radical selected from ethylene (—CH_2—CH_2—) and isopropylene



radicals; *a* is an integer from 0 to 2 and *b* is an integer from1 to 3; the sum of *a* and *b* always being 3. This type of aliphatic hydroxy amine is prepared from either ammonia or a primary or secondary aliphatic monoamine as mentioned hereinabove. For example, the reaction between ethylene oxide and ammonia in the mole ratio of 3 moles of ethylene oxide to 1 mole of ammonia yields triethanolamine

$$N(CH_2CH_2OH)_3$$

With a primary aliphatic amine, such as octadecyl amine, on the other hand, the reaction of 1 mole of the amine with two moles of ethylene oxide results in N-octadecyl, N,N-di-2-hydroxyethylamine



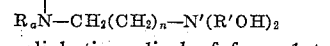
A similar product is one prepared by reaction of 1 mole of "Amine Mixture A" (supra) with 2 moles of ethylene oxide and which corresponds to the formula

$$RN(CH_2CH_2OH)_2$$

where R is composed of aliphatic radicals in about the following proportions: 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl.

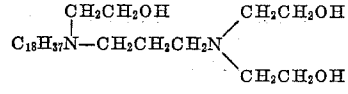
Correspondingly, where the amine used is a diamine, the aliphatic hydroxy amine produced will conform to the general formula

(2)



where R is an aliphatic radical of from 1 to about 20 carbon atoms, as heretofore defined; R′ is selected from —CH_2—CH_2— and —$CH_2C(CH_3)H$—radicals; *a* is an integer from 0 to 1 and *b* is an integer from 1 to 2; the sum of *a* and *b* always being 2; and *n* is an integer from 1 to 2.

A compound exemplifying this type of aliphatic hydroxy amine is N-octadecyl N,N′,N′-tris-2-hydroxyethyl-1,3-trimethylene diamine, which has the formula



and which is prepared by reaction of 3 moles of ethylene oxide with 1 mole of N-octadecyl-1,3-trimethylene diamine.

A similar product is a mixed aliphatic hydroxy amine prepared by reaction of 1 mole of "Amine Mixture B" (surpa) with 3 moles of ethylene oxide and which corresponds to the formula

$$HOCH_2CH_2—N(R)—CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed of aliphatic radicals in approximately the following proportions: 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl.

The reaction between the ethylene oxide or propylene oxide and the amino compound can be readily effected by methods well known to the art. For example, the reaction may be carried out by adding the alkylene oxide to the amino compound in the presence of a small amount, i.e., from about 0.02% to about 0.1%, of finely divided sodium and heating the mixture to about 150°–175° C. for from about 3 to about 6 hours. As has been indicated hereinabove, the amount of alkylene oxide used in the reaction is governed by the number of amino hydrogens present in the amino compound. Thus, where the amino compound contains two such hydrogens, as in the case of a primary monoamine, two mole proportions of the alkylene oxide are reacted with one mole proportion of the amine. Correspondingly, where the amine contains three amino hydrogens, such as in the case of ammonia, or a diamine of the formula.

$$R(H)NCH_2(CH_2)_nNH_2 \text{ (supra)}$$

in which R is an aliphatic radical, three mole proportions of the alkylene oxide per mole proportion of the amino compound is used.

The aliphatic hydroxy amines may also be readily formed by reaction of the amino compound with an excess of the alkylene oxide in the absence of a catalyst. The excess alkylene oxide insures complete reaction of all the amino hydrogens without any significant reaction of hydroxy alkyl groups with alkylene oxide to form polyether products.

Carboxylic acids in general may be employed in the formation of the addition salts of the invention. Thus, the acid may be of either the aliphatic or aromatic type and may contain more than one carboxyl group. The aliphatic acids may contain straight-chained, branch-chained or cyclic groups and they may be saturated or unsaturated. Suitable aliphatic acids are, for example, acetic, propionic, butyric, valeric, caprylic, lauric, myristic, palmitic, stearic, oleic, linoleic, dimer of linoleic, hyenic, psyllic and other fatty acids. Naphthenic acids derived from petroleum oil are particularly suitable. Also, carboxylic acids produced by the oxidation of petroleum oils, as well as naturally occurring acids, such as those found in tall oil, castor oil, rapeseed oil and the like, may be employed. The acid may suitably contain substituent groups, such as hydroxy or halide radicals, α-hydroxy substituted aliphatic acids, such as α-hydroxy decanoic acid and its dimer, being particularly suitable.

Aromatic acids and hydroxy-substituted aromatic acids, such as benzoic acid, salicylic acid, phthalic acid and the like, as well as acids of this character having ring-substituted aliphatic radicals are suitable in the invention, salicylic acid being especially preferred.

The reaction between the aliphatic hydroxy amine and the carboxylic acid to form the salts of the invention is conducted by bringing the reactants together at temperatures ranging from room temperature up to about 250° F., the preferred temperature being between about 100° F. and about 200° F. The reaction which is exothermic in nature occurs readily. One-half hour reaction time at the aforesaid level of 100° F. to 200° F. is sufficient to complete the reaction. Care should be taken to maintain the reaction temperature below about 250° F. in order to avoid elimination of water and the formation of amide-type products as such products are not contemplated herein.

It will be appreciated that the proportions of acid and aliphatic hydroxy amine employed in the reaction can vary considerably. Thus, where the aliphatic hydroxy amine contains one amino nitrogen and the acid is a monocarboxylic acid, the ratio of proportions will be 1:1 on a mole basis. On the other hand, where a dicarboxylic acid is reacted with an aliphatic hydroxy amine having one amino nitrogen, from 1 up to about 2 moles of the latter per mole of acid may be used. Alternatively, where the aliphatic hydroxy amine contains two amino nitrogens, and the acid is a monocarboxylic acid, from 1 up to about 2 moles of the acid can be used per mole of the aliphatic hydroxy amine, etc. The salt product, therefore, need not, in every case, be one in which each carboxyl group of the reacting acid is attached to an amine nitrogen, or in which each amino nitrogen in the aliphatic hydroxy amine is attached to a carboxyl group of the acid, but may suitably be either a mono- or di-acid salt of an aliphatic hydroxy diamine, or a mono- or di-aliphatic hydroxy amine salt of a dicarboxylic acid, or a mixture of such salts.

If desired, the reaction between the hydroxy aliphatic amine and the carboxylic acid may be carried out in a

suitable solvent medium, such as a petroleum naphtha, which may be subsequently removed from the final product, or which may be wholly or partly retained, providing a concentrated solution of the product salt for addition to gasoline.

A full understanding of the invention may be had by reference to the following illustrative examples and tests.

EXAMPLE I

Triethanolamine oleate was prepared by heating together 70.6 grams (0.25 mole) of oleic acid and 37.3 grams (0.25 mole) of triethanolamine at 90° F. for about one-half hour.

EXAMPLE II

The mono-salicylate salt of the aliphatic hydroxy diamine

$$HOCH_2CH_2—N(R)—CH_2CH_2CH_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals, was prepared by mixing 13.8 grams (0.1 mole) of salicylic acid with 55.8 grams (0.1 mole) of the aliphatic hydroxy amine and heating the mixture at a temperature of about 200° F. for about one-half hour.

EXAMPLE III

The di-salicylate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2N(R)—CH_2(CH_2)_2N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals, was prepared by heating together 27.6 grams (0.2 mole) of salicylic acid and 55.8 grams (0.1 mole) of the aliphatic hydroxy amine at a temperature of about 200° F. for about one-half hour.

EXAMPLE IV

The mono-naphthenate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2N(R)—CH_2(CH_2)_2N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals, was prepared by mixing 16.7 grams (0.06 mole) of naphthenic acid with 33.3 grams (0.06 mole) of the aliphatic hydroxy amine and heating the mixture at about 150° F. for about one-half hour.

EXAMPLE V

The di-naphthenate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2N(R)CH_2(CH_2)_2N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals, was prepared by mixing 147 grams (0.55 mole) of naphthenic acid and 153 grams (0.28 mole) of the aliphatic hydroxy amine and heating the mixture at about 150° F. for about one-half hour.

EXAMPLE VI

The mono-trichloroacetate salt of the aliphatic hydroxy amine

$$RN(CH_2CH_2OH)_2$$

wherein R is composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5 octadecenyl radicals, was prepared by mixing 17.5 grams (0.11 mole) of trichloroacetic acid with 32.5 grams (0.11 mole) of the aliphatic hydroxy amine and heating the mixture at about 150° F. for about one-half hour.

EXAMPLE VII

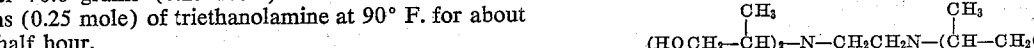
The mono-salicylate salt of the aliphatic hydroxy amine

$$RN(CH_2CH_2OH)_2$$

wherein R is composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl radicals, was prepared by mixing 15.6 grams (0.113 mole) of salicylic acid with 34.4 grams (0.113 mole) of the aliphatic hydroxy amine and heating the mixture at about 190° F. for about one-half hour.

EXAMPLE VIII

The mono-naphthenate salt of N,N,N',N'-tetrakis-(2-hydroxypropyl)ethylene diamine,



was prepared by heating together 24.4 grams (0.087 mole) of naphthenic acid and 25.5 grams (0.087 mole) of the diamine at a temperature of about 160° F. for about one-half hour.

EXAMPLE IX

The mono-naphthenate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl radicals, was prepared by heating together 6.2 grams (0.022 mole) of naphthenic acid and 10 grams (0.022 mole) of the aliphatic hydroxy amine at a temperature of about 160° F. for about one-half hour.

EXAMPLE X

The di-naphthenate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl radicals, was prepared by heating together 12.4 grams (0.044 mole) of naphthenic acid and 10 grams (0.022 mole) of the aliphatic hydroxy amine at a temperature of about 160° F. for about one-half hour.

EXAMPLE XI

The mono-glycolate salt of the aliphatic hydroxy amine

$$HOCH_2CH_2—N(R)—CH_2(CH_2)_2N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals, was prepared by heating together 6 grams (8.9 grams of a 67% aqueous solution) (0.079 mole) of glycolic acid and 44 grams (0.079 mole) of the aliphatic hydroxy amine in 150 cc. of benzene at a temperature of about 150° F. for about one-half hour. The water was azeotroped off with the benzene by increasing the final temperature to about 190° F.

ANTI-STALLING EFFECTIVENESS

The ability of the additives of the invention to prevent engine stalling under conditions conducive to carburetor icing has been demonstrated by means of a series of tests conducted as follows:

(a) Description of test

A standard Chevrolet engine, equipped with a Holley single downdraft carburetor, was mounted in a "cold" room in which the temperature was maintained at 50° F. The Holley carburetor was used because it has been shown to be very susceptible to icing. A thermocouple was attached to the throttle plate shaft to record the plate temperature. A ½-inch insulating gasket was placed between the carburetor and manifold to prevent heat conduction. An asbestos sheet covered the entire manifold system to shield the carburetor from convection and radiation. A spray chamber was used to saturate the incoming air with moisture before entering an ice tower which cooled the air to about 35° F.

In conducting a test, the engine was first run for about 10 minutes at 2000 r.p.m. to bring the engine temperature to equilibrium. The engine was then shut off. When the throttle shaft temperature rose to 40° F., the engine was restarted with the idle speed set at 400 to 500 r.p.m. so that the base fuel stalled at idle in 10 seconds or less after a run-time of 20 to 40 seconds. Run-time means the time that the engine was run at 2000 r.p.m. before returning to idle.

All runs were started when the throttle shaft reached 40° F. At the instant of starting, the throttle arm was moved to the 2000 r.p.m. position and a stop watch started. At the end of the selected run-time, the throttle arm was moved to the idle position. The time required to stall was recorded. Several tests were made at each run-time and averaged.

In evaluating an additive, the base fuel was first tested and subsequent tests were made on blends of the additives in the base fuel. The system was flushed between tests with the fuel to be run next. Any improvement caused by the additives was reflected in a longer run-time (as compared to the base fuel) to cause stalling in 10 seconds or less when the engine was idled. The more effective the additive, the longer the run-time.

(b) Test results

Tests were run on five different gasolines, A, B, C, D and E, described in Table I. The test results are summarized in Table II.

TABLE I

Fuel		Boiling Range, ° F.	Mid-Boiling Point, ° F.
A	70% Catalytically cracked 27% Natural gasoline 3% Butane	98-384	185
B	85% Catalytically cracked 15% Natural gasoline	92-387	200
C	70% Catalytically cracked 30% Natural gasoline	98-387	194
D	70% Catalytically cracked 30% Natural gasoline	76-373	180
E	68% Catalytically cracked 12% Natural gasoline 12% Benzene 8% Toluene	97-390	202

It will be seen from Table II that the addition salts of the invention are highly effective anti-stall agents, the salicylate and naphthenate salts of the mixed aliphatic hydroxy amine, N—R,N,N',N'-tris-2-hydroxyethyl-1,3-trimethylene diamine (Examples II, III, IV and V), the mono-salicylate salt (Example II) being outstandingly effective.

TABLE II.—ANTI-STALLING TEST

[Initial Throttle Plate Temp., 35° F.]

Additive	Fuel	Idle Speed, r.p.m.	Run-Time to 10 Sec. Stall-Time (Sec.)			
			0.0 Wt. Percent	0.01 Wt. Percent	0.02 Wt. Percent	0.05 Wt. Percent
None	A	400	40			
Example I	A	400		45		60
None	B	450	40			
Example II	B	450		130		
Example III	B	450		80		
None	C	450	20			
Example IV	C	450		65		100
Example V	C	450		40		115
Example VI	C	450		50		90
Example VIII	C	450		30		90
Example IX	C	450		50		110
Example X	C	450		70		140
Example XI	C	450		50		50
None	D	450	20			
Example II	D	450		80		
Example VII	D	450		60		
None	E	450	20			
Example V	E	450		30	60	90
Example VIII	E	450			70	90

The amount of the additives of the invention to be added to the gasoline will vary depending upon the particular additive and the particular gasoline being treated, as well as upon the conditions of use contemplated for the gasoline. In general, the additives may be added in amounts varying from 0.0004% up to about 1.0% by weight, the usual amount being from about 0.002% to about 0.1%.

The addition salts of the invention may be used in the gasoline along with other anti-stall additives or with additives designed to impart different improved properties thereto. Thus, anti-knock agents, antioxidants, detergents, pre-ignition inhibitors, anti-rust agents, metal deactivators, dyes, etc., may be present in the gasoline. Also, the gasoline may contain a small amount, from about 0.01% to about 1%, by weight, of a solvent oil or upperlube. Suitable oils, for example, include coastal and mid-continent distillate oils having viscosities within the range of from about 50 to about 500 S.U.S. at 100° F. Synthetic oils, such as diester oils, polyalkylene glycols, silicones, phosphate esters, polypropylenes, polybutylenes and the like, may also be used.

Although the present invention has been illustrated herein by means of specific examples and embodiments thereof, it is not intended that the scope of the invention be limited in any way thereby, but only as indicated in the following claims.

What is claimed is:

1. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a salt of a carboxylic acid selected from the group consisting of naphthenic acid and salicylic acid, and a mixed aliphatic hydroxy amine of the formula:

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R represents mixed aliphatic radicals selected from the group consisting of (*a*) aliphatic radicals composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl and (*b*) aliphatic radicals composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl.

2. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a salicylic acid addition salt of the aliphatic hydroxy amine

$$HOCH_2CH_2—N(R)—CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals.

3. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a monosalicylic acid addition salt of the aliphatic hydroxy amine

$$HOCH_2CH_2N(R)—CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals.

4. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a mononaphthenic acid addition salt of the mixed aliphatic hydroxy amine corresponding to the formula

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals.

5. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a

dinaphthenic acid addition salt of the mixed aliphatic hydroxy amine corresponding to the formula

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 2% tetradecyl, 24% hexadecyl, 28% octadecyl and 46% octadecenyl radicals.

6. A gasoline of improved anti-stalling characteristics containing as an anti-stalling agent, a minor proportion, from about 0.0004% to about 0.05%, by weight, of a mononaphthenic acid addition salt of the mixed aliphatic hydroxy amine corresponding to the formula

$$HOCH_2CH_2—N(R)CH_2(CH_2)_2—N(CH_2CH_2OH)_2$$

wherein R is composed approximately of 8% octyl, 9% decyl, 47% dodecyl, 18% tetradecyl, 8% hexadecyl, 5% octadecyl and 5% octadecenyl radicals.

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