United States Patent [19]

Friberg et al.

[11] **3,902,869**

[45] **Sept. 2, 1975**

[54] **FUEL COMPOSITION WITH INCREASED OCTANE NUMBER**

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[21] Appl. No.: **391,467**

[52] **U.S. Cl.** **44/51**
[51] **Int. Cl.**[2] **C10L 1/32**
[58] **Field of Search** 44/51, 67

[56] **References Cited**

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[57] **ABSTRACT**

The field of art to which this invention pertains is hydrocarbon based liquid fuel compositions having increased octane number by the use of microemulsion technique. The new composition comprises a main part of a liquid hydrocarbon mixture, water in the form of a microemulsion, an emusifier which makes possible the solubilization of the water in the hydrocarbon mixture and at least one water-soluble inorganic substance which has been dissolved in the water solubilized in the hydrocarbon mixture.

1 Claim, 3 Drawing Figures

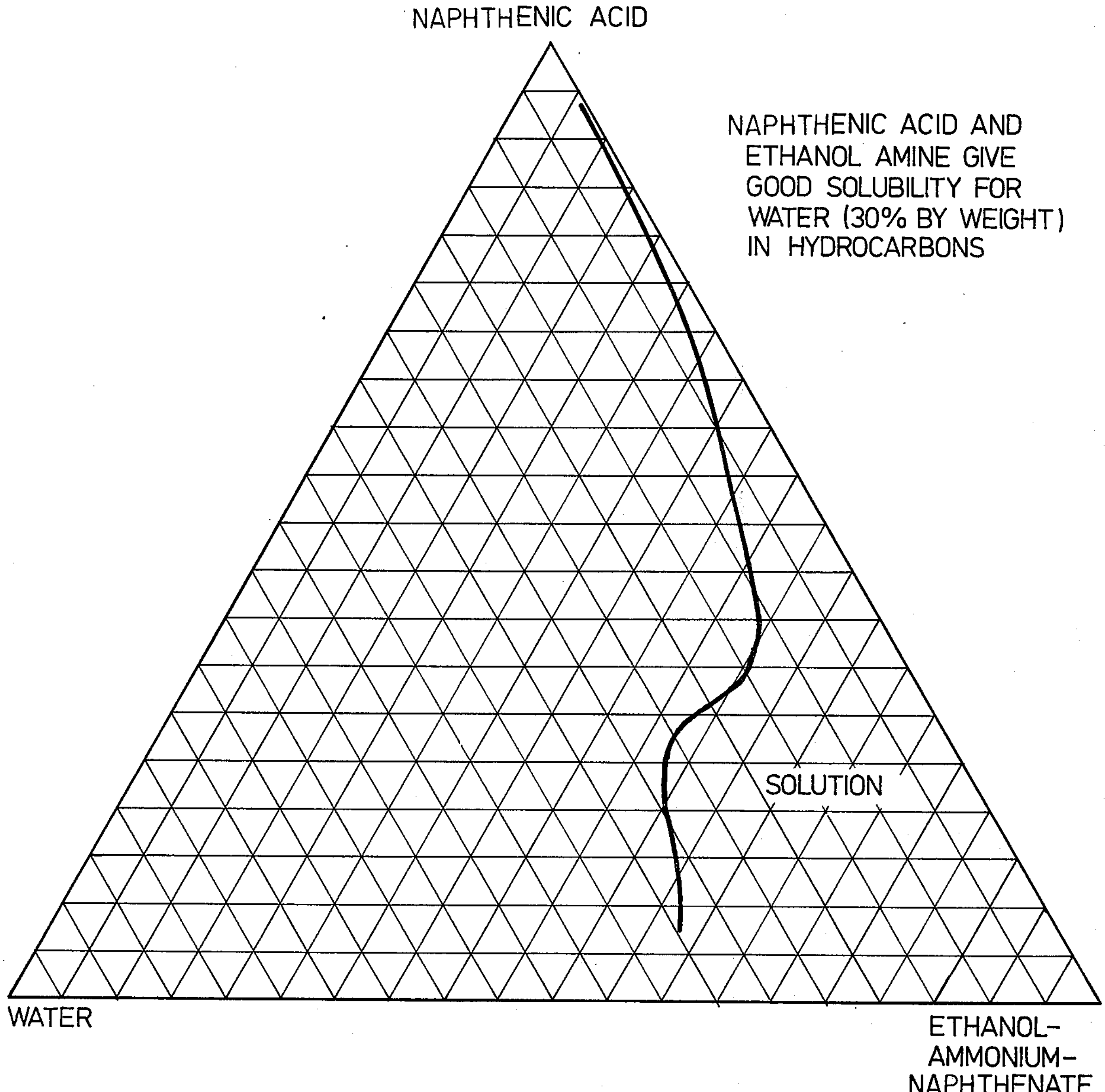
NAPHTHENIC ACID
NAPHTHENIC ACID AND
ETHANOL AMINE GIVE
GOOD SOLUBILITY FOR
WATER (30% BY WEIGHT)
IN HYDROCARBONS
SOLUTION
WATER
ETHANOL-
AMMONIUM-
NAPHTHENATE

FIG. 1

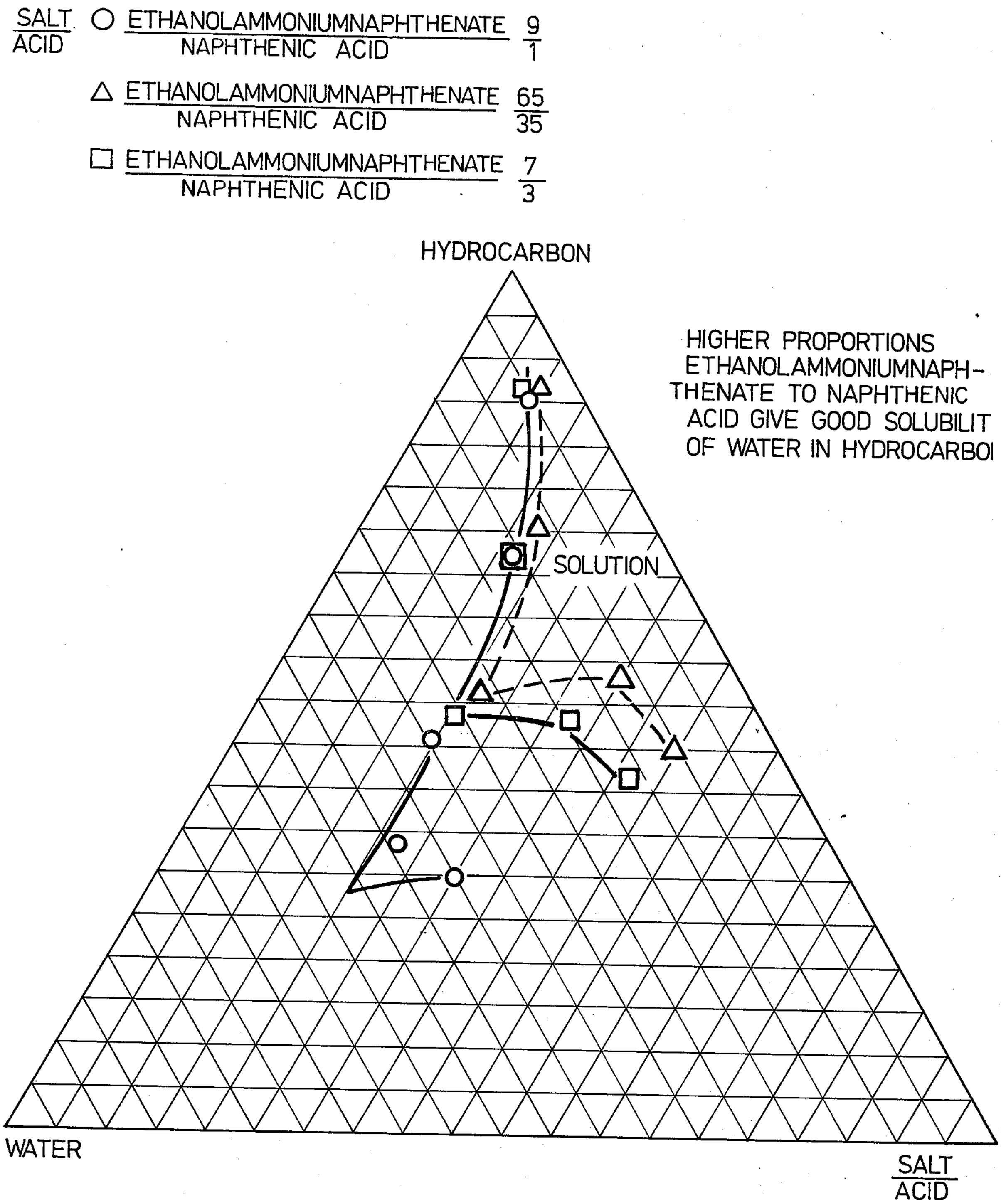
SALT / ACID
○ ETHANOLAMMONIUMNAPHTHENATE / NAPHTHENIC ACID 9/1
△ ETHANOLAMMONIUMNAPHTHENATE / NAPHTHENIC ACID 65/35
□ ETHANOLAMMONIUMNAPHTHENATE / NAPHTHENIC ACID 7/3
HYDROCARBON
HIGHER PROPORTIONS ETHANOLAMMONIUMNAPHTHENATE TO NAPHTHENIC ACID GIVE GOOD SOLUBILIT OF WATER IN HYDROCARBOI
SOLUTION
WATER
SALT / ACID

FIG. 2

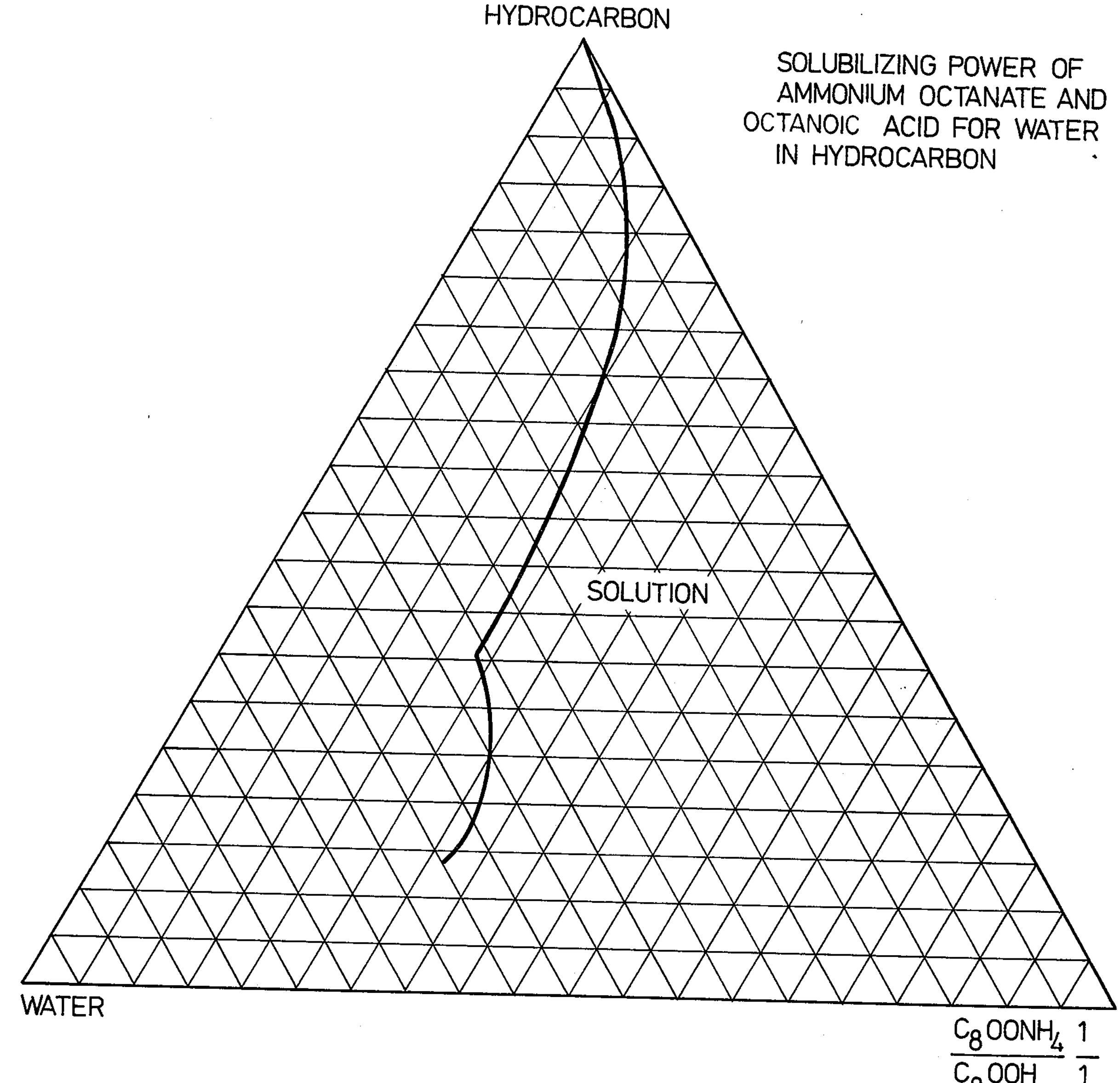
HYDROCARBON
SOLUBILIZING POWER OF AMMONIUM OCTANATE AND OCTANOIC ACID FOR WATER IN HYDROCARBON
SOLUTION
WATER
$\frac{C_8OONH_4}{C_8OOH}$ $\frac{1}{1}$

FIG. 3

FUEL COMPOSITION WITH INCREASED OCTANE NUMBER

The present invention relates to a fuel composition with increased octane number in which the combustion characteristics are regulated by the use of microemulsion technique.

Different types of additives to hydrocarbon fuels have been used for a long time for improving the combustion characteristics of the fuel. By combustion characteristics it is meant here, for example, octane number, propensity for ignition by incandescence, heat conductivity, composition of the exhaust gases, etc.

Improvement of the combustion characteristics by increasing the ability of a hydrocarbon fuel to resist knocking in a combustion engine, i.e. various ways of increasing the octane number, are known. As is known, the octane number is a measure of the resistance to knocking of a motor fuel, where knocking means that a spontaneous combustion of the fuel/air mixture occurs with abnormally high speed, whereby a loud metallic sound is made at the same time as the power of the engine decreases and the specific fuel consumption increases.

Additives to the engine fuel of different types have been used for a long time to increase the octane number. The most usual is tetraethyl and tetramethyl lead (Swedish Pat. No. 61,470). During the past few years the appropriateness of the lead additives has been strongly questioned because of the fact that the lead additives remain in the exhaust from combustion engines in toxic form. In many countries this has led to legislation or demand for legislation to limit or completely prohibit lead additives in engine fuels.

Other metal organic compounds have also been used as additives for the prevention of knocking in combustion engines such as dicyclopentadienyl compounds of iron, nickel, ruthenium or osmium (Swedish Pat. No. 155,935), organotitanium compounds (Swedish Pat. No. 165,904), oxygen-containing organic copper compounds (Swedish Pat. No. 83,431) et al.

A number of these additives in engine fuels also have disadvantages of a technical nature. The increased tendency to ignition by incandescence, especially in airplane engines, can be mentioned as an example.

However, all of the above mentioned additives are limited to elements which are soluble in the organic phase, i.e. the hydrocarbon mixture.

It has now been shown according to the invention that a fuel composition with increased octane number is achieved when the composition comprises

A hydrocarbon mixture,

water in the form of a microemulsion,

an emulsifier which makes possible the solubilisation of the water in the hydrocarbon mixture, whereby the emulsifier consists of a mixture of one or more carboxylic acids, and one or more salts of the corresponding acid or acids,

and the composition contains at least one water-soluble inorganic substance which is dissolved in the water which is solubilized in the hydrocarbon mixture.

An additional advantage with the invention is that, because of the possibility of regulating the combustion characteristics of the fuel, one can start with a raw material of lower quality than what was previously feasible in the production of a fuel with special combustion characteristics, e.g. a certain octane value.

A microemulsion is a clear emulsion in which the drops disperged in the continuous phase are very small, preferably less than 1 μm. Stable microemulsions of water and hydrocarbon are already known and are achieved by the addition of emulsifier compositions to the mixture of water and hydrocarbon.

The introduction of water in the form of a microemulsion in a hydrocarbon lubricant oil has been described in U.S. Pat. No. 3,346,494 in which a long life for the lubricant is obtained by suspending the water, sludge and other contaminants in the microemulsion, thereby reducing the harmful effect of these contaminants. Further it is disclosed that macroemulsions containing for example water and sludge which are formed in fuel oil tanks and cause disturbances in the functioning of the burner and in some cases even interruption of operation can be converted to microemulsions.

In the fuel composition according to the invention, water is solubilized in a hydrocarbon mixture by the use of an emulsifier which is preferably made up of a combination of an anionic and a cationic substance, namely a mixture consisting of 2 – 98% by weight of one or more carboxylic acids and 98 – 2% of an alkylammonium salt or a mono-, di- or triethanolammonium salt or an ammonium salt or a metal of corresponding acids or a mixture of such salts. In the fuel composition according to the invention the emulsifier is used in an amount 1 – 35% by weight, preferably 1 – 25% by weight, and especially in an amount of 10 – 25% by weight, depending on the desired amount of solubilized water. This amount of water, which corresponds to a certain amount of emulgent, is obtained by constructing a phase diagram for corresponding water-hydrocarbon emulsifier systems. Thermodynamically stable systems are obtained with these emulsifiers which are stable even during lengthy storage under changing temperature conditions. The micro-emulsion of water in the hydrocarbon mixture is obtained with the help of the emulsifier by the various components in the fuel composition being mixed with each other during agitation (see Examples 1 – 3 below).

The enclosed **FIGS. 1 – 3** show examples of phase diagrams in which

FIG. 1 shows the ternary system naphtenic acid - ethanol ammonium naphtenate water,

FIG. 2 shows solubilization curves for water in hydrocarbon with different proportions of naphtenic acid and ethanol ammonium naphtenate in the emulsifier and

FIG. 3 shows the solubilizing capacity for water in hydrocarbons with an emulsifier consisting of equal parts octanoic acid and ammonium octanate.

An appropriate emulsifier for solubilizing water in a hydrocarbon mixture for obtaining a fuel composition according to the invention is a mixture of one or more carboxylic acids which contain at least one aromatic group and/or alicyclic group as well as long hydrocarbon chains, and which has sufficient hydrophobicity so that it can function as a surfactant substance in the emulsifier according to the invention, and alkylammonium salts and/or mono-, di- and/or triethanol ammonium salts and/or ammonium salts and/or metal salts of the corresponding acid or acids. Appropriate alkyl ammonium salts contain 1 — 20 carbon atoms, preferably 6 — 10 carbon atoms in the alkyl group. Appropriate metal salts are salts of alkali metals, earth alkali metals, transition metals in the groups 1*b*, 2*b*, 3*b*, 4*b*, 5*b*, 6*b* and 7*b* in the periodic table, iron metals platinum metals, metals in the groups 3*a*, 4*a*5 5*a* and 6*b* in the periodic table and semi metals in the groups 4*a*, 5*a* and 6*a* in the periodic table.

There is obtained an even greater solubilizing capability for water in hydrocarbons with emulsifiers of this composition than with those containing straight aliphatic acids, because of the fact that a weak intermolecular interaction is obtained between the π-electrons of the aromatic ring and the water molecule.

Examples of such acids are naphthenic acids, resin acids and gallic acids.

One emulsifier combination which has shown very good results when used in a fuel composition according to the invention for solubilizing of water in the hydrocarbon mixture is a mixture of naphthenic acid and ethanol ammonium naphthenate. From **FIG. 1**, which shows the solubilization characteristics for water in hydrocarbon with different proportions between naphthenic acid and ethanol ammonium naphthenate, it is evident that a combination of this type gives rise to a great increase in solubilization when the ratio of ethanol ammonium naphthenate to naphthenic acid exceeds 2:3. **FIG. 2** shows how the solubilizing characteristics for water in hydrocarbon vary with different ratios between ethanol ammonium napthenate and naphthenic acid. From **FIG. 2** it is evident that higher ratios of salt to acid give good solubilization characteristics and that the solubilization capacity assumes very good values at a ratio of 9:1 of salt to acid.

Naphthenic acid is obtained as a by-product in the refining of petroleum and contains cycloaliphatic and aromatic compounds and has long hydrocarbon chains. A further advantage is achieved by the naphthenic acid being very cheap in relation to more well-defined pure acid but still, in combination with for example ethanolamine, gives at least equally good solubilization characteristics as the previously used more expensive acids.

When an emulsifier is added to a hydrocarbon mixture, which emulsifier contains a mixture of one or more carboxylic acids which contain at least one aromatic ring and/or alicyclic group and ethanol ammonium salts and/or alkyl ammonium salts and/or ammonium salts and/or metal salts of the corresponding acid or acids, e.g. naphthenic acid, whereby the alkylammonium salts contain 1 – 20 carbon atoms, preferably 6 – 10 carbon atoms in the alkyl chain and appropriate metal salts are salts of alkali metal, earth metals, transition metals in the groups 1*b*, 2*b*, 3*b*, 4*b*, 5*b*, 6*b* and 7*b* in the periodic table, iron metals, platinum metals, metals in the groups 3*a*, 4*a*, 5*a* and 6*a* in the periodic table, and semi-metals in the groups 4*a*, 5*a* and 6*a* in the periodic table, a direct increase in the octane number is obtained which is expected because of the presence of cycloaliphatic and aromatic compounds in the acid. An addition of water which is solubilized in the form of a microemulsion in the hydrocarbon mixture with the help of the above mentioned emulsifiers gives a further increase in the octane number of the same order of magnitude as with only the emulsifier additive.

Table I shows the connection between the octane number for an engine fuel composition and its composition when an emulsifier, which consists of various amount proportions of ethanol ammonium naphthenate to naphthenic acid, is added to a hydrocarbon mixture consisting of pure petrol with the octane number **93** and when water is subsequently added in varying amounts.

TABLE I

Trial No.	Ethanol-ammonium naphthenate % by weight	Naphthenic acid % by weight	Ratio salt: acid	Hydro-carbon mixture % by weight	Water % by weight	Octane number (research)
1	—	—	—	100	—	93
2	9.0	1.0	9:1	90.0	—	94.0
3	18.0	2.0	9:1	80.0	—	94.5
4	27.0	3.0	9:1	70.0	—	95.7
5	18.0	2.0	9:1	70.0	10.0	95.6
6	22.5	2.5	9:1	60.0	15.0	97.0
7	18.0	2.0	9:1	65.0	15.0	96.8
8	6.5	3.5	65:35	90.0	—	93.5
9	19.5	10.5	65.35	70.0	—	94.4
10	13.0	7.0	65:35	70.0	10.0	95.9

As is evident from the table, the increase in the octane number occurs when the water is added, both in relation to the octane number for the pure petrol and to that octane number obtained when various amounts of emulsifier are added. Likewise it is evident that the highest octane number of all is obtained when the ratio between the ethanol ammonium naphthenate and the naphthenic acid is 9:1 and the amount of water added is 15.0% by weight.

Another appropriate emulsifier for solubilization of water in a hydrocarbon mixture for obtaining the fuel composition according to the invention consists of a mixture of one or more straight, aliphatic carboxylic acids with 1 – 22 carbon atoms, preferably 6 – 10 carbon atoms, and at least one mono-, di- or triethanol ammonium salt or ammonium salt or alkyl ammonium salt or metal salt of corresponding acids, where appropriate alkyl ammonium salts contain 1 – 22 carbon atoms in the alkyl group, preferably 6 – 10 carbon atoms, and appropriate metal salts are salts of alkali metals, earth alkali metals, transition metals in the groups 1*b*, 2*b*, 3*b*, 4*b*, 5*b*, 6*b* and 7*b* in the periodic table, iron metals, platinum metals, metals in the groups 3*a*, 4*a*, 5*a* and 6*a* in the periodic table and semimetals in the groups 4*a*, 5*a* and 6*a* in the periodic table. The appropriate proportional amounts of the components included in the emulsifier in relation to the desired amount of solubilized water can be determined by investigation of the phase relations in water-hydrocarbon emulsifier systems.

As examples of appropriate carboxylic acids of the above mentioned type one can give formic acid, acetic acid, hexanoic acid, heptoic acid, octanoic acid etc. The acids are preferably combined with corresponding ethanol ammonium-, ammonium-, alkyl ammonium- and/or metal salts. The sum of carbon atoms in the salts of the carboxylic acid should preferably be between 5 and 14. Acids with short hydrocarbon chains in combination with amines in longer chains have produced good solubilization results, but the use of carboxylic acids with short chains involves the possibility of corrosion problems occurring, and therefore they are less appropriate for use in a fuel composition according to the invention.

Another emulsifier combination, which has produced good results in solubilization of water in hydrocarbon, is a mixture of octanoic acid and ammonium octanate and octanoic acid in the forming of micro-emulsions of water in hydrocarbon. In FIG. 3 C_8OOH designates octanoic acid and C_8OONH_4 designates the ammonium salt of this acid. The ratio between the amount of acid and the corresponding salt is critical, which is demonstrated by the fact that the following amounts of water are solubilized in hydrocarbon when the composition of the emulsifier is varied:

Ratio between the amount of salt and the amount of acid + salt:	% H_2O
0.3	5
0.5	40
0.7	5

When an emulsifier is added, which consists of a mixture of one or more straight aliphatic carboxylic acids with 1 – 22 carbon atoms, preferably 6 – 10 carbon atoms, and at least one mono-, di- or triethanolammonium salt or ammonium salt or alkyl ammonium salt or metal salt of corresponding acids, where appropriate alkyl ammonium salts contain 1 – 22 carbon atoms in the alkyl group, preferably 6 – 10 carbon atoms, and appropriate metal salts are salts of alkali metals, earth alkali metals, transition metals in the groups 1*b*, 2*b*, 3*b*, 4*b*, 5*b*, 6*b* and 7*b* in the periodic table, iron metals, platinum metals, metals in the groups 3*a*, 4*a*, 5*a* and 6*a* in the periodic table and semi-metals in the groups 4*a*, 5*a*, 6*a* in the periodic table, to a hydrocarbon mixture a reduction of the octane number is obtained and when pure water is added for formation of a microemulsion of the water in the hydrocarbon mixture it is true that the octane number rises, but not the octane number level for the pure hydrocarbon mixture.

However, when an inorganic substance, which is soluble in water, or a mixture of such substances, is dissolved in an amount of from 0.01 g/l to such an amount that the acqueous solution becomes saturated, preferably in an amount of 0.01 – 100.0 g/l, and especially in an amount of 0.01 – 10.0 g/l, in the water which is thereafter solubilized in the hydrocarbon mixture, a marked increase in the octane number is obtained.

A water soluble inorganic substance or a mixture of such substances which, in solution in the water solubilized in the hydrocarbon mixture, gives the desired fuel composition with controllable combustion characteristics, e.g. increased octane number, can be a water soluble inorganic substance AB, where

A designates hydrogen, ammonium, metal, e.g. alkali metal, alkaline earth metal, transition metal in the groups 1*b*, 2*b*, 3*b*, 4*b*, 5*b*, 6*b* and 7*b* in the periodic table, iron metal, platinum metal, metal in the groups 3*a*, 4*a*, 5*a* and 6*a* in the periodic table, and semi-metal in the groups 4*a*, 5*a* and 6*a* in the periodic table or non-metal in the groups 3*a*, 4*a*, 5*a*, 6*a* and 7*a* in the periodic table, and

B designates hydride, boride, carbide, nitride, oxide, peroxide, silicide, phosphide, sulphide, hydrogen sulphide, halogenide, e.g. chloride, bromide, ionide, fluoride, hydroxide, cyanide, cyanate, thiocyanate, or an oxohalogenate, e.g. hypochlorite, chlorite, chlorate, perchlorate, periodate, perbromate, or an oxosulphate, e.g. sulphite, sulphate, sulphoxylate, thiosulphate, or an oxonitrate, e.g. nitrite, nitrate or an oxophosphate, e.g. hypophosphite, phosphite, phosphate, metaphosphate, or carbonate, silicate, borate, chromate, dichromate or acid salts of the above mentioned ions, e.g. hydrogen sulphate, hydrogen phosphate, hydrogen carbonate, or

where AB designates a complex compound in which

A designates a positive complex ion, e.g. amino complex of transition metals such as $Cu(NH_3)_4^+$, $Ag(NH_3)_2^+$, $Co(NH_3)_6^{3+}$, $Cr(NH_3)_6^{3+}$, $Ni(NH_3)_6^{2+}$, or thiocyanato complex of transition metals, e.g. $FeSCN^{2+}$, $Fe(SCN)_2^+$ and B has the meaning given above, or

B designates a negative complex ion, e.g. cyano complex of transition metals such as $Cd(CN)_4^{2-}$, $Ni(CN)_4^{2-}$, $Ag(CN)_2^-$, $Fe(CN)_6^{4-}$, $Fe(CN)_6^{3-}$, $Fe^{II}Fe^{III}(CN)_6^-$,

or halogen complex of transition metals, e.g. $CoCl_4^{2-}$, or hydroxy complex of transition metals or other metals such as $Cr(OH)_4^-$, $Sn(OH)_3^-$, $Sn(OH)_6^{2-}$, $Pb(OH)_6^{2-}$, where A has the meaning given above.

Such a substance AB can appropriately contain multivalent metal ions, preferably of transition metals, especially in complex bound form, and especially in a form in which the metal in the complex assumes two different oxidation numbers. One example of such substance, in which the metal is iron, is potassium hexacyanoferrate (II,III) which has the chemical formula $K[Fe^{II}Fe^{III}(CN)_6]$, designated in the following by $KFe_2(CN)_6$. K^+ here can naturally be replaced by other positive ions, e.g. Na^+, NH_4^+ etc.

In the fuel composition according to the invention, in which the water which is solubilized in the hydrocarbon mixture contains dissolved $KFe_2(CN)_6$ and in which the microemulsion has been achieved with the help of octanoic acid and ammonium octanate as emulsifier, an appreciable increase in the octane number is achieved.

Table II shows different mixtures of a fuel composition according to the invention in which the hydrocarbon mixture is a petrol with octane number **93**, the emulsifier consists of a mixture of octanoic acid and ammonium octanate, and in which the water solubilized in the hydrocarbon mixture contains varying amounts of $KFe_2(CN)_6$. The octane number for the different mixtures, for the pure petrol and for the petrol with water and emulsifiers but without the addition of a salt to the water, are given for the purpose of comparison. The additions of KCN given in the table have only the purpose of working against the effect of the potassium hexacyanoferrate's effect on the stability of the microemulsion.

TABLE II

Trial No.	Ammonium octanate, % by weight	Octanoic acid, % by weight	Hydro-carbon, % by weight	Water, % by weight	Addition of $K[Fe_2(CN)_6]$ g/l	Addition of KCN g/l	Octane number (Research)
1	—	—	100	—	—	—	93
2	12.1	14.9	63.0	10.0	—	—	91.2
3	12.1	14.9	63.0	10.0	1.0	—	≈96
4	12.1	14.9	63.0	10.0	0.1	0.5	96.0
5	12.1	14.9	63.0	10.0	0.5	2.5	95.5
6	12.1	14.9	63.0	10.0	1.0	5.0	96.4

From the above table it can be seen that the addition of the water soluble inorganic substance, in this case the iron complex, causes a marked increase in the octane number.

The octane number was measured in all cases according to the Research method, i.e. the characteristics of the fuel were investigated and compared with a reference fuel, composed of n-heptane and isooctane, in a so-called CFR method, whose compression ratio can vary.

The hydrocarbon mixture can be any liquid fuel at all which consists of hydrocarbons, e.g. motor fuel, kerosene (paraffin oil), aviation fuel, petrol, cracked petrol, polymer petrol, diesel fuel, fuel oil etc. The hydrocarbon mixture used in the invention corresponds to a lead-free petrol which does not contain any other commonly used additives.

Some examples of how one obtained the fuel compositions which were subjected to testing, are given below.

EXAMPLE 1

12.1 g ammonium octanate was weighed in a flask, 14.9 g octanoic acid was then added and finally 63.0 g petrol. To the mixture in the flask there was then added 10.0 g water and after light shaking a clear yellowish solution was formed (Trial 2, Table II).

EXAMPLE 2

To a solution with the same composition as in Example 1 there was added 0.1 g potassium ferrocyanate, which after agitation produced a strong blue-coloured solution. 0.5 g potassium cyanide was then added during additional agitation. After the addition of the potassium cyanide the solution become very strongly blue-coloured (Trail 4, Table II).

EXAMPLE 3

2.5 g ethanol amine was weighed in a flask, and 15.0 g water and 60.0 g petrol was then added. Thereafter 22.5 g naphthenic acid was added in small portions during agitation, which produced a clear brown-coloured solution (Trial 6, Table I).

The other mixtures disclosed in Tables I and II were obtained by corresponding methods by varying only the amounts of the components included.

EXAMPLE 4

Octane number measurement according to the Research method was carried out on a base fuel having the following composition (percent by weight)

85.5 % 91 octane lead-free petrol

8.55 % NS 130[x]

0.95 % mixed ethanol amine

5.0 % H_2O

Various metal salts have been dissolved in the water in such proportions that the salt concentration in the petrol solution was 50 ppm.

[x]NS 130 and NS 160, respectively, are references for different maphthenic acid qualities.

Metal salts	$\Delta RO = RO_{fuel} - RO_{base\ fuel}$
NaCl	0.3
CsCl	0.7
RbCl	0.8
$SrCl_2 \cdot 6H_2O$	0.9
LiCl	1.1
$CrCl_3 \cdot 6H_2O$	0.8
$PbCl_2$	0.8
$CuCl_2 \cdot 2H_2O$	0.8
$NiCl_2 \cdot 6H_2O$	0.8
$CeCl_3 \cdot 7H_2O$	0.8
$LaCl_3 \cdot 7H_2O$	0.9
$MgCl_2 \cdot 6H_2O$	0.9
$Al_2(SO_4)_3 \cdot 18H_2O$	0.8
$Fe_2(SO_4)_3 \cdot 9H_2O$	0.8
$Fe(SO_4) \cdot 7H_2O$	0.8
$CuSO_4 \cdot SH_2O$	1.0
$MgSO_4$	0.8
$Cd(NO_3)_2$	2.6
$Mn(NO_3)_2$	2.1
$Ni(NO_3)_2$	2.3
$Cr_2(SO_4)_3$	2.2
$Cr(NO_3)_3$	2.0
$CoSO_4$	2.1
$Zn(NO_3)_2$	1.8

EXAMPLE 5

Octane number measurement according to the Reserach method was carried out on a base fuel having the composition (percent by weight)

85.5 % 91-octane, lead-free petrol

8.55 % NS 160

0.95 % mixed ethanol amine

5.2 % H_2=

Various metal salts have been dissolved in the water in such proportions that the concentration of metal in the fuel solutions was 0.5 g/l.

Metal salts	$\Delta RO = RO_{fuel} - RO_{base\ fuel}$
MnI_2	1.0
$MnBr_2$	1.2
$Ni(HCOO)_2$	0.6
$Na(CH_3COO)$	0.9
$K(C_2O_4H)$	0.1
KI	0.3
$NaCO_3$	0.2
$KHCO_3$	0.1
$K[Fe_2(CN)_6]$	0.6

EXAMPLE 6

Octane number measurement according to the Research method was carried out on a base fuel having the composition (percent by weight)

80.75 % 91-octane, lead-free petrol

14.25 % Non-ion emulsifier EMU 267[x]

5.0 % H_2O

Various metal salts have been dissolved in the water in such proportions that the concentration of metal in the fuel solutions was 0.5 g/l.

[x]Non-ion emulsifier from MoDo-Chemicals

Metal salts	RO = RO_{fuel} - $RO_{base\ fuel}$
MnI_2	1.3
$MnBr_2$	0.1
NiI_2	0.9
$Ni(HCOO)_2$	0.2
Mn-lactate	0.6
$Ni(CH_3COO)_2$	0.6
$Mn(CH_3COO)_2$	0.6
KI	1.0
$KHPO_4$	0.6
$Na(CH_3COO)$	0.6
$K_2C_2O_4$	0.7
$KC_3H_7O_2$	0.7
$K[Fe_2(CN)_6]$	0.1

EXAMPLE 7

Octane number measurement according to the Research method was carried out on a fuel having the composition (percent by weight):

85.09 % 91-octane, lead-free petrol
8.50 % NS 160
1.41 % Monoethanol amine
5.0 % H_2O

$K_4[Fe(CN)_6]$. $3H_2O$ and $K_3[FE(CN)_6]$ (mole ratio 1:1) were dissolved in water in such proportions that the concentration of Fe in the fuel was 0.5 g/l.

RO for said fuel was 93.7.

EXAMPLE 8

Octane number measurement according to the Research method was carried out on a fuel having the composition (percent by weight):

85.25 % 91-octane, lead-free petrol
8.53 % NS 160
0.27 % Monoethanol amine
0.95 % Calcium cyanide
5.00 % H_2O $K[Fe_2(CN)_6]$ was dissolved in water in such proportions that the Fe concentration in the fuel was 0.5 g/l.

RO for said fuel was 95.0.

EXAMPLE 9

Octane number measurement according to the Research method was carried out on a fuel having the composition (percent by weight):

85.09 % 91octane, lead-free petrol
8.51 % NS 160
0.47 % Monoethanol amine
0.93 % Calcium cyanide
5.00 % H_2O

RO for said fuel was 94.8.

EXAMPLE 10

Octane number measurement according to the Research method was carried out on a fuel having the composition (percent by weight):

63.0 % 91-octane, lead-free petrol
14.9 % $HOOC_8$
12.1 % NH_4OOC_8
10.0 % H_2O

1.0 g $K[Fe_2(CN)_6]$ and 5.0 g KCN were added to 1 litre of the above mentioned fuel, whereby RO was 96.4.

EXAMPLE 11

Octane number measurement according to the Research method was carried out on a fuel having the composition (percent by weight):

63.0 % 91-octane, lead-free petrol
14.9 % $HOOC_8$
12.1 % NH_4OOC_8
10.0 % H_2 =

0.3 g Na-laurylsulphonate and 0.28 g $FeCl_2$. $4H_2O$ were added to 1 litre of the above mentioned fuel, whereby

RO was 93.1.

What we claim is:

1. A fuel composition comprising a major proportion of liquid hydrocarbon mixture, about 5 – 40% by weight of water in the form of a microemulsion of water drops of a diameter less than 1 μm dispersed in the continuous hydrocarbon phase, 1 – 35% by weight of said composition of an emulsifier for the water in the hydrocarbon mixture, the emulsifier consisting of 2 – 98% by weight of the emulsifier of at least one monocarboxylic acid and 98 – 2% by weight of the emulsifier of at least one salt of said at least one monocarboxylic acid, and 0.1 – 10.0 grams per liter of said water of an inorganic compound dissolved in said water thereby imparting to said composition an increased octane number.

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