# PATENT SPECIFICATION

**1,062,606**

NO DRAWINGS.

1,062,606

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## COMPLETE SPECIFICATION.

## Engine Fuel.

We, AUTOL A. G., a Swiss corporation, of Allschwil, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In the operation of combustion engines disadvantages occur in many operative conditions as a result of incomplete combustion, for example corrosion and wear due to acid combustion products, residues in the combustion chamber at the outlet valves or slits, respectively, and in the outlet paths, in the case of diesel engines also at the nozzle apertures and, as a consequence thereof, decrease in performance and increased wear. These unavoidable effects are particularly serious in the case of engines which are running cold, such as is the case in short distance running.

A great number of proposals have already been made known for preventing these damaging results of incomplete combustion such as, for example, by way of the engine oil by the use of the well known HP-engine oils; since these cannot be used in the fuel, however, additives are advised for this field, for which numerous combinations of substances with anti-corrosive and cleaning effect have been proposed. It is question here principally of combustion of corrosion protection agents or also of selected detergents with solvents such as terpentine oils, camphor oils, alcohols, ketones, esters and hydrohalides. In the recent past, an additive has been proposed as particularly active, consisting of polyalcohol fatty acid esters or free fatty acids with at least 12 carbon atoms, aliphatic fatty acid esters, and calcium phenyl stearate. Moreover, it has been proposed to use in these additives, instead of aliphatic fatty acid esters, esters of phenol and its homologues or fatty acid esters with a hydroxyl or alkoxy group in the fatty acid component or in the alcohol component, or in both, as well as mixtures of these esters.

It has now been found that both the corrosion protection and the dissolving action on combustion residues in internal combustion machines can be substantially improved if a fuel additive is used which contains

(a) 1—50% of a condensation product of 1 mole of a polyethanolamine with 1 to 2 moles of a fatty acid having at least 10 carbon atoms or of a mixture of several of such fatty acids,

(b) 1—50% of a high boiling ester of fatty acids, aromatic acids, hydroaromatic acids or naphthenic acids or of a mixture of such esters and

(c) 10—90% of a refined mineral oil having a viscosity of at least 1.6° E/20 °C. and at most 15.0° E/50 °C.

To produce the above said condensation product one can heat to temperatures exceeding 130 °C. for 1—3 hours in conventional manner e.g. 1 mole by weight of triethanolamine with 1 mole by weight of a fatty acid having at least 12 carbon atoms, for example oleic acid. In order to obtain light condensation products, it is advantageous to perform the reaction in containers of glass, porcelain or anti-corrosive steels; it may also be helpful to carry out the reaction in vacuo with the addition of metal deactivators such as, for example, a Schiff base of salicylic aldehyde. After distilling off the water entirely and cooling one obtains, when oleic acid is used, a light yellow to light brownish liquid condensation product which consists principally of the mono-oleic acid ester of triethanolamine. If 2 moles of oleic acid are used instead of

1 mole, the triethanolamine dioleic acid ester principally forms. Both said condensation products are readily soluble in most solvents and in the refined mineral oils to be used.

In the engine fuel according to the invention, one can use, instead of the condensation product of triethanolamine and a fatty acid having at least 10 carbon atoms, a product which is obtained by analageous condensation of 1 mole of diethanolamine with 1 mole of a fatty acid having at least 10 carbon atoms, or with a mixture of such fatty acids. If technical oleic acid is used as the fatty acid, the mono-oleic acid ester of diethanolamine is obtained substantially as reaction product.

All high boiling fatty acid esters or mixtures of fatty acid esters which are soluble in hydrocarbons are suitable as ester component b) for the purposes of the invention, but preferably those having a boiling point exceeding 150°C. such as, for example, lauric acid ethyl ester, butyric acid isooctyl ester, acetic acid oleylyl ester, benzoic acid ethyl ester, naphthenic acid isopropyl ester and cyclohexane carboxylic acid methyl ester.

However, esters of carboxylic acids and phenol and its homologues, and fatty acid esters in which either the alcohol component or the fatty acid component or both bear a hydroxy or alkoxy group, or mixtures of these esters, have proven especially active as ester component b). As esters of carboxylic acids and phenol and its homologues, the following may be used by way of example: cresyl acetate, xylenyl acetate, phenol esters of naphthenic acids, cresyl naphthenate or the cresyl ester of cyclohexane carboxylic acid. Fatty acid esters which bear a hydroxy or alkoxy group are, for example, methoxybutyl acetate, methoxy acetic acid ethyl ester, methoxy butyl ester of methoxy acetic acid, lactic acid acetyl ester, lauric acid mono-ester of methoxy ethanol, glycol monooleate, or mixtures thereof.

It has proven on the grounds of engine tests that the refined mineral oil is essential for the action of the two other components (a) and (b) in the fuel. It should further be noted that the refined mineral oil (c) may be partially replaced by synthetic hydrocarbons prepared for example by the Fischer-Tropsch synthesis, or by synthetic or natural aromatic hydrocarbons such as alkyl benzenes.

It has proven in the engine tests that very small amounts of the individual components of the additive have an optimal action on a conventional fuel. As a rule, 0.005 to 1 % by volume, preferably 0.02 to 0.5 % by volume, based on the engine fuel, suffice.

Compounded engine fuels of the following type have proven to be particularly effective:

*Example 1*

The following substances are added to a diesel fuel:

| | |
|---|---|
| Condensation product (produced from 1 mole of triethanolamine and 2 moles of techn. oleic acid) ... ... | 0.12 to 0.40% |
| Cresyl naphthenate ... ... ... ... ... | 0.04 to 0.12% |
| Glycol monooleate or methoxy butyl butyrate ... ... | 0.16 to 0.32% |
| Neutral oil ... ... ... ... ... ... | 0.40 to 0.50% |

If diesel engines which already have heavy residues are driven with this compounded diesel fuel, the residues will be removed within a few running hours. Simultaneously, the corrosion protection in the fuel system will be substantially improved.

*Example 2*

An engine gasoline (fuel) contains the following additives:

| | |
|---|---|
| Condensation product (produced from 1 mol of diethanolamine and 1 mole of oleic acid) ... ... ... ... | 0.01 to 0.03% |
| Cresyl acetate ... ... ... ... ... ... ... | 0.01 to 0.04% |
| Methoxy butyl acetate ... ... ... ... ... | 0.01 to 0.03% |
| Refined spindle oil ... ... ... ... ... ... | 0.01 to 0.04% |
| Alkyl benzene mixture ... ... ... ... ... | 0.16 to 0.06% |

The formation of corrosion and residues in two and four stroke carburetor engines is substantially prevented with this compounded engine fuel. Residues already present in carburetor engines are removed within a few running hours.

The invention is not limited to the substances cited in the Examples and in the specification.

Moreover, other substances such as, for example, corrosion inhibitors, ignition accelerators, octane number improvers, antioxidants, high pressure additives, and combustion promotors may be added in conventional manner to the engine fuels of the invention.

A fuel additive for internal combustion engines is claimed and described in the specification of our co-pending application no. 28287/64 (Serial No. 1,062,605).

WHAT WE CLAIM IS:—

1) Engine fuel such as gasoline and diesel fuel, characterized by containing an additive consisting of

a) 1—50% of a condensation product of 1 mole of a polyethanol-amine and 1 to 2 moles of a fatty acid having at least 10 carbon atoms or a mixture of several of such fatty acids,

b) 1—50% of a high boiling ester of fatty acids, aromatic acids, hydroaromatic acids or naphthenic acids or a mixture of such esters and

c) 10—90% of a refined mineral oil having a viscosity of at least 1.6°E/20 °C. and at most 15°E/50 °C.

2) Engine fuel according to Claim 1, characterized by containing as condensation product a product obtained by condensation of 1 mole of diethanolamine with 1 mole of a fatty acid having at least 10 carbon atoms or with a mixture of such fatty acids.

3) Engine fuel according to Claim 1, characterized by containing as condensation product a product obtained by condensation of 1 mole of triethanolamine and 2 moles of a fatty acid having at least 10 carbon atoms, or of a mixture of such fatty acids.

4) Engine fuel according to any one of Claims 1 to 3, characterized by containing as high boiling ester at least one ester of phenol or of one of its homologues or at least one fatty acid ester in which either the alcohol component or the fatty acid component or both the alcohol component and the fatty acid component bear a hydroxy or alkoxy group, or a mixture thereof.

5) Engine fuel according to any one of Claims 1 to 4, characterized in that the refined mineral oil is partially replaced by synthetic hydrocarbons such as are prepared by the Fischer-Tropsch synthesis or by synthetic or natural aromatic hydrocarbons such as alkyl benzenes.

6) Engine fuel according to any one of Claims 1 to 5, characterized in that the content of the individual components in the fuel amounts to 0.005 to 1% by volume, preferably 0.02 to 0.5% by volume, based on the engine fuel.

7) Engine fuel such as gasoline and diesel fuel substantially as hereinbefore described with reference to the foregoing Examples.

J. Y. & G. W. JOHNSON,
Furnival House,
14-18 High Holborn,
London, W.C.1,
Chartered Patent Agents,
Agents for the Applicants.

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