

UNITED STATES PATENT OFFICE

2,324,779

MOTOR FUEL

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No Drawing. Application July 25, 1940
Serial No. 347,484

3 Claims. (Cl. 44-69)

This invention relates to motor fuels and particularly to a method of improving their combustion in spark-ignition engines.

Relatively heavy motor fuels containing low volatility ends are of high calorific value but have tendencies to cause fuming and objectionable odor in exhaust gases when used in spark-ignition type engines. These combustion product difficulties are very annoying and, nevertheless, very commonly accompany the operation of internal combustion engines used in large motor vehicles, as; for example, trucks and motor buses, which for economical reasons use relatively heavy motor fuels. The same situation exists to a lesser but still annoying degree with motor fuels of conventional volatility.

The objects of this invention are to improve motor fuels in their combustion performance by addition agents which effectively accomplish a reduction in fuming and odor without seriously detracting from anti-knock qualities and power output of the fuel so that the fuel may retain its economical and practical value.

It has been found that substances having high anti-knock or detonation properties, in particular, organo-metallic compounds such as lead alkyl anti-knock agents, and certain ignition accelerating agents, when added in combination of small proportions to the motor fuels, accomplish the aforesaid objects.

Although there are a large number of substances which have the property of accelerating ignition of a fuel, they cannot all be used with the same degree of effectiveness for the purpose of the present invention, because a number of them detrimentally tend to cause excessive pre-ignition, also, a number of them excessively lower the anti-knock and calorific values of the fuel, or in other ways interfere with the improvement desired.

Substances having ignition acceleration effects which have been discovered to be well adapted for utilization in the present respects comprise preferably organic nitrates, and, more particularly, alkyl nitrates containing from 3 to 6 carbon atoms per molecule as, for example, isopropyl nitrate, butyl nitrates, amyl nitrate and iso-amyl nitrate. Next in order to these may be used organic peroxides, nitrogen derivatives, and organic sulfides of similar molecular weight, volatility, and ignition accelerating properties. The substances are in common characterized as being aliphatic compounds containing oxygen, nitrogen, and/or sulfur in an active form, but furthermore, for the objects of this invention, the compounds of this general class are preferably

selected when they have boiling points within the range of 100° C. to 300° C.

Using the preferred types of ignition accelerating agents, incorporated in very minute proportions into an ordinary commercial gasoline, or a motor fuel of relatively heavy character, such as is sometimes used in heavily constructed internal combustion engines of the spark-ignition type, the objectionable nature of the exhaust gas has been very successfully eliminated. It has been found of additional significance, that when the fuels are also blended with small amounts of a lead alkyl anti-knock agent, the results have been even better with respect to the reduction of the odor in the exhaust gases; and in keeping with the object of avoiding reduction in the fuel performance, the preferred types of ignition accelerator agents remarkably avoid depression of the anti-knock value of the fuel.

The following example and test data will further illustrate the nature and advantages of this invention:

Example

A commercial gasoline of about 65 octane number (A. S. T. M.) and boiling in the range of from 125° F. to 450° F., and portions of this base fuel blended with 1.0 cc. of tetraethyl lead and with 0.75 cc. of amyl nitrate per gallon were used as fuels in running a bus motor. The fuel blended with both the tetraethyl lead and the amyl nitrate was observed to considerably reduce visible fuming and odor in the exhaust gases.

The blended fuel performed satisfactorily in the trial runs without causing any detectable knocking.

Further tests were made with a C. F. R. engine to determine more accurately the effects of the ignition accelerating agents on the anti-knock value of the fuels. The following tabulated results illustrate that the ignition accelerator does not adversely affect the octane number of the leaded fuel, and therefore can be economically employed in such fuels to accomplish the objects of this invention.

Fuel composition	A. S. T. M. octane number	
	Clear	3 cc. T. E. L.
Gasoline base.....	65.8	82.9
Gasoline base+0.014% amyl nitrate.....	62.1	82.1
Gasoline base+0.2% amyl nitrate.....	57.1	79.6

In the practice of this invention the addition agents are added to a hydrocarbon fuel base generally boiling within the range of 100° F. to 450° F., but the fuel base may have an end point as high as 500° F. or even 600° F. The fuel base may be of the nature of a straight run gasoline or naphtha, and it may be a motor fuel distillate fraction obtained by any of the commercial conversion processes, such as thermal cracking, reforming, catalytic cracking, or destructive hydrogenation. The fuel base may also have incorporated various high octane blending value fuel ingredients, such as are obtained by processes of alkylation, polymerization, and hydrogenation. It may also include various synthetic anti-knock blending agents, such as isopropyl ether, aniline, benzol, etc.

The quantity of the ignition accelerator agent to be added to the fuel is restricted as much as possible consistent with obtaining the desired improvement in the combustion, and generally this amount is between the approximate limits of 0.005% to 0.2% by weight of the fuel composition. The lead alkyl anti-knock agent employed, together with the ignition accelerator, may be used in amounts ranging from 0.5 cc. to 5 cc. per gallon of the fuel.

In addition to the additives blended with the fuel for improving the combustion qualities, various other types of blending agents may be used, such as materials having lubricating or gum fluxing properties, dyes, corrosion inhibitors, antioxidants, color stabilizing agents, etc.

It is desired not to be limited by any of the specific examples given for the sake of illustration, and various modifications may be made within the scope of the appended claims.

I claim:

1. A motor fuel for spark-ignition engines, comprising a gasoline base fuel blended with from 0.5 cc. to 5 cc. per gallon of lead alkyl anti-knock agent, and with from 0.005% to 0.2%, by weight of the fuel composition, of an alkyl nitrate containing from 3 to 6 carbon atoms per molecule.

2. A composition as described in claim 1, in which said alkyl nitrate is amyl nitrate.

3. A motor fuel comprising essentially gasoline, about 3 cc. per gallon of tetraethyl lead, and about .014% of amyl nitrate, said fuel being substantially free from tendency to form fumes and objectionable exhaust odors during use in a spark-ignition engine.

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