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BREAK-IN FUEL

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Our invention relates to a new composition of matter and specifically it relates to new break-in type fuels for internal combustion engines.

It is standard practice among engine manufacturers to operate the engines produced for a given number of hours as a test and to break them in or wear some of the very stiff newness out of joints. This practice is generally quite costly in that it ties up engines for long periods and consumes much time, particularly if the test run is extended to make it a break-in run. The desirability of accelerating the break-in time of an engine has long been appreciated, but little has been done to accomplish it. The only feasible method of accelerating break-in time appeared to be by addition of some abrasive to the lubricating system. This method, although workable, is attended by numerous disadvantages, namely, the difficulty of obtaining a fine enough abrasive, keeping it in suspension and controlling the wear of parts.

It is the principal object of our invention to provide a novel fuel composition for use in accelerated break-in runs of internal combustion engines.

It is a secondary object of our invention to provide a fuel composition suitable not only for accelerated break-in runs of internal combustion engines, but also for polishing and burnishing engine cylinders and pistons and for removing small amounts of hard carbon from the engine.

Our invention comprises a fuel for internal combustion engines possessing the features, properties, and the relation of components, which will be exemplified in the product hereinafter described and the scope of the invention will be indicated in the claims.

In our copending application, Serial Number 556,651 filed on even date herewith, we have described a method of performing accelerated break-in runs and of applying a superior final finish to the cylinder walls and pistons.

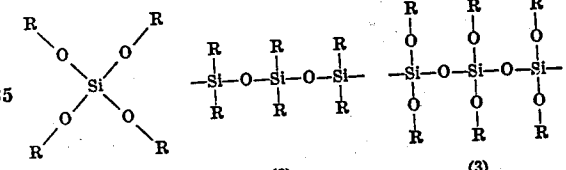
We have devised a method and composition whereby a very finely divided abrasive of characteristic spherical or globular particle shape can be generated in the cylinders of a running engine and scattered over the inner surfaces of the cylinders to be worked between the juxtaposed cylinder walls and pistons to polish and break-in the engine. In particular we have found that by operating the engine on a fuel which is essentially a solution of an organo-silicon compound, the compound will burn in the cylinders to form a very finely divided silicon

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dioxide, which oxide will act as a polishing agent in the engine. Apparently, in operation, the fuel and, consequently, the organo-silicon compound dissolved therein are sprayed into the engine cylinder in very finely divided form or actually vaporized just before entry into the cylinder. The organocompound is injected into the cylinder in very finely divided form and is decomposed to silica with explosive violence when the fuel in the cylinder ignites.

The reaction conditions in the cylinder are such that they favor the formation of finely divided particles whose shape is spherical or globular and whose size we have found is less than one micron. Often the particle size is less than 0.05 micron or 500 angstrom units. The fine particles thus scattered throughout the interior of the cylinder are worked or rolled between the piston and the cylinder walls and by their rolling action flatten out many of the microscopic or submicroscopic irregularities left in the juxtaposed cylinder and piston surfaces by the lapping or finishing step used in the manufacture of the engine. Furthermore the particles are so light and fine that they blow out through the engine exhaust line with the fuel smoke without permitting the accumulation of any substantial quantity in the cylinder.

In the practice of our invention, organo-silicon compounds of the following general types can be used:



(1) (2) (3)

where R is an alkyl, aryl, alkaryl or aralkyl radical. It will be noted that the above classes of compounds include silicon compounds having ester-like structures (1), silicon compounds having ether-like structures (2), and silicon compounds containing both ether-like and ester-like linkages (3). Typical of the compounds are ethyl orthosilicate, propyl orthosilicate, amyl orthosilicate and various alkyl, aryl, aralkyl and alkaryl polysiloxanes such as those now being manufactured and offered to the trade as silicone fluids and plastics.

In series of tests made on new engines we used substantially saturated solutions of the organo-silicon compounds in the hydrocarbon fuel for the engine. In most cases this was

satisfactory for the compounds of the types mentioned above are of very limited solubility in hydrocarbons and the possibility of getting too concentrated a solution with which a dangerously large amount of silica would be formed in the engine is rather remote.

The method of making up the fuel containing the organo-silicon additive is quite simple. Since a solution of about 0.5% to 1% concentration is generally best, one part by weight of the silicon compound selected, e. g., ethyl silicate, is added to about one hundred parts of fuel and the mixture agitated until the silicate is dissolved. Alternatively, when the silicious compound is only slightly soluble in the hydrocarbon fuel e. g., as is true with most polysiloxanes, it is often easier to add an excess to the fuel to be used, agitate the mixture for a few hours and separate the undissolved liquid by decantation. Although it is desirable that the fuel used have the silicon compound dissolved therein, no harm results if a small amount of undissolved silicon compound remains in the hydrocarbon fuel. Since certain changes may be made in carrying out the above process without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A break-in fuel for internal combustion engines adapted to reduce the break-in time from that normally required consisting of a hydrocarbon fuel for the engines substantially saturated with a monomeric lower tetra alkyl orthosilicate.

2. A break-in fuel for internal combustion engines adapted to reduce the break-in time from that normally required consisting of a hydrocarbon fuel for the engines substantially saturated with about 0.5% by weight of monomeric tetra ethyl orthosilicate.

3. A break-in fuel for internal combustion engines adapted to reduce the break-in time from that normally required consisting of a hydrocarbon fuel for the engines substantially saturated with about 0.5% by weight of monomeric tetra propyl orthosilicate.

4. A break-in fuel for internal combustion engines adapted to reduce the break-in time from that normally required consisting of a hydrocarbon fuel for the engines substantially saturated with about 0.5% by weight of monomeric tetra amyl orthosilicate.

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