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ANTI-KNOCK FUEL FOR INTERNAL-COMBUSTION ENGINES

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This invention relates to internal combustion engine fuels and to means and methods for increasing the octane rating of such fuels and more particularly to the use of urea derivatives as anti-knock agents.

One object of the invention is to provide an improved fuel of this kind which has a high octane rating, is safe to handle, and non-toxic and non-corrosive.

Other objects of the invention are to provide an improved fuel of this kind which prevents gum formation and is free from objectionable odors.

Additional objects of the invention are to effect simplicity and efficiency in methods and apparatus for providing an extremely safe fuel of this kind which is economical, stable, and reliable in operation, and economical to manufacture.

Still other objects of the invention will appear as the description proceeds; and while herein details of the invention are described in the specification and some of the claims, the invention as described in the broader claims, is not limited to these, and many and various changes may be made without departing from the scope of the invention as claimed in the broader claims.

The inventive features for the accomplishment of these and other objects are shown herein in connection with a motor fuel which briefly stated, includes a liquid internal combustion engine fuel containing small amounts of an alkylated and/or arylated urea.

A blended lead-free 60 octane reference fuel was made for obtaining comparative data. To various portions of this reference fuel were added different amounts of symmetrical dimethyl diphenyl urea. Samples of the said various portions were tested for anti-knock properties by a road test.

In this road test a standard model "A" Ford sedan was run up a hill having an average grade of about 10%. The hill was marked with black lines 50 feet apart and the spaces between the black lines were further divided into one foot spaces.

The car was driven until the temperature of the cooling water was fairly constant. A separate one gallon gasoline test tank was provided and the car run until one gallon of the reference fuel was used, during which time the carbureter was adjusted to give highest efficiency with the reference fuel and not disturbed.

Then the car was driven up the test hill at a uniform speed of 15 miles per hour with the spark control lever fully advanced. At the first distinctly audible knock of the motor the point on

the hill was noted. An average of five hill climbs was taken as the point where knocking occurred with the reference fuel. Then the various samples of the treated fuel were tested in a similar manner and the gain in feet climbed compared to the feet climbed for the reference fuel obtained by difference, the results being as follows:

10	Percent dimethyl diphenyl urea in reference fuel	Feet up hill at first knock	Feet up hill gained over reference fuel
	None.....	262	
	0.01.....	359	97
	0.02.....	349	87
	0.04.....	342	80
15	0.05.....	339	77
	0.10.....	323	61
	0.50.....	303	41
	1.00.....	296	34
	5.00.....	318	56

20 The spark timing, carbureter setting and load remained constant throughout the tests.

Laboratory dynamometer tests show that concentrations from 0.1% down to 0.00075% dimethyl diphenyl urea give increasingly better anti-knock qualities depending on the base gasoline.

Reference fuels containing mixtures of dimethyl-diphenyl urea and tolyl-methyl ketone were improved but not as much as by dimethyl diphenyl urea alone. Mixtures of dimethyl-diphenyl urea and benzene showed similar improvements. Benzene and/or the ketone may be used to increase the solubility of the urea derivative in the fuel.

35 Careful examination of all testing equipment has shown no signs of corrosion of any parts subjected to action of the fuels containing dimethyl diphenyl urea. The blended fuel contained cracked gasoline but no gum formation was noted.

40 While dimethyl diphenyl urea is given as an example of the anti-knock compound of the invention, many equivalent materials may be used, wherein one or more of the hydrogen atoms of urea have been substituted by an alkyl or aryl group sufficiently to render the resulting compound soluble in the fuel. More specific examples of equivalents include diethyl-diphenyl urea, diphenyl urea, dimethyl-ditolyl urea, diethyl-ditolyl urea, ditolyl urea, phenyl-methyl substituted compounds from biuret, iso propyl-phenyl urea, and di-isopropyl-diphenyl urea. Straight chains of carbon atoms may be substituted for the phenyl groups.

55 The base fuel may be a hydrocarbon liquid of

the type generally used as a motor fuel or alcohol, casing head gasoline, fuel oil. The urea derivative may be used in powdered form and mixed with viscous liquids or solids for use in Diesel engines.

Since the data as tabulated herein shows that anti-knock properties of fuels containing dimethyl diphenyl urea increase with decreasing concentration from about 1% down to about 0.01% dimethyl diphenyl urea and since the laboratory tests mentioned have shown increased anti-knock properties with decreased concentration down to about 0.00075% concentration, the practical working range of concentration is from 1% down to 0.00075% and is preferably from about 0.1% down to 0.00075%.

From the tabulated data and the laboratory tests there appears to be a critical concentration somewhere about 0.00075%, since below this concentration, at zero, the anti-knock effect is, of course, zero. Above this value, as the concentration is increased, the anti-knock properties decrease until a concentration of about 1% is

reached, thereafter with a concentration of 5% the anti-knock effect is slightly greater than that obtained with 1% concentration. It therefore appears that a minimum effect is obtained with a concentration of about 1%.

The invention claimed is:

1. An anti-knock motor fuel comprising substantially 10,000 parts by weight of gasoline and between 4 and .075 parts by weight of symmetrical di methyl diphenyl urea.
2. An anti-knock motor fuel comprising substantially 10,000 parts by weight of gasoline and between 4 and .075 parts by weight of a substituted urea derivative containing two methyl groups and two phenyl groups, said groups being attached directly to the nitrogen atoms.
3. An anti-knock motor fuel comprising substantially 100 parts by weight of gasoline and between .04 and .00075 part by weight of a derivative of urea, wherein at least one of the hydrogen atoms of urea is substituted by one of the groups consisting of alkyl radicals and aryl radicals.

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