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UPPER CYLINDER LUBRICANT AND TUNE-UP SOLVENT COMPOSITION

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Our invention relates to compositions having special value as upper cylinder wall lubricants and deposit removers for use in the operation of internal combustion engines.

Many compositions have been proposed as upper cylinder lubricants and tune-up solvents for use in internal combustion engines. It is difficult, however, to devise a product of sufficient effectiveness to justify the added cost in use without incurring possible operational disadvantages, if use is more than intermittent, such as increased intake valve and induction deposits. Moreover, increasing requirements with respect to severity of engine operating conditions because of competitive trends in engine design have tended to make problems such as wear, combustion chamber deposits, octane requirement increase in service, and preignition more critical. We have now developed a multi-functional composition that combines effectiveness in removing gum and freeing sticking valves with beneficial properties of antiwear and reduction in combustion chamber deposits by gum and lacquer removal. When added to gasoline, the new composition imparts anti-rust properties and also appears to improve the oxidation stability of gasoline as measured by gum forming and oxygen absorption tests.

The new compositions essentionally comprise about 50 to 90 volume percent of a light lubricating oil extract of aromatic character such as 5W phenol extract and about 10 to 50 volume percent of an oxygenated organic solvent such as a Cellosolve. More particularly, they may include an oil-soluble anti-rust agent of the type comprising a polar group in conjunction with a relatively high molecular weight hydrocarbon group. Depending upon the nature of the particular lubricating oil extract, the inclusion of a small amount of a pour depressant may be desirable.

The lubricating oil extract is a light aromatic oil which may be derived from a petroleum distillate corresponding approximately to the SAE–5 viscosity range. The extract may be derived by solvent extraction of light neutral oils, or petroleum fractions of similar viscosity range (SAE–5W to 10W), with phenol or other polar solvents having selective capacity for aromatic hydrocarbons. Thus, extracts obtained by solvent extraction with solvents such as liquid sulfur dioxide, furfural, methylethyl ketone, dimethylformamide and the like are suitable.

The oxygenated organic solvent is an ether alcohol, most advantageously a Cellosolve such as ethylene glycol monoethyl ether, i.e., ethyl Cellosolve. Other Cellosolves such as the methyl and butyl Cellosolves are suitable. The carbitols, however, appear to be less useful since they appear to have appreciably lower solvent power for gasoline gums and lacquers in co-operation with aromatic extracts. For maximum solvency of gasoline gums and lacquers, a ratio of about 75:25 for the aromatic

extract component to the oxygenated component is desirable.

In a particularly advantageous form of the invention, the new compositions contain an oil soluble anti-rust, suitably in the range of about 0.1 to 1.0 percent by weight. A number of known anti-rusts have value. For example, a carboxylic acid type rust inhibitor such as the dimeric or trimeric form of linoleic acid has special value. Another example of a suitable anti-rust is a substituted urea such as one of the N-alkyl-N', N'-dicarboxymethyl ureas disclosed in U.S. Patent No. 2,796,407 to Ellis K. Fields, dated June 18, 1957. Another useful nitrogen containing anti-rust is an inhibitor of the type represented by the fatty acid salts of imidazolines as disclosed and claimed in co-pending application S.N. 525,389, filed July 29, 1955 by Jack A. Williams. An example of a commercially available anti-rust that has been found effective is Alox–856 which is a blend of dialkyl dimethylammonium chloride with a mixture of polymerized fatty acids in a mineral oil solvent as a diluent. Other useful inhibitors include organic phosphonates and sulfonates such as the preferentially oil soluble mahogany sulfonates, particularly ammonium mahogany sulfonate.

For winter use, it may be desirable to incorporate a pour depressant in the compositions of the invention. For example, about 0.1 to 1.0 percent of a pour depressant such as the condensation product of chlorinated wax and naphthalene may be used although other known pour depressants, e.g. the acryloids or polymethylacrylate types, are also suitable.

The new compositions may be used by adding about 0.1 to 5 volume percent to gasoline, conveniently, for example, by adding a 12-ounce can to a tank of gasoline, e.g. about 14 gallons (0.67 volume percent). Alternatively, a small volume of the composition, e.g. about 12-ounces can be injected directly into the upper part of the carburetor of the engine, i.e. the air horn, while the engine is at a fast idle. In this case, the rate of addition should be controlled so that the engine continues running in order to avoid too rapid a rate of addition which may cause the engine to stop.

The following is a particularly suitable example of a composition of the invention:

EXAMPLE A

	Volume percent
5W phenol extract	75
Ethyl Cellosolve	24.3
Dilinoleic acid (50% in kerosene)	0.5
Pour depressant	0.2

In the example, the phenol extract typically may have a gravity of 18.7° API, a viscosity at 100° F. of 176.1 SSU, a viscosity at 210° F. of 41.4 SSU, a pour point of +25° F. and a flash, (Tag closed cup) of 370° F. The finished product then has a gravity of 17.9° API, a viscosity at 100° F. of 56.2 SSU, a pour point of —20° F., a flash of 112° F. and visual acidity (mgs. KOH/g.) of 0.58 mg. The product has an initial boiling point of about 270° F. and a 50 percent point of about 700° F.

In further illustration of the invention, evaluation tests on the following example of the invention will be described:

EXAMPLE B

	Volume percent
5W phenol extract	75.0
Ethyl Cellosolve	24.5
Anti-rust (Alox 856)	0.5

Table I below indicates that incorporation of the composition in finished gasoline does not adversely affect stability or octane number:

Table I

	Finished Gasoline	Finished Gasoline +0.67% (V.) Example B
Induction Period, min.	660	810.
ASTM D-381 Gum, mgs./100 ml.	1.0 Hexane Wash to 0.4.	92.8 Hexane Wash to 1.1.
Four-Hour Gum, mgs./100 ml.	4.8 Hexane Wash to 4.7.	113.2 Hexane Wash to 4.0.
Differential, CFR-R O.N.	87.9	87.8.
Rust Test	35% of area of steel panel rusted.	Less than 1.0% of Panel rusted (15 spots).

It will be noted that Example B imparts considerable improvement in anti-rust properties to the gasoline. This advantage has been borne out in comparison of the new compositions with representative commercial gasolines containing anti-rust inhibitors confirming the superiority of the new compositions.

The effectiveness of the above composition as a solvent for gasoline type gums was tested by successive solution of gum residues from the ASTM gum test. In the ASTM D-381 gum test, gasoline is evaporated at 320° F. and the gum residue is left behind in the beaker. About 25 mgs. of gum were removed successively at room temperature from six beakers by the same 20 mls. of Example B before the solvent power of the composition declined significantly. The solution was effected in about 15 minutes per beaker without agitation.

The effectiveness of the new compositions in reducing wear and combustion chamber deposits was determined by the addition of 12 ounces of Example B to 12 gallons of premium gasoline (0.78 volume percent) and running the fuel under the conditions of the Chevrolet FL-2 engine test. This test has been developed by the Coordinating Research Council for evaluating fuel deposit forming tendencies and correlates well with road service. It involves engine operation for 40 hours at moderate speed, load and oil temperature and with very low engine water jacket temperatures. The data are tabulated in Table II below:

	Premium Gasoline (Avg. 3 tests)	Premium +Example B
Wear: Total Top Ring Weight Loss, gms.	1.13	0.68
Deposits (Merit Ratings, 10=clean):		
Piston, Avg.	8.6	8.4
Oil Pan	8.0	8.7
Push Rod Cover	7.6	7.7
Valve Cover	7.8	7.7
Timing Gear Cover	8.6	9.3
Intake Valve Stem	4.5	1.5
Average	7.5	7.2
Combustion Chamber Deposits, Avg/Cyl., gms.	[1] 10.6	8.9

[1] Available for single test.

Tests were run in a Lauson engine according to a procedure described in a paper entitled, "Evaluating Gasolines for Induction System Gums" by C. C. Moore, J. L. Keller, W. C. Kent and F. S. Liggett, presented before the SAE National Fuels and Lubricants Meeting in Tulsa, Oklahoma, held November 4–5, 1954 (available as Preprint No. 406 from the SAE Special Publications Department). The test method described correlates very well with full-scale engine tests in measuring undesirable deposits built up in the intake manifold and on the intake valves. The effectiveness of the new composition in reducing deposits in this test is demonstrated by the following data:

	20 hour Lauson engine test acetone soluble deposits, mg.
Finished gasoline	112.4
Above fuel+.67 vol. percent product Example B	27.1
Finished gasoline plus concentrate contributing to induction system deposits	225.1
Above fuel+.67 vol. percent product Example B	27.3

In further tests with a CFR (octane rating) engine, it was found that the new compositions, as exemplified by Example B above, reduce combustion deposits significantly and have negligible effect on the potentially limiting factors of octane requirement increase and preignition rate.

Hence, our invention provides low cost compositions of high gum solvency which act to reduce deposits and wear and which impart anti-rust protection without deleterious effect on fuel properties.

We claim:

1. An upper cylinder wall lubricant composition consisting essentially of 75 volume percent of an aromatic extract of a 5W base lubricating oil, 74.3 volume percent ethylene glycol monoethyl ether, 0.25 volume percent dilinoleic acid, 0.25 volume percent kerosene, and 0.2 volume percent of the pourpoint depressant.

2. An upper cylinder wall lubricant composition consisting essentially of 75.0 volume percent of a phenol extract of a 5W base lubricating oil, 24.5 volume percent ethylene glycol monoethyl ether, 0.5% of an anti-rust composition consisting essentially of a dialkyl dimethyl ammonium chloride and a mixture of polymerized fatty acids and a mineral oil diluent.

3. An upper cylinder lubricant and tune-up solvent composition capable of introduction into the carburetor of an internal combustion engine while operating, boiling essentially above the boiling range of gasoline, and consisting essentially of about 50 to 90 volume percent of a light aromatic oil extract obtained from the selective solvent extraction of an SAE-5W to 10W petroleum lubricating oil and about 10 to about 50 volume percent of ethylene glycol monoethyl ether.

4. A process for removing gum and deposits from the carburetor and upper cylinder chambers and for engine tune-up of an internal combustion engine which comprises introducing into the carburetor of an operating internal combustion engine a composition boiling essentially above the boiling range of gasoline and consisting essentially of about 50 to 90 volume percent of a light aromatic oil extract obtained from the selective solvent extraction of an SAE 5W to 10W petroleum lubricating oil and about 10 to about 50 volume percent of ethylene glycol monoethyl ether, whereby gum and deposits are removed and tune-up is effected while maintaining said engine in operation.

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