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LUBRICATING OIL

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8 Claims. (Cl. 252—50)

This invention relates to lubricants, and particularly to lubricating materials containing small percentages of compounds which inhibit reactions causing deterioration of the composition in quality; it also relates to the process of preparing such improved lubricants.

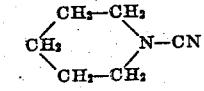
In the art of manufacturing lubricants, it has been necessary that developments in the use of addition agents keep pace with the progress in refining technique. The manufacture of modern lubricants is no longer considered a mere question of selection of a suitable base stock and its subsequent refining, but it is a problem in a very specialized industry. In this field, addition agents have been employed to overcome inherent deficiencies of the crude stock in lubricating quality which can not be satisfactorily achieved by refining treatment, and to supply to the composition added features and superior quality.

At the present time, the preparation of lubricants requires a detailed consideration of the specific uses to which the lubricants are to be applied. It is essential to know whether the lubricant is to be employed largely as a motor lubricant for use in internal combustion engines (thick film lubrication) or as an extreme pressure lubricant for high bearing duty (thin film lubrication). Equally important is the information as to the nature of the bearing surfaces since lubrication is often dependent upon relations between the lubricant and the surface, and in many cases the chemical and physical characteristics of the surface accelerate the breakdown of constituents of the oils. In the case of motor lubricants a lubricating film must be maintained between metal surfaces of quite varied chemical composition at temperatures at the piston head above 350° F. and the lubricant should be able to withstand the surface action of cylinder gases at temperatures of between 1800° F. and 3500° F.

The chemical stability of a lubricant, especially as to oxidation and cracking effects is a highly important consideration, therefore, in the manufacture of modern lubricants. The resistance to chemical deterioration of the hydrocarbon base in the case of heavy duty lubricants is less important than in the case of motor oils, because such lubricants are not subjected to the prolonged oxidizing and cracking conditions at high temperatures. Usually in these cases, the employment of base stocks of relatively stable chemical characteristics is satisfactory, but the addition of compounds inhibiting deterioration to the base stocks used in the preparation of extreme pressure lubricants is an economic advantage and permits a wider and more varied selection of base materials.

The prolonged oxidation of lubricating oils, often coupled with thermal cracking, usually causes the formation of acids, asphalts, resins and sludges, which decrease the lubricating value and cause corrosion of metal surfaces with which the oil is in contact, especially the various copper and silver alloy bearings often used in automobile engines. However, all reactions occurring in a lubricant as a result of the conditions of commercial usage do not give rise to products which decrease the lubricating value; some actually increase the lubricity and others are without appreciable effect. To control such reactions, is the purpose of the addition to lubricating base stocks of stabilizing or improving agents, such as are employed in the present invention. Additional advantages of employing blended lubricants in which the improving agents used in the present invention are employed will be apparent from the subsequent description and illustrations of the invention.

The addition agents employed in this invention are organic substituted cyanamides. These compounds have the general formula X=N—CN in which X is an organic divalent radical combination, that is, it represents a divalent organic radical, such as phenylene, two separate organic radicals (R and R_1) or a divalent portion of a cyclic structure such as in pentamethylene cyanamide.



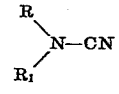
These radicals may contain ether and thio ether linkages and such substituents as halogen, cyano and amino groups. The organic radicals may be acyclic or cyclic groupings, but those which have been found to be especially suitable are the alkyl, aryl, and/or aralkyl groupings. The general formula given above of the cyanamide compounds is purely diagrammatic and illustrative

of a general attribute of the class of the compounds employed in this invention.

The stabilized oils are usually prepared by dissolving or dispersing from 0.001% to 5% by weight of the cyanamide compound in the lubricating oil base stock, but higher percentages may be employed without detriment to the lubricating value of the blended stock. The preferred concentration range of the cyanamide compound in the blended stock is from 0.1% to 0.5%, but the particular amount employed is dependent upon the nature of the base stock and the purity and character of the specific cyanamide compound employed. The base stock may be any lubricating oil distillate or residue from any type crude, or it may be any synthetic lubricating oil stock or any such material that has been refined by any of the well-known processes, such as acid treating, solvent extraction, hydrogenation, clay contacting, etc.

The cyanamide compounds employed in the present invention are applicable to improve lubricating oil stocks especially, but may be employed for any petroleum distillate or synthetic oil to inhibit reactions causing deterioration. The principal reactions causing deterioration are without doubt oxidation and thermal cracking, but other reactions of less significance also occur which are also retarded by the blending in the oils of the cyanamide compounds. The improving agents employed in this invention are therefore used in blended stocks to substantially reduce or prevent reactions causing deterioration which are distinctly noticeable in stocks to which these compounds are not added, and the after-effects of which are the formation of sludge, carbon in the cylinder, ring sticking, loss of viscosity, ready emulsibility and corrosion of metal surfaces, especially alloy bearings. No theory is advanced for the action of these compounds.

The improving agents that have been found to be particularly effective are those compounds in which R and R_1 of the general formula



are alkyl, aryl, and/or aralkyl groups. The preferable alkyl groups are those which contain from 1 to 12 carbon atoms in the molecule, the structure of the compound being relatively unimportant, except that compounds of iso structure are more oil-soluble than the corresponding straight chain compounds. The preferable aryl compounds are those of benzenoid and condensed ring structure with short chain alkyl substituent groups.

Examples of specific compounds suitable for use according to this invention are dibutyl cyanamide, diisobutyl cyanamide, di-2-isopentenyl cyanamide, diallyl cyanamide, beta-bromoallylmethyl cyanamide, betachloroallylmethyl cyanamide, butyl-delta-cyanobutyl cyanamide, diphenoxypropyl cyanamide, benzylethyl cyanamide, p-bromophenylethyl cyanamide, p-bromobenzylethyl cyanamide, p-chlorobenzylmethyl cyanamide, fluorobenzylethyl cyanamide, aminobutylethyl cyanamide, p-nitrophenylethyl cyanamide, butylthioethylisopropyl cyanamide, phenylbutyl cyanamide, pentamethylene cyanamide, delta-2-cyclopentenylmethyl cyanamide.

The stabilized lubricants prepared according to this invention are investigated for quality by certain recognized standard tests of the lubricating oil industry. The standards to which the lubricants of the present invention were tested were the oxygen absorption test, and the C. F. R. engine test. The oxygen absorption test and the C. F. R. engine test are briefly described below:—

Oxygen absorption test

This test is used for the most part in judging the oxidation susceptibility of a lubricating oil at engine operation temperatures. A known amount of oxygen is bubbled through 10 cc. of the lubricating oil maintained at 200° C. The oxygen is continuously recycled. At the end of succeeding fifteen minute periods the amount of oxygen absorbed by the oil is measured. The results usually termed the oxidation rate of the oil are given as the number of cubic centimeters of oxygen absorbed by 10 cc. of an oil per 15 minute intervals at 200° C.

C. F. R. engine test

This test is often employed to indicate the susceptibility of a lubricating oil to stick rings and gum up pistons in an engine. The oil is employed to lubricate a C. F. R. (Cooperative Fuel Research) engine with a jacket temperature of 390° F. using 2½ lbs. of oil for 14 hours, a very severe test for performance under hot conditions. The piston demerit is the rating given based on the general appearance of the piston; the worse the condition, the higher the value. Usually a record is also made of the number of rings stuck as well as the number of degrees of the stuck portion of the piston rings.

To illustrate a specific embodiment of the invention, oxygen absorption tests were conducted on S. A. E. 20 refined petroleum distillate lubricating oil and a blend of 0.25% of di-n-butyl cyanamide in the same oil. The results are given in the following table:

	Oxidation rate
S. A. E. 20 oil	74, 40, 35
S. A. E. 20 oil + di-n-butyl cyanamide	56, 14, 12

It is seen that the oxidation rate of the blend was much lower, especially during the second and third 15 minute periods. The engine performance data obtained by tests on the C. F. R. engine operating at 390° F. jacket temperature on a 14 hour run for an unblended S. A. E. 40 refined petroleum distillate and a blended oil composed of the same S. A. E. 40 oil containing 0.25% di-n-butyl cyanamide, are given below:

Observation demerits

	Carbon formed	Piston overall	Rings stuck	Degree sticking	Ring slits	Ring grooves	Carbon under piston	Varnish skirt
	Grams							
S. A. E. 40 distillate	4.52	4.29	3	630	7.00	5.00	4.5	4
Ditto+dibutyl cyanamide	2.57	2.31	1	360	2.33	3.50	4	4

These tests demonstrate that the blending of 0.25% dibutyl cyanamide with the oil improves the functioning of the oil and effects greater engine cleanliness, decreases ring sticking, gum sludge and carbon formation.

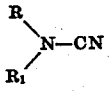
The present invention is not limited to the specific embodiments described herein, as it is

possible to obtain similar results with other organic cyanamide compounds. It is also possible to obtain other embodiments of the invention without departing from the inventive concept herein disclosed. It is therefore desired to claim all the novelty inherent in the disclosure.

I claim:

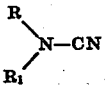
1. An improved lubricating composition which comprises a lubricant and a small quantity of an oil soluble organic substituted cyanamide of formula X=N—CN in which X is an organic divalent radical combination.

2. An improved lubricating composition which comprises a lubricant and a small quantity of an oil soluble organic substituted cyanamide of formula



wherein R and R_1 represent organic radicals.

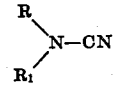
3. An improved lubricating composition which comprises a lubricant and a small quantity of an oil soluble cyanamide of formula



in which R and R_1 represent alkyl groups.

4. An improved lubricating composition which comprises a lubricant and a small quantity of di-n-butyl cyanamide.

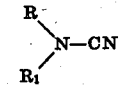
5. An improved lubricating composition which comprises a lubricant and a small quantity of an oil soluble cyanamide of



wherein R represents an alkyl group and R_1 represents an aryl group.

6. An improved lubricating composition which comprises a lubricant and a small quantity of phenyl butyl cyanamide.

7. An improved lubricating composition which comprises a lubricant and a small quantity of an oil soluble cyanamide compound of formula



in which R and R_1 are organic radicals containing ether linkages.

8. An improved lubricating composition which comprises a lubricant and a small quantity of diphenoxy-propyl cyanamide.

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