

# UNITED STATES PATENT OFFICE

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## LUBRICATING OIL

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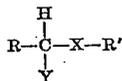
16 Claims. (Cl. 87-9)

This invention relates to lubricants and, in particular, to addition agents imparting to lubricants improved properties.

My invention has particular utility in preventing and/or inhibiting the corrosion of "hard metal" alloy bearings such as copper-lead, cadmium-nickel, and cadmium-silver bearings which, to a large extent, have replaced soft metal bearings such as Babbitt metal in the trend toward internal combustion engines having high compression ratios and having increased acceleration and increased speed characteristics. The use of the "hard metal" bearings has created lubrication and corrosion problems, particularly in connection with "highly refined" oils, some of which may be very corrosive to the "hard metal" bearings.

By "highly refined" lubricating oils I mean viscous oils which have a minimum viscosity in the range of S. A. E. 10 oils and which have been subjected to such refining processes such as, for example, solvent extraction, that the paraffinity of the oil is markedly increased. It has been found that highly refined lubricating oils cause corrosion to alloy bearings of the cadmium-silver type to the extent of 5 mg/cm<sup>2</sup> and even greater when such bearings are submerged for 25 hours or less in an air-agitated oil which has been preoxidized at about 340° F. for 25 to 50 hours. The motor oils may be highly refined lubricating oils such or mixtures of highly refined lubricating oils with less highly refined lubricating oils, or stated in another way, mixtures of corrosive oils and non-corrosive oils, examples of the latter being lubricating oil fractions from Winkler crude or crudes of the Winkler type.

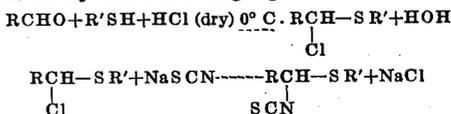
I have found that corrosion of hard metal alloy bearings can be inhibited and highly desirable properties can be imparted to the lubricating oil by adding thereto up to 5% but preferably 0.05% to 1% of certain thiocyno ethers, particularly the alpha thiocyno ethers having the general formula



in which R and R' are alkyl or aralkyl radicals, Y is a thiocyno radical or an isothiocyno radical and X is either an oxygen or sulfur group.

These compounds may be economically prepared by reacting an aldehyde with a mercaptan or an alcohol in the presence of dry hydrochloric acid and subsequently reacting the resulting product with a metal thiocyanate such as sodium

thiocyanate. The reaction involved probably is as shown by the following equation



Examples of the compounds contemplated within the scope of my invention are as follows:

- Ethyl alpha isothiocyno ethyl ether
- Ethyl alpha thiocyno ethyl thio ether
- Butyl alpha thiocyno ethyl thio ether
- Butyl alpha thiocyno ethyl ether
- Amyl alpha thiocyno butyl ether
- Amyl alpha isothiocyno butyl thio ether
- Butyl alpha isothiocyno amyl ether

My invention also contemplates the use of alcohol and thiocynoic acid addition products such as the addition product of amyl alcohol and thiocynoic acid having the formula HSCN·3C<sub>5</sub>H<sub>11</sub>OH.

Since these compounds are subjected to high temperature conditions it is highly desirable that the compounds of the aforementioned type having boiling points of about 400° F. or greater be used.

The effectiveness of these compounds as corrosion inhibitors is demonstrated by the following tests which were conducted under conditions more severe than those encountered in the actual operation of internal combustion engines. In the first test the weighed bearings are placed in a highly refined oil containing the inhibitor and the oil air agitated at about 341° F. At periodic intervals the bearings are removed from the oil bath, washed free of oil and the loss in weight determined.

Each time before being replaced in the oil bath the bearings are polished bright and reweighed and again tested for predetermined periods. The results obtained in this test are tabulated below.

Table I

Oil	Loss in mg/cm. <sup>2</sup> —periods		
	1st 24 hrs.	2nd 6 hrs.	3rd 16 hrs.
Control	0.0	5.2	22.9
Control+.2% amyl thiocyno methyl ether	0.1	0.0	0.0
Control+.2% amyl isothiocyno butyl thio ether	0.1	1.1	13.8
Control+.2% amyl isothiocyno butyl ether	0.0	0.8	10.0
Control+.2% HSCR·3 amyl alcohol	0.3	0.0	0.4

In the other test the oil containing .2% of amyl alpha thiocyno butyl ether was tested in a six-cylinder internal combustion engine having cadmium-silver bearings and copper-lead bearings and operated at about 2500 R. P. M. with an oil temperature of about 320° F. and a jacket temperature of about 250° F. The results of this test are tabulated below.

Table II

Oil	Bearing	Loss in grams (total bearing)	Time
			Hours
Control.....	Cd-Ag..	0.6551	15
Control.....	Cu-Pb..	0.4743	15
Control+.2% amyl alpha thiocyno ether.....	Cd-Ag..	0.1190	25
Control+.2% amyl alpha thiocyno ether.....	Cu-Pb..	0.4761	25

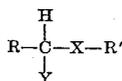
In addition to inhibiting the corrosion of hard metal alloy bearings compounds of the foregoing type when used in quantities up to 10 to 15% improve the film strength of the lubricant to which they are added and also impart to such lubricants improved extreme pressure characteristics. These compounds may also be used to improve the lubricity and other properties of lubricating oils.

Some of the hereinbefore named compounds may not be completely soluble in the lubricant, in which case effective results are obtained by suspending the inhibitor in the lubricant by means of a small amount of a peptizing agent such as aluminum naphthenate, aluminum stearate, etc.

While I have described my invention with certain specific embodiments thereof I do not wish to be limited thereby except as defined by the appended claims which should be given the broadest interpretation permitted by the prior art.

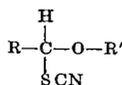
I claim:

1. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about 15% of an ether having the general formula



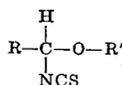
in which R and R' are alkyl radicals, Y is a radical selected from the group consisting of a thiocyno radical and an isothiocyano radical and X is an element selected from the group consisting of oxygen and sulfur.

2. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about 15% of an alkyl thiocyno ether having the general formula



in which R and R' are alkyl radicals.

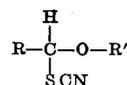
3. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about 15% of an alkyl isothiocyano ether having the general formula



in which R and R' are alkyl radicals.

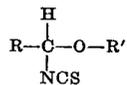
4. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about

15% of an alkyl alpha thiocyno ether having the general formula



in which R and R' are alkyl radicals.

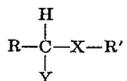
5. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about 15% of an alkyl alpha isothiocyano ether having the general formula



in which R and R' are alkyl radicals.

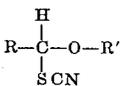
6. An improved lubricant comprising a mineral lubricating oil and from about 0.05% to about 15% of a butyl alpha isothiocyano amyl ether.

7. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and 0.05 to 1% of an alkyl thiocyno ether having the general formula



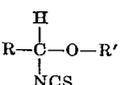
in which R and R' are alkyl radicals, Y is a radical selected from the group consisting of a thiocyno radical and an iso thiocyno radical and X is an element selected from the group consisting of oxygen and sulfur.

8. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about 0.05% to 5% of an alkyl thiocyno ether having the general formula



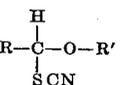
in which R and R' are alkyl radicals.

9. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about 0.05% to about 5% of an alkyl isothiocyano ether having the general formula



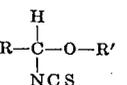
in which R and R' are alkyl radicals.

10. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about 0.05% to about 5% of an alkyl alpha thiocyno ether having the general formula



in which R and R' are alkyl radicals.

11. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about 0.05% to about 5% of an alkyl alpha isothiocyano ether having the general formula

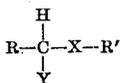


in which R and R' are alkyl radicals.

12. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about 0.05% to about 5% of a butyl alpha isothiocyano amyl ether.

13. The method of preventing corrosion of

bearing metal alloys selected from the group consisting of cadmium-silver alloys, cadmium-nickel alloys, and copper-lead alloys, in the presence of highly refined lubricating oils in internal combustion engines which comprises adding to said lubricating oils from about 0.05% to about 5% of an ether having the general formula

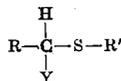


in which R and R' are alkyl radicals, Y is a radical selected from the group consisting of a thiocyno radical and an isothiocyno radical and X is an element selected from the group consisting of oxygen and sulfur.

14. The method of preventing corrosion of bearing metal alloys selected from the group consisting of cadmium-silver alloys, cadmium-nickel alloys and copper-lead alloys in the presence of highly refined lubricating oils in internal combustion engines which comprises adding to said lubricating oils from about 0.05% to about 5% of an amyl-isothiocyno butyl-thioether.

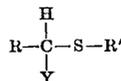
15. A corrosion inhibited lubricating oil comprising a mineral lubricating oil and from about

0.05% to 5% of a thio ether having the general formula



in which R and R' are alkyl radicals and Y is a radical selected from the group consisting of a thiocyno radical and an isothiocyno radical.

16. A method of preventing corrosion of bearing metal alloys selected from the group consisting of cadmium-silver alloys, cadmium-nickel alloys and copper-lead alloys in the presence of highly refined lubricating oils in internal combustion engines which comprises adding to said lubricating oil from about 0.05% to about 5% of a thio ether having the general formula



in which R and R' are alkyl radicals and Y is a radical selected from the group consisting of thiocyno radicals and isothiocyno radicals.

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