United States Patent Office

3,287,267

Patented Nov. 22, 1966

3,287,267

ANTIRUST OIL

Shigeru Yonezaki and Shoji Shimada, both of Kitakyushu, Japan, assignors to Yawata Iron & Steel Co., Ltd., Tokyo, Japan, a corporation of Japan

No Drawing. Filed Dec. 28, 1964, Ser. No. 421,635
Claims priority, application Japan, Feb. 14, 1961, 36/5,063
2 Claims. (Cl. 252—47.5)

This application is a continuation-in-part of copending application Serial No. 171,303, filed February 5, 1962, and now abandoned.

This invention relates to an improved antirust oil. More particularly, the invention relates to an antirust oil comprising a base material selected from the group consisting of petroleum lubricating base oils, kerosene, light oils, aliphatic alcohols, animal oils and fats, vegetable fats and oils, aromatic carboxylic acid esters, aliphatic carboxylic acid esters, alkylbenzenes, alkylnaphthalenes, alkylbenzene derivatives, and alkylnaphthalene derivatives and the first and second additives that will be defined below.

It has been known as shown in United States Patents Nos. 2,236,168, 2,287,639 and 2,698,304 that sulfonamides are used as additives for obtaining lubricating compositions. It has been also disclosed in Canadian Patent No. 496,376 that sorbitan monostearate and sorbitan monooleate are added as additives.

However, since such lubricating oil as prepared by the above-mentioned conventional process loses its antirusting power in a comparatively short period of time, it is unsuitable or unpracticable to effect antirusting for a long time by using such a lubricating oil under conditions of high humidity.

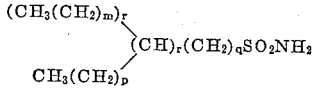
The inventors have found that the antirusting property and lubricating property of a lubricating base oil, such as, petroleum lubricating base oils, kerosene, light oils, aliphatic alcohols, animal oils and fats, vegetable fats and oils, aromatic carboxylic acid esters, aliphatic carboxylic acid esters, alkylbenzenes, alkylnaphthalenes, alkylbenzene derivatives, and alkylnaphthalene derivatives can be remarkably improved by adding sorbitan monooleate as a first additive and at least one sulfonamide as defined by the general formula below, as a second additive.

Therefore, a main object of this invention is to provide an antirusting lubricating oil having improved antirusting and lubricating properties, which is particularly useful for deep drawing of steel plates.

According to the present invention, the antirusting lubricating oil of this invention comprises a lubricating base material selected from the group consisting of petroleum lubricating base oils, kerosene, light oils, aliphatic alcohols, animal oils and fats, vegetable fats and oils, aromatic carboxylic acid esters, aliphatic carboxylic acid esters, alkylbenzenes, alkylnaphthalenes, alkylbenzene derivatives, and alkylnaphthalene derivatives; sorbitan monooleate as a first additive; and as a second additive at least one compound selected from the group consisting of a straight chain alkyl sulfonamide shown by the general formula

$$CH_3(CH_2)_nSO_2NH_2 \qquad (1)$$

wherein n is 7–19, an aliphatic sulfonamide having side chain groups and 8–20 total carbon atoms, said sulfonamide being shown by the general formula

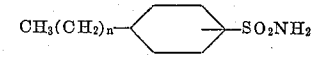


(2)

wherein m=0–17, p=0–17, r=1–3, q=0–17, and

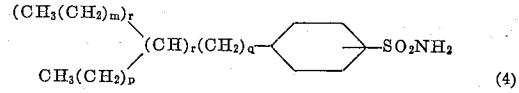
$$m+p+q+r=5-17$$

a straight chain alkylbenzene sulfonamide shown by the general formula



(3)

wherein n is 7–19, and a side chain alkylbenzene sulfonamide having side chain groups and 11–26 total carbon atoms, said sulfonamide being shown by the general formula



(4)

wherein m=0–17, p=0–17, q=0–17, r=1–3, and $m+p+q+r$=–17.

In a preferred embodiment of this invention, a suitable proportion of the first additive, that is, sorbitan monooleate is about 2–10 weight parts to 100 weight parts of the aforementioned base oil, e.g., a petroleum lubricating base oil, and that of the second additive, that is, that of at least one compound selected from the compounds shown by the above-mentioned Formulas 1, 2, 3 and 4 is present in an amount of 0.01–5 weight parts.

The petroleum lubricating base oil used as the base material of the lubricating oil of this invention can be spindle oil, refrigerating machine oil, compressor oil, dynamo oil, turbine oil, machine oil, lubricating oil for internal combustion engines, cylinder oil, marine engine oil, gear oil, lubricating oil for aeroengines, drive oil and insulating oil.

The aliphatic alcohols used as the base oil of this invention may be straight chain aliphatic alcohols, side chain aliphatic alcohols, and straight chain aliphatic alcohols having a double bond in the molecules. Among the aforementioned alcohols that can be used are isobutyl alcohol, butyl alcohol, amyl alcohol, nonyl alcohol, octyl alcohol, oleyl alcohol and the like.

Vegetable fats and oils in this invention which are suitable are cotton seed oil, soybean oil, olive oil, coconut oil and palm oil. Animal oils and fats which may be mentioned are beef tallow, lard, whale oil, and neat's-foot oil.

Further, as the base oil of the antirust oil of this invention, the esters of aliphatic carboxylic acids and alcohols and the esters of aromatic carboxylic acids and alcohols can be used. The alcohols in this case may be primary alcohols, secondary alcohols and other polyhydric alcohols. For example, diesters, such as, dioctyl sebacate and dioctyl adipate may be used, and further, an olefine polymer oil, such as, polyethylene or atactic polypropylene can be also used. Additionally, sperm oil, isopropyl alcohol oleate and isopropyl alcohol palmitate are all useful.

Aromatic carboxylic acids which can be reacted with the alcohols, are, e.g., monobasic carboxylic acids such as benzoic acid, and dibasic carboxylic acids, such as, phthalic acid, terephthalic acid, and phthalic anhydride.

The aliphatic carboxylic acids which are reacted with the alcohols must be monobasic carboxylic acids or polybasic carboxylic acids each having one or two (2) double bonds in the molecule. Suitable examples of them are oleic acid and linoleic acid.

Alkylbenzenes of this invention may be those having less than 20 carbon atoms, such as, toluene, ethylbenzene, xylene, cymene, dodecylbenzene, butlybenzene, and tetralin.

In addition to the above-mentioned compounds, alkylbenzene derivatives, alkylnaphthalenes, and alkylnaphthalene derivatives can also be used as the base oil of the antirust oil of this invention, but it is preferable that they have lower viscosities if possible.

At the addition of sorbitan monooleate as the first ad-

ditive and the sulfonamide of the above-mentioned general formula as the second additive to the above-mentioned base oil the composition ratio of the base oil and the additives may be varied in wide ranges to form lubricating oils having a low viscosity to a viscosity as high as Vaseline.

It should be understood that the terms "the first additive" and "the second additive" in this specification are not used to indicate the addition order of the additives but are used to indicate that two different kinds of additives are used. That is in this invention the properties of the lubricating oil are not influenced by the order in which the additives are added.

The base oil, viz., petroleum lubricating base oils, kerosene, light oils, etc., may be a mono-form or a mixture thereof.

Typical examples of the second additives shown by general Formula 1 are straight chain alkyl sulfonamides, such as, octyl sulfonamide, decyl sulfonamide, dodecyl sulfonamide, myristyl sulfonamide, cetyl sulfonamide, stearyl sulfonamide, docosanyl sulfonamide, and oleyl sulfonamide.

Typical examples of the second additives shown by general Formula 2 are aliphatic sulfonamides having side chain groups, such as, trimethylnonyl sulfonamide, 2-ethylhexyl sulfonamide, and trimethylhexyl sulfonamide.

Typical examples of the second additives shown by general Formula 3 are straight chain alkylbenzene sulfonamides, such as, octylbenzene sulfonamide, decylbenzene sulfonamide, dodecylbenzene sulfonamide, myristylbenzene sulfonamide, cetylbenzene sulfonamide, stearylbenzene sulfonamide, icosanylbenzene sulfonamide, and oleylbenzene sulfonamide.

Typical examples of the second additives shown by general Formula 4 are side chain alkylbenzene sulfonamides, such as, trimethylnonylbenzene sulfonamide, 2-ethylhexylbenzene sulfonamide, and trimethylhexylbenzene sulfonamide.

However, it should be understood that the second additives in this invention are not limited to only the above-mentioned compounds.

The inventors have found that by using the aforementioned first and second additives in the ranges as defined above, the base material for a lubricating oil is endowed with excellent antirusting and lubricating properties by the synergistic action of the additives. Also, it has found that even though the first additive and the second additive are added to the base material, the desired effects or merits cannot be obtained if the amounts are not in the above-mentioned range.

Due to the synergistic action of the first additive and the second additive, the oil film formed by a base material and the additives becomes stable and sound, and is endowed with an excellent antirusting property and surface lubricating property, which is not suggested in any of the above-mentioned United States patents and Canadian patent.

The invention will be explained, more in detail, in the following examples, in which the tested sample plate was a soft steel plate of 100 mm. x 50 mm. x 3 mm. having standard of QQ–S–636, which was polished thoroughly, washed with a solvent, dried, and then coated with the antitrust oil over the whole surface. The rusting test for thus coated sample was conducted in a humidity cabinet having standard of JAN–H–792 under the conditions of 49° C.±1° C. in temperature, 98%–100% in humidity, and 31.2 ft.^{3}/hr. in air blast rate. In the tests, the time was recorded from the beginning to the time when rusts began to appear on the surface of the sample.

Lubricating property is merely a property of the lubricating oil which increases the deep drawability of steel sheets when lubricating oil is applied thereon. For assessing the deep drawability (ductility) the Erichsen test is normally used. The so-called Erichsen test machine is used in this test by means of which a depth of the impression of a fracture on a cold-rolled steel sheet of 1.0 mm. in thickness is measured. The depth of the impression of the fracture is shown in mm. units, and the greater the mm. value, the better is the deep drawing lubricating property of the oil being tested. Also, the deep drawing lubricating property of a lubricating oil is closely connected with the boundary lubricating property of said oil. The method used for assessing the boundary lubricating property is by means of a Soda type pendulum tester which measures the friction coefficient which is shown by μ. The smaller the μ value, the better.

Example 1

The above-mentioned test was carried out by using an antirust oil having the following composition;

	Wt. parts
Base oil: #150 spindle oil	100
Additives:	
Sorbitan monooleate	5
Cetyl sulfonamide	0.5

From the results of the test the period of time until the rust began to appear was 480 hours and the friction coefficient μ and the depth of the impression of the fracture were 0.13 and 12.27 mm., respectively.

In a sample coated with only #150 spindle oil the entire surface was rusted in 24 hours. The friction coefficient μ was 0.28 and the depth of the impression of the fracture was 7.8 mm.

Further, for comparison, a comparative sample coated with a mixture of 100 parts by weight of #150 spindle oil and 5 parts by weight of sorbitan monooleate was tested but the sample rusted in about 100 hours. Also, another comparative sample coated with a mixture of 100 parts by weight of #150 spindle oil, 0.5 part by weight of cetyl sulfonamide rusted after 48 hours.

Example 2

When the above-mentioned test was conducted using an antirust oil prepared from the composition shown in Example 1 except that 0.5 weight part of cetyl sulfonamide was replaced with 0.5 weight part of trimethylnonyl sulfonamide, almost identical results as in Example 1 were obtained.

Example 3

The test was conducted in this example using an antirust oil having the following composition;

	Wt. parts
Base oil: #150 spindle oil	100
Additives:	
Sorbitan monooleate	5
Dodecylbenzene sulfonamide	0.5

The period of time until rusting in this example was 400 hours, and the friction coefficient μ and the depth of the fracture were 0.13 and 12.14 mm., respectively.

For comparison, a sample coated with a mixture of 100 parts by weight of #150 spindle oil and 0.5 part by weight of dodecylbenzene sulfonamide was tested. The sample rusted after 24 hours.

Example 4

The afore-mentioned test was conducted in this example by using the antirust oil prepared from the composition shown in Example 3 except that 0.5 part by weight of dodecylbenzene sulfonamide, and results similar to those of Example 3 were obtained.

What is claimed is:

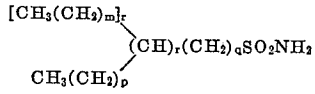
1. An antirust lubricating oil composition which consists essentially of (1) an oil, (2) about 2 to 10 weight percent of sorbitan monooleate, and (3) about 0.01 to 5 weight percent of at least one member selected from the group consisting of

(a) straight chain alkyl sulfonamide of the formula

$$CH_3(CH_2)_nSO_2NH_2$$

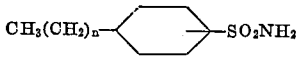
wherein n is an integer of from 7 to 19,

(b) aliphatic sulfonamide having from 8 to 20 carbon atoms of the formula



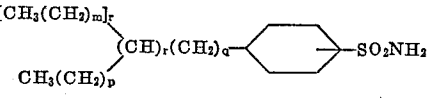
wherein m=0–17, p=0–17, r=1–3, q=0–17, and $m+p+q+r$=5–17,

(c) a straight chain alkylbenzene sulfonamide of the formula



wherein n is an integer of from 7 to 19, and

(d) branch chain alkylbenzene sulfonamide, having from 11 to 26 carbon atoms of the formula



wherein m=0–17, p=0–17, q=0–17, r=1–3, and $m+p+q+r$=5–17.

2. An antirust lubricating oil composition which consists essentially of (1) a petroleum oil, (2) about 2 to 10 weight percent of sorbitan monooleate, and (3) about 0.01 to 5 weight percent of cetyl sulfonamide.

References Cited by the Examiner

UNITED STATES PATENTS

2,236,168	3/1941	Dietrich	252—47.5
2,287,639	6/1942	Pings	252—47.5
2,631,979	3/1953	McDermott	252—57

FOREIGN PATENTS

496,376	9/1953	Canada.

DANIEL E. WYMAN, *Primary Examiner.*

P. P. GARVIN, *Assistant Examiner.*