

UNITED STATES PATENT OFFICE

2,398,193

LUBRICANT

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ration of Indiana

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Serial No. 512,365

14 Claims. (Cl. 252—33.4)

This invention relates to improved protective coatings and lubricants. More particularly it relates to compounded lubricants which have, in addition to valuable lubricating properties, the property of preventing corrosion of metal surfaces.

Metallic equipment, especially iron and steel equipment, exposed to the atmosphere for considerable periods of time without operation frequently develops considerable corrosion, sufficient in many cases to impede subsequent operation of the equipment and to reduce its operating life.

The above observations apply with particular force to internal combustion engines and other equipment exposed to severely corrosive atmospheres, such as are encountered, for example, on shipboard, in coastal areas, and in many industrial areas. Engines in military equipment, for example, in automobiles, tanks, trucks, airplanes, tractors, are often subjected to storage in a corrosive environment for extended periods, for example, as deck cargo in transoceanic shipping. Furthermore, the operation of internal combustion engines, especially spark ignition engines, results in the production of gases which corrode various metal engine parts with which they come in contact. Particularly corrosive gases are generated in the operation of internal combustion engines with fuels containing ethyl fluid.

Heretofore it has been proposed to protect metal surfaces from corrosion by the use of readily removable protective coatings known as slushing compounds. Slushing compounds are petroleum rust preventives and are usually classified as oils and greases, from the standpoints of appearance, handling and service properties.

Lubricating oils which can also be used as rust preventives, especially for internal combustion engines, in addition to meeting the usual specifications concerning viscosity, volatility, ash content, residual carbon deposits, and pour point, must have the following additional properties:

1. Ability to protect metal surfaces from high humidity and moisture condensation;
2. Ability to neutralize acidic corrosive materials;
3. Ability to be readily applied to and removed from metal surfaces, e. g. relatively inaccessible parts of an engine assembly.

It is an object of this invention to provide compositions which afford protection against corrosion to metal surfaces coated thereby. Another object of this invention is to provide corrosion preventive lubricants for metallic equipment

stored or operated in a corrosive environment. Still another object of this invention is to provide lubricants which will prevent the occurrence of corrosion in internal combustion engines. A further object of this invention is to provide rust preventive lubricants particularly adapted for the lubrication of ordnance. Yet another object of this invention is to provide a method of preventing corrosion on metal surfaces by the application thereto of novel protective coatings or lubricants.

It will be apparent that practical specifications based on the properties desired in rust preventive lubricants can hardly be absolute in nature, but relative standards, represented by certain tests have been offered and have received rather wide acceptance. These tests will be described briefly. Unless otherwise indicated all tests are carried out upon polished, cold-rolled, sandblasted S. A. E. 1020 steel panels.

In the humidity test, the small steel panels are suspended in a highly humid atmosphere, generally about 100% humidity, at a fixed temperature in a special cabinet and the time of initial corrosion of the panels is noted. The humidity cabinet is provided with heating units and thermal regulators for automatic temperature control. A water level of two inches or more is maintained in the bottom of the cabinet to assure high humidity at all times. The steel panels are coated by dipping into the rust preventive material and are suspended by glass hooks from a glass rod running across the top of the humidity cabinet. Generally from 1 to 1.5 complete changes of air per hour are provided in the cabinet. The minimum acceptable period of protection offered by the rust preventive material in the humidity cabinet test is determined in accordance with the severity of the contemplated service conditions under which the rust preventive material will be applied.

A number of hydrobromic acid tests have been designed to measure the ability of rust preventive lubricants to neutralize acidic corrosive materials, particularly the acidic products of combustion of internal combustion engines. In a well recognized hydrobromic acid test, duplicate steel panels, such as are used in humidity cabinet tests, are swirled for a short time (usually either 30 or 60 seconds) in an emulsion prepared by vigorous agitation of a mixture of one part of aqueous hydrobromic acid and nine parts of the rust preventive lubricant. Very dilute aqueous hydrobromic acid is used, generally either 0.1 or 0.2%. The duplicate panels are then stored in

a wood block support in the laboratory atmosphere for four hours and then subjected to a 24 hour test period in a humidity cabinet, as generally described above. After exposure in the humidity cabinet the duplicate panels are examined for evidence of corrosion or pitting.

I have found that compositions comprising an ester of an anhydroalkitol and a lubricant possess the combination of properties desired in corrosion preventive lubricants. I have further found that soaps of preferentially oil-soluble petroleum sulfonic acids constitute a useful addition when added in small proportions to corrosion preventive lubricants containing an ester of an anhydroalkitol.

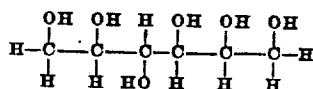
By an anhydroalkitol I mean to designate a product of intramolecular dehydration of an alkitol. By an alkitol, I intend to denote a polyhydric alcohol having at least four carbon atoms and at least four hydroxyl groups. Alkitols can be produced by the hydrogenation of polyhydroxy aldehydes or ketones which occur in nature as sugars or saccharides. Depending on the spatial configuration of the polyhydric alcohol, it can be either optically active or optically inactive, due either to the presence of a meso form of the molecule or to racemic mixtures of optically active molecules. Exemplary alkitols are the erythritols; pentitols; arabitols, adonitols, xylitols, prepared for example by the hydrogenation of pentoses; hexane pentols, e. g. rhamnitol; hexitols: sorbitol, mannitol, dulcitol, iditol, talitol; heptane hexols, e. g. rhamnohexitol; heptitols: mannoheptitol, glucoheptitol, galaheptitol; octitols: gluco-octitol, manno-octitol; nonitols, e. g. glucononitols, and the like.

The alkitols readily undergo intramolecular dehydration to produce anhydroalkitols, which are polyhydric cyclic ethers. When one molecule of water is lost from an alkitol by intramolecular dehydration, a polyhydric monocyclic ether which I designate as a monoanhydroalkitol or alkitan is produced. When two molecules of water are lost from an alkitol by intramolecular dehydration, a hydroxy bicyclic ether which I designate as a dianhydroalkitol or alkide is produced.

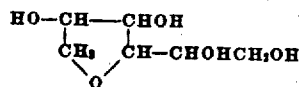
Intramolecular dehydration or etherification generally results in the production of 4- to 7-membered cyclic ether, or oxido, rings. The 3-membered cyclic ether ring is sometimes called the oxidopropan ring. The 4-membered ring is usually called the furan ring. The 5-membered ring is usually called the pyran ring. In general, there are manifold possibilities for intramolecular dehydration of alkitols, especially of the higher alkitols, such as hexitols, heptitols and the like. In the higher alkitols it is conceivable that there is some possibility of forming even tricyclic ethers.

It will be appreciated that whenever the terms "alkitan" and "alkide" are used, or whenever specific alkitans and alkides are designated, that these terms do not necessarily mean a single chemical compound but may refer to a mixture of several anhydroalkitol derivatives falling therein.

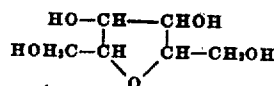
In order to demonstrate the meaning of the nomenclature given above, it will be applied to the alkitol known as sorbitol, which is generally produced by the hydrogenation of glucose. Sorbitol has the following structure:



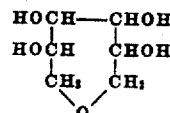
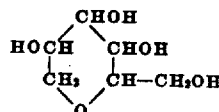
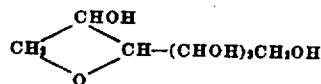
Upon intramolecular dehydration with the loss of one molecule of water, sorbitol can form a variety of cyclic monoethers, but generally the main product is an ether containing a furan ring: thus,



and

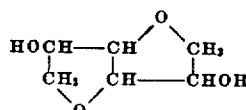


In addition 4-, 6- and 7-membered oxido rings may be produced to some extent:

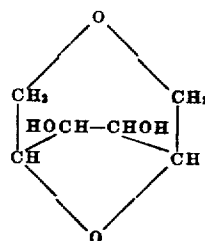


The cyclic mono-ethers depicted above are the sorbitans.

A dianhydrosorbitol or sorbide containing two condensed 5-membered oxido rings has the structural formula:



Another dianhydrosorbitol may have the following structure:



I have found that esters of anhydroalkitols can be compounded in small proportions with lubricants to produce corrosion preventive lubricants. Esters suitable for the purposes of my invention can be obtained by esterifying anhydroalkitols by conventional esterification procedures. The acid components of the esters may be derived from a variety of acids, such as the aliphatic carboxylic acids, e. g. fatty acids, or aliphatic carboxylic acids containing a branched-chain structure and/or an odd number of carbon atoms; cyclic carboxylic acids, e. g. cycloaliphatic carboxylic acids or naphthenic acids; aromatic carboxylic acids, alkylaromatic carboxylic acids, aralkyl carboxylic acids, rosin acids; sulfonic acids, such as alkyl or aryl sulfonic acids, and the like.

I prefer to use esters of anhydroalkitols and fatty acids for the purposes of my invention.

Particularly suitable esters are derived from the unsaturated fatty acids, particularly oleic acid.

Either part or all of the free hydroxyl groups available for esterification in the anhydroalkitols can be esterified to produce products for the purposes of my invention. However, I have found that superior products are obtained when part only of the free hydroxyl groups in anhydroalkitols are esterified, and preservative and corrosion preventive lubricants containing partial esters, particularly mono-esters of anhydroalkitols constitute a preferred product of my invention.

Also useful for the purposes of my invention are the products obtained by reacting partial esters of anhydroalkitols with alkylene oxides, such as ethylene oxide or propylene oxide to produce polyoxyalkylene derivatives.

It will be appreciated that although a wide variety and large number of esters of anhydroalkitols are available for use in corrosion preventive lubricants and protective coatings, they are not all precisely equivalent. The choice of a particular ester for compounding in accordance with the principles of my invention, will depend on the nature of the base stocks, i. e. whether it is an oil, grease, wax, etc., the solubility of the particular ester in the selected base stock, the severity of service conditions which is contemplated, the costs involved, etc.

The esters which are useful for the purpose of my invention can be compounded with a wide variety of hydrocarbon lubricating oils, which may also contain additions of animal, vegetable or marine oils. The esters can also be compounded with lubricating greases, by which I means solid or gel-like dispersions of soaps in hydrocarbon lubricating oils, or with waxes, e. g. paraffin wax, petrolatum, or ester-type waxes.

In general, esters of anhydroalkitols can be compounded with base stocks in proportions in the range of about 0.5% to about 15% by weight, preferably about 1 to about 10% by weight, based on the total composition. It is generally preferable that the particular ester chosen for use be soluble in the base stock in the proportions which it is desired to use. In the event that the particular ester which it is desired to use is not sufficiently soluble in the base stock, the use of conventional solubilization or dispersion techniques may become necessary.

The following examples will serve to illustrate my invention:

Example 1

Sorbitan mono-oleate can be prepared, for example, by intramolecular dehydration and esterification of a three-fold molecular excess of technical sorbitol syrup with oleic acid from white oleine by treatment under a blanket of inert gas such as CO₂ at about 500° F. A rust preventive lubricating oil particularly adapted for the protection of aviation engines was prepared by dissolving 3.75% by weight of sorbitan mono-oleate in a lubricating oil having a viscosity index of about 95 and a viscosity of 120 seconds Saybolt Universal at 210° F. The rust preventive oil passed the humidity cabinet test described above, affording ample protection to sandblasted steel strips for 150 hours in a cabinet operating at 120° F. at 100% humidity. The rust preventive oil was likewise subjected to the hydrobromic acid test employing 0.2% hydrobromic acid in emulsion and swirling time of 60 seconds and found to afford sufficient protection.

Example 2

A rust preventive lubricant adapted for the protection and lubrication of internal combustion engines was prepared by compounding 5% by weight of sorbitan mono-oleate with 62% by weight of a lubricating oil having a viscosity of 47 seconds Saybolt Universal at 210° F. and 33% by weight of a lubricating oil having a viscosity of 94 seconds Saybolt Universal at 210° F. The compounded oil thus prepared passed a humidity cabinet test of 50 hours duration at 100° F. and 95-100% humidity, the air in the cabinet being circulated at the rate of 1-1.5 complete changes per hour. It likewise passed the hydrobromic acid test employing 0.1% aqueous hydrobromic acid in the emulsion and a swirling period of 60 seconds.

When tested in a spark ignition engine for six hours at about 2600 R. P. M. at a crankcase oil temperature of 250° F. it was found that there was less than 200 mg. loss per whole bearing, whereas a loss of 500 mg. is commonly tolerated in this type of product.

I have found that soaps of preferentially oil-soluble petroleum sulfonic acids constitute desirable addants to rust preventive lubricants and protective coatings containing esters of anhydroalkitols.

Petroleum sulfonates are soaps of sulfonic acids obtained by the treatment of petroleum oils with strong sulfuric acid, usually fuming sulfuric acid. The preferentially oil-soluble sulfonic acids remain dissolved in the acid-treated oil; they are commonly known as mahogany acids. Although a wide variety of mahogany soaps can be used for the purposes of this invention, I have found that they exhibit some variation in efficacy in my corrosion preventive lubricating compositions, depending on their method of preparation.

I have found that superior mahogany acids and soaps therefrom, for the purpose of this invention, can be produced by treating distillates of from about 50 seconds to about 1000 seconds or higher, and preferably from about 200 to about 400 seconds Saybolt Universal viscosity at 100° F. with from about 6 to about 9 pounds, and preferably from about 7 to about 8 pounds of concentrated sulfuric acid, preferably fuming sulfuric acid, per gallon of oil.

The method of obtaining these desirable soaps of preferentially oil-soluble sulfonic acids derived from petroleum oils is illustrated by the following example, which describes the preparation of a sodium soap.

A petroleum oil distillate having a Saybolt Universal viscosity at 100° F. of from about 200 seconds to about 850 seconds is treated with from about 7 to about 8 pounds of fuming sulfuric acid per gallon of oil in one-half pound increments or "dumps." After the acid sludge from each one-half pound acid "dump" is settled and withdrawn, the next one-half pound of fuming sulfuric acid is added to the oil. The temperature of the oil before the fuming acid is added thereto is maintained below about 60° F. but due to the heat of reaction upon the addition of the sulfuric acid, the temperature of the oil may rise to from about 90° F. to about 100° F. After the required total amount of fuming sulfuric acid has been added to the oil and the oil freed of acid sludge, the acid treated oil containing oil-soluble sulfonic acids dissolved therein, is neutralized with a solution of sodium hydroxide. The aqueous

alkali solution is then separated from the oil solution containing dissolved therein sodium soaps of sulfonic acids and the latter then separated from the oil by extraction with alcohol of about 60% strength. The alcohol layer containing dissolved sodium sulfonates is then separated from the oil and subsequently distilled to recover the alcohol and remove water. The crude sulfonic soap obtained in this manner contains from about 30% to about 60% sodium sulfonate, from about 30% to about 60% oil, from about 1% to about 10% water, and up to 10% of inorganic salts which may be removed by the procedure hereinafter described.

The above procedure may be modified after the acid sludge is removed from the acid-treated oil. The oil containing dissolved sulfonic acids is extracted with about 60% alcohol to remove the sulfonic acids which may then be neutralized with sodium hydroxide and subsequently freed of the alcohol by distillation.

The crude soaps of these preferentially oil-soluble sulfonic acids obtained by the procedure described above may be freed of inorganic salts by purification. This purification is preferably accomplished by dilution of the crude soap with from about $\frac{1}{2}$ to about 10 parts, preferably 1 to 2 parts of 50% or higher strength alcohol, preferably alcohol of 60 to 70% strength, and allowing the salts to settle while maintaining the mixture within the temperature range of 130 to 175° F., preferably 155 to 165° F. When the salts have settled the supernatant alcohol-soap layer is separated and the alcohol is recovered by conventional distillation procedure. By this method of purification the salt content of the crude sulfonic soap can be readily reduced to 5% or less, e. g., to about 3.5%.

Although I have described a specific method for the preparation of petroleum sulfonic acids suitable for the purposes of my invention, it should be understood that my invention is not restricted thereto, but that suitable organic sulfonates having similar properties can be used, however made.

Suitable soaps of preferentially oil-soluble petroleum sulfonic acids for the purposes of my invention include those of metals in groups I, II, III, IV, VI and VIII of the periodic table. Thus, for example, I can employ the sodium, potassium, lithium, calcium, barium, tin, lead, aluminum, chromium, cobalt and nickel soaps of preferentially oil-soluble petroleum sulfonic acids. I can also employ the ammonium, alkylammonium and alkylolamine soaps of preferentially oil-soluble petroleum sulfonic acids. It is not intended to imply that the wide variety of sulfonates mentioned above are exactly equivalent for the purpose of my corrosion preventive lubricating compositions. Because of their relative cheapness and high efficacy I prefer to use the sodium soaps, especially the sodium soaps of the preferred mahogany acids whose preparation has been described above.

The exact proportion of petroleum sulfonate to be used in my corrosion preventive lubricating compositions will vary with the particular sulfonate chosen for use and upon the severity of the service conditions which are anticipated. In general, I have found that a useful range of commercial petroleum sulfonate is about 5% to about 40%, the actual sulfonate soap content being in the range of about 2% to 16% based on the total composition, the remainder of the commercial

sulfonate being associated oil and a small proportion of mineral salts.

The following example is adduced to illustrate the use of a soap of preferentially oil-soluble petroleum sulfonic acid together with an ester of an anhydroalkitol to produce a preservative lubricant in accordance with my invention. All percentages are by weight.

Example 3

A rust preventive lubricant designed particularly for the lubrication and preservation of firearms, e. g. hand and machine guns, was prepared by compounding 5% of sorbitan monooleate and 5% of the sodium soap of a purified mahogany soap with 89.5% of a highly refined acid treated petroleum oil of about 56 seconds Saybolt Universal viscosity at 100° F. and 0.5% of a pour point depressant prepared by the chemical condensation of naphthalene and a chlorinated wax, e. g. as described in the following U. S. patents:

Patent No.	Patentee	Patent date
1,933,917	F. H. MacLaren	June 19, 1934
1,933,918	do	June 19, 1934
2,030,307	do	Feb. 11, 1936
2,057,104	F. H. MacLaren and T. E. Stockdale	Oct. 13, 1936
2,089,655	F. H. MacLaren	Aug. 10, 1937

The compounded oil passed a humidity cabinet test of 200 hours at 100° F. and 100% humidity, fresh saturated air being directed through the humidity cabinet at a rate between 1 and 1.5 complete changes per hour.

As an indication that the rust preventive oil was not itself corrosive, it was found that it did not discolor a bright copper strip to a greater extent than exposure to dry heat in an oven at 212° F. for three hours.

The compounded oil was applied to a 0.50 caliber M2 basic aircraft machine gun, the gun retained in a cold room at -70° F. for three hours and then 26 rounds fired at full automatic fire. No stoppages occurred during firing and an examination of the gun revealed that satisfactory lubrication was being obtained.

My novel rust preventive compositions may, in addition, contain polymeric thickeners, viscosity index improvers, oiliness agents, pour point depressants, antioxidants and other well known types of addition agents. Although the use of my rust preventive compositions for the protection of the interiors of internal combustion engines during storage has been emphasized, it is to be understood that they are applicable generally for the protection of metal surfaces, as in gun barrels and breeches, metal containers for petroleum products or other corrosive materials, idle machinery, finished machine parts and accessories, stand-by or emergency equipment, and the like. The novel antirust agents of my invention may be compounded with a wide variety of normally liquid, semi-solid or solid lubricating or other media.

I claim:

1. A rust preventive lubricant comprising a major proportion of a lubricating oil an ester of and minor corrosion inhibiting proportions of an anhydroalkitol and a carboxylic acid and an aliphatic soap of a preferentially oil-soluble petroleum sulfonic acid.

2. A composition comprising a minor corrosion inhibiting proportions of a partial ester of an anhydroalkitol and a fatty acid and a soap of a

preferentially oil-soluble petroleum sulfonic acid, and a major proportion of a lubricating oil.

3. A composition comprising a minor corrosion inhibiting proportions of a partial ester of an alkitan and a fatty acid and a soap of a preferentially oil-soluble sulfonic acid, and a major proportion of a lubricating oil.

4. The method of inhibiting the corrosion of a metal exposed to a corrosive environment which comprises coating said metal with a slushing compound comprising minor corrosion inhibiting proportions of an ester of a hexitan and an unsaturated fatty acid and a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from 6 to about 9 pounds of strong sulfuric acid per gallon of distillates and a major proportion of a hydrocarbon lubricating oil.

5. A rust preventive lubricating composition comprising a major proportion of a hydrocarbon lubricant and minor corrosion inhibiting proportions of an ester of an aliphatic carboxylic acid and an anhydroalkitol and a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from about 6 to about 9 pounds of strong sulfuric acid per gallon of distillate.

6. A rust preventive lubricating composition comprising a major proportion of a lubricating oil and minor corrosion inhibiting proportions of a partial ester of a fatty acid and a hexitan, and a soap of preferentially oil-soluble petroleum sulfonic acid.

7. A rust preventive lubricating composition comprising a major proportion of a lubricating oil and minor corrosion inhibiting proportions of a mono-ester of a hexitan and oleic acid and a soap of a preferentially oil-soluble petroleum sulfonic acid.

8. A rust preventive lubricating composition comprising about 5% of sorbitan mono-oleate, about 5% of a soap of a preferentially oil-soluble petroleum sulfonic acid, and a hydrocarbon lubricating oil.

9. A rust preventive lubricating composition comprising about 5% of sorbitan mono-oleate, about 5% of a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from about 6 to about 9 pounds of strong sulfuric acid per gallon of distillate, and a hydrocarbon lubricating oil.

10. A rust preventive lubricant comprising a major proportion of a lubricating oil, a minor corrosion inhibiting proportion of a partial ester of an anhydroalkitol and an aliphatic carboxylic acid, and a soap of a preferentially oil-soluble petroleum sulfonic acid.

11. A rust preventive lubricant comprising a major proportion of a lubricating oil, between about 0.5 and about 15% of a partial ester of an anhydroalkitol and an aliphatic carboxylic acid, and between about 5% and about 40% of a soap of a preferentially oil-soluble petroleum sulfonic acid.

12. A composition comprising a minor, corrosion inhibiting proportion of an ester of an anhydroalkitol and a fatty acid, a soap of a preferentially oil-soluble petroleum sulfonic acid, and a lubricating oil.

13. A composition comprising between about 0.5% and about 15% of an ester of an anhydroalkitol and a fatty acid, between about 5% and about 40% of a soap of a preferentially oil-soluble petroleum sulfonic acid, and a lubricating oil.

14. A composition comprising a minor, corrosion inhibiting proportion of an ester of an anhydroalkitol and an unsaturated fatty acid, a soap of a preferentially oil-soluble petroleum sulfonic acid, and a lubricating oil.

THOMAS E. SHARP.

Certificate of Correction

Patent No. 2,398,193.

April 9, 1946.

THOMAS E. SHARP

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, lines 68 to 71 inclusive, claim 1, strike out the words "an ester of and minor corrosion inhibiting proportions of an anhydroalkitol and a carboxylic acid and an aliphatic" and insert instead *and minor corrosion inhibiting proportions of an ester of an anhydroalkitol and an aliphatic carboxylic acid and a;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of June, A. D. 1946.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.

preferentially oil-soluble petroleum sulfonic acid, and a major proportion of a lubricating oil.

3. A composition comprising a minor corrosion inhibiting proportions of a partial ester of an alkitan and a fatty acid and a soap of a preferentially oil-soluble sulfonic acid, and a major proportion of a lubricating oil.

4. The method of inhibiting the corrosion of a metal exposed to a corrosive environment which comprises coating said metal with a slushing compound comprising minor corrosion inhibiting proportions of an ester of a hexitan and an unsaturated fatty acid and a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from 6 to about 9 pounds of strong sulfuric acid per gallon of distillates and a major proportion of a hydrocarbon lubricating oil.

5. A rust preventive lubricating composition comprising a major proportion of a hydrocarbon lubricant and minor corrosion inhibiting proportions of an ester of an aliphatic carboxylic acid and an anhydroalkitol and a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from about 6 to about 9 pounds of strong sulfuric acid per gallon of distillate.

6. A rust preventive lubricating composition comprising a major proportion of a lubricating oil and minor corrosion inhibiting proportions of a partial ester of a fatty acid and a hexitan, and a soap of preferentially oil-soluble petroleum sulfonic acid.

7. A rust preventive lubricating composition comprising a major proportion of a lubricating oil and minor corrosion inhibiting proportions of a mono-ester of a hexitan and oleic acid and a soap of a preferentially oil-soluble petroleum sulfonic acid.

8. A rust preventive lubricating composition comprising about 5% of sorbitan mono-oleate, about 5% of a soap of a preferentially oil-soluble petroleum sulfonic acid, and a hydrocarbon lubricating oil.

9. A rust preventive lubricating composition comprising about 5% of sorbitan mono-oleate, about 5% of a soap of a preferentially oil-soluble petroleum sulfonic acid produced by treating a petroleum distillate having a viscosity in the range of about 50 to about 1000 seconds Saybolt Universal at 100° F. with from about 6 to about 9 pounds of strong sulfuric acid per gallon of distillate, and a hydrocarbon lubricating oil.

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Signed and sealed this 4th day of June, A. D. 1946.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.