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1

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RUST PREVENTIVE COMPOSITION

Edgar A. Dieman, Crown Point, Ind., and Alf T. Swanson, Chicago Heights, Ill., assignors to Standard Oil Company, Chicago, Ill., a corporation of Indiana

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6 Claims. (Cl. 106—14)

This invention relates to improvements in corrosion inhibiting compositions otherwise known as slushing compounds, and more particularly is directed to dry film type corrosion inhibiting compositions for protecting metal surfaces, particularly those of ferrous and related metal or alloy products from rusting and from the corrosive action of air or oxygen in the presence of moisture or other aqueous liquids.

Metal surfaces whenever possible are protected from corrosion and/or rusting by a coating of some kind. In general, two types of protective coatings have been employed, namely permanent and temporary coatings. In the first class are included oxide coatings, phosphate coatings, paints, varnishes and other non-metallic materials which form dry, hard films. In the second class of protective coatings which are of the type which must at some time be readily removed from the surfaces they are protecting are those products prepared from oleaginous materials, such as petroleum oils, petrolatums, waxes, greases, asphalts, etc. While such products give satisfactory protection under certain conditions, under many conditions they do not provide the protection desired, and require the addition thereto of rust and/or corrosion inhibitors. Anti-rust or slushing compositions are used for the protection of metals either in the form of stock or fabricated articles against corrosion and/or rusting. Materials prior to storage should be coated with an anti-rust material to prevent corrosion and/or rusting while in storage; and finished or semi-finished metal stocks destined for shipment by rail or by water must be protected against attack by moisture by coating such materials with suitable anti-rust or slushing compounds. Materials for shipment overseas must be protected against attack by salt spray.

It is an object of the present invention to provide dry film type anti-rust compositions which will effectively prevent and/or inhibit corrosion of metal surfaces. Another object of the present invention is to provide improved slushing and/or anti-rust compositions of the dry film type.

In accordance with the present invention, the foregoing objects can be attained by employing slushing compositions comprising essentially from about 2% to about 30% sperm wax or hydrogenated sperm wax or mixtures thereof and from about 0.5% to about 10% of a surfactant compound, and from about 60% to about 97.5% of a normally liquid hydrocarbon diluent.

The sperm wax component is preferably a product obtained by crystallization at about 50° F. of the crude sperm oil, to obtain a sperm wax having the following approximate analysis:

| | |
|--------------------|----------|
| Iodine value | 20-35. |
| Saponification No. | 125-135. |
| Acid value | 4 max. |
| Unsaponifiables | 40-50%. |
| Cetyl alcohol | 50% max. |
| Melting point | 90° F. |

2

In place of the above sperm wax or in combination therewith, the hydrogenated sperm wax can be used. The hydrogenated sperm wax has the following approximate analysis:

| | |
|--------------------|-------------|
| 5 Iodine No. | 7.0 max. |
| Saponification No. | 125-135. |
| Acid value | 4 max. |
| Unsaponifiables | 40-50%. |
| Melting point | 115-125° F. |
| 10 Flash point | 485° F. |

The surfactant compound is preferably an alkaline earth sulfonate, preferably calcium mahogany soap, i.e. the calcium soap of a preferentially oil-soluble petroleum sulfonic acid; or an ester of an anhydroalkitol. The term "anhydroalkitol" designates a product of intramolecular dehydration of a polyhydric alcohol having at least four carbon atoms and at least four hydroxyl groups. Examples of such polyhydric alcohols are erythritols, pentitols, sorbitol, mannitol, hexitols, dulcitol, iditol, glucoheptitol, nonitols, talitol, etc. Such polyhydric alcohols undergo intramolecular dehydration to form the anhydroalkitols, which are polyhydric cyclic ethers. The esters are readily obtained by esterifying anhydroalkitols by conventional esterification procedures with a variety of acids such as fatty acids, aliphatic carboxylic acids containing a branched-chain structure and/or an odd number of carbon atoms. For the present invention, it is preferred to use the esters of anhydroalkitols and fatty acids having 8 to about 30 carbon atoms, per molecule such as for example, caproic, capric, lauric, palmitic, oleic, stearic, oleostearic, linoleic, dehydroxystearic, erucic and behenic acids. Examples of preferred esters are sorbitan mono-laureate, sorbitan mono-oleate.

15 The preferentially oil-soluble mahogany soaps of the alkaline earth metals are produced by treating petroleum distillates of between about 50 and 1000 seconds or higher Saybolt Universal viscosity at 100° F. and preferably between about 80 and 300 seconds SSU at 100° F. with between about 3 and 9 pounds, and preferably between about 3 and 6 pounds of concentrated sulfuric acid, preferably fuming sulfuric acid, per gallon of oil. The calcium soaps of preferentially oil-soluble mahogany acids are preferred, and the preparation thereof is illustrated by the following example.

20 A Mid-Continent petroleum distillate having a Saybolt Universal viscosity at 100° F. of between about 220-230 seconds is treated with 6 pounds of fuming sulphuric acid per gallon of oil in one-half pound dumps. After the separation of the acid sludge, the acid-treated oil is treated with a suitable alcohol, for example, ethanol, of about 60% strength, to remove crude petroleum sulphonic acid. The alcoholic layer containing the crude sulphonic acid is then treated with lime slurry to neutralize the petroleum sulphonic acid. The mixture is allowed to settle, the alcoholic layer containing the calcium mahogany soap is drawn off, and then passed to a distillation column wherein the alcohol is recovered. The resultant calcium mahogany soap is usually a 70-80% concentration in unreacted oil. To facilitate handling of the soap, it is preferred to further dilute the soap with a paraffinic oil having a viscosity of between about 80 and 85 seconds, SSU at 100° F. to a concentration of about 37%. The molecular weight of the sulfonate soap may lie in the range of 410 to 450 or about 430.

25 The normally liquid hydrocarbon diluent or solvent is suitably any aliphatic or aromatic hydrocarbon having a distillation range of from about 150° F. to about 450-500° F., for example, naphthas, kerosene, gas oil, benzene, toluene, xylenes, etc. A preferred diluent is a petroleum naphtha having an initial boiling point of about 300° F. and an end point of about 400° F., such

as a Stoddard's solvent. A suitable aromatic diluent is a product having a distillation range of from about 210° F. to about 310° F. and comprising about 90% C₈ aromatic hydrocarbons together with xylenes and ethyl benzene. For some uses it may be desirable to mix from about 2.0% to about 20.0% of a heavier liquid hydrocarbon with the lower boiling hydrocarbons, such as using a blend of Stoddard's solvent with a viscous hydrocarbon oil having a Saybolt Universal viscosity at 100° F. of from about 60 seconds to about 200 seconds.

The effectiveness of the herein described composition in inhibiting corrosion is demonstrated by the data in Table I. These data were obtained by subjecting sand blasted steel test panels coated with the various compositions to the humidity cabinet test and the time before rusting occurs noted in each instance.

In the humidity test the steel panels are suspended in a special cabinet described in the National Military Establishment specification designated JAN-H-792(6-21-49), and the time of initial corrosion of the panels noted. The humidity cabinet is provided with heating units and thermal regulators for automatic temperature control at 120° F. (±2° F.). A water level is maintained in the bottom of the cabinet to give approximately 100% humidity at all times. The steel panels are coated by dipping into the rust preventive material and are suspended in the cabinet by stainless steel or Monel hooks.

(Sample 4) or the samples with the sorbitan fatty acid ester without the sperm wax (Samples 5, and 11) gave protection of only 19 to 60 hours.

Percentages given herein and in the appended claims are weight percentages unless otherwise stated.

We claim:

1. A rust preventive composition consisting essentially of from about 2% to about 30% of a normal wax selected from the class consisting of sperm wax, hydrogenated sperm wax and mixtures thereof, from about 0.5% to about 10% of a surfactant selected from the class consisting of an alkaline earth soap of a preferentially oil-soluble petroleum sulfonic acid and a fatty acid ester of an anhydroalkitol, and from about 60% to about 97.5% of a hydrocarbon normally liquid diluent.
- 10 2. A composition as described in claim 1 in which the alkaline earth soap of a preferentially oil-soluble petroleum sulfonic acid is calcium mahogany soap.
- 15 3. A composition as described in claim 1 in which the fatty acid ester of an anhydroalkitol is a mono-fatty acid ester of sorbitol.
- 20 4. A composition as described in claim 1 in which the fatty acid ester of an anhydroalkitol is sorbitan monooleate.
- 25 5. A rust preventive composition consisting essentially of from about 2% to about 30% of a sperm wax, from about 0.5% to about 10% of a calcium mahogany soap,

Table I

| | Sample No. | | | | | | | | | | | | | |
|--|------------|-----|-----|-----|----|------|------|------|------|------|-----|------|-----|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Composition, percent: | | | | | | | | | | | | | | |
| Hydrogenated Sperm Wax ¹ | 5 | 5 | 5 | 0 | 0 | 5 | 5 | 10 | 5 | 5 | 0 | 0 | 10 | 10 |
| Sperm Wax ² | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 10 | 0 | 0 |
| Solvent | 95 | 90 | 90 | 95 | 95 | 90 | 90 | 85 | 85 | 87 | 97 | 87 | 85 | 80 |
| Calcium Mahogany Soap | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Mono-fatty acid ester of sorbitol ³ | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 5 | 0 | 3 | 3 | 3 | 0 | 0 |
| Hydrocarbon Oil ⁴ | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 |
| Protection in Hours | 16- | 16- | 16- | 19- | 60 | 570+ | 600+ | 600+ | 520+ | 520+ | 19- | 520+ | 16- | 520+ |

¹ Marketed as "Moby Dick Hi Wax 120" by Werner G. Smith, Inc.

² Marketed "Wax 90" by Werner G. Smith, Inc.

³ Marketed as "Atpet 100" by Atlas Powder Company.

⁴ Paraffin distillate oil Saybolt Universal viscosity at 100° F. of 80 seconds.

The synergistic effect of the combination of the sperm wax or the hydrogenated sperm wax and the alkaline earth mahogany soap or the anhydro-alkitol-ester (mono-fatty acid ester of sorbitan) is clearly demonstrated by comparison of Samples 1, 2, 3, 4, 5, 11, and 13 with Samples 6, 7, 9, 10, 12 and 14. It will be noted that whereas the compositions containing the hydrogenated sperm wax (Samples 1 and 3) or the hydrogenated sperm wax in combination with sperm wax (Sample 2) in the absence of the surfactant gave protection of only 16 hours, the combination of the sperm wax, hydrogenated sperm wax or combinations thereof with calcium mahogany soap (Samples 4, 9, and 14) or with the sorbitan mono-fatty acid ester (Samples 7, 8, 10, and 12) gave protection of 520+ to 600+ hours. The samples with the calcium mahogany soap without the sperm wax

and from about 60% to about 97.5% of a hydrocarbon diluent having a distillation range of from about 150° F. to about 500° F.

50 6. A rust preventive composition consisting essentially of from about 2% to about 30% of a sperm wax, from about 0.5% to about 10% of a mono-fatty acid ester of sorbitol, and from about 60% to about 97.5% of a hydrocarbon diluent having a distillation range of from about 150° F. to about 500° F.

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