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2,883,289

THIN FILM RUST PREVENTION

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This invention relates to a coating composition having rust preventive properties. More specifically, the invention relates to asphalt cutback rust preventive compositions which have been improved in rust preventive and water repellancy properties by inclusion therein of a minor proportion of a zirconium salt of an organic acid.

Solvent-cutback, hard film rust preventives are well known in the art. These are cold-applied compounds used for (1) the protection of metals exposed to a variety of outdoor weather conditions and (2) any general purpose preservation where a dry-to-touch film is desired. These materials generally contain an asphalt diluted with a petroleum solvent. The compounds are fluid in nature and may be applied to the metal surfaces to be protected by dipping, brushing or spraying. Upon evaporation of the solvent, a thin film, usually about 1 to 5 mils thick, remains on the metal parts to serve as protection against weathering, corrosive fumes, and the like.

It has now been found, and forms the subject of this invention, that zirconium salts of aliphatic monocarboxylic acids having 12 to 24 carbon atoms per molecule, are capable of materially improving the rust preventive properties of these asphalt solvent-cutback compositions. These zirconium salts when blended with a major amount of an asphalt solvent-cutback rust preventive, in proportions ranging from about 0.1 to 10.0% by weight, and preferably from 0.5 to 3.0% by weight, based on the total composition, materially increase the effectiveness of the rust preventive composition.

The asphalt cutback type rust preventive compositions of this invention therefore contain (1) a volatile solvent, (2) an asphaltic material capable of forming a film and (3) certain zirconium salts. Additional additives may also be incorporated, such as wetting agents, plasticizers or other corrosion inhibitors.

The cutback asphalt is prepared by blending a petroleum solvent with an asphalt. The asphalt may be any of the types of reduced and reduced and oxidized asphalts previously used in this service such as asphalts having a ring and ball softening point of about 150 to 250° F. (ASTM Method D5-25), and penetration values at 77° F. under a 100 gram needle load for five seconds, of about 5 to 50 (ASTM Method D-36). Best results are obtained from asphalts having softening points of about 160 to 200° F. and penetration values of 10 to 40.

This asphaltic base is diluted with a volatile solvent having the ability to dissolve the asphalt and which will readily evaporate from the composition after application to leave a thin hard film. Such a mixture of asphalt and solvent is often called an asphalt "cutback."

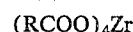
The rate of drying and the hardness of the asphalt film remaining are controlled by the proper selection of the base asphalt and the volatility of the solvent vehicle. For example, if a naphtha solvent is used, the resulting product is of the rapid-drying type, while if

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a kerosene fraction is used as the solvent vehicle, medium or slow-drying products result.

The solvent can be any normally liquid organic solvent such as hydrocarbon fractions having a boiling range of about 200 to 600° F., e.g. 200 to 400° F. Examples of suitable solvents are petroleum naphthas; aromatic petroleum solvents, such as toluene, xylene, pseudo cumene; kerosenes; and others, and combinations thereof. It is preferred to use aromatic hydrocarbon solvents, since they will form asphalt cutbacks which have less tendency to gel or increase in viscosity upon storage. Chlorinated hydrocarbon solvents may also be used such as chlorobenzene, trichloroethylene, ethylene dichloride, carbon tetrachloride, and others.

The zirconium salts used in the practice of the invention have the general formula:



wherein, R is a radical of an aliphatic monocarboxylic acid containing from 11 to 23 carbon atoms, preferably 15 to 19 carbon atoms per molecule. The high molecular weight aliphatic monocarboxylic acids or fatty acids used in preparing the zirconium salt may be either saturated or unsaturated. In general, the salts are prepared from monocarboxylic acids having from about 12 to 24 carbon atoms per molecule and preferably containing about 16 to 20 carbon atoms per molecule. Suitable aliphatic monocarboxylic or fatty acids include saturated fatty acids such as tridecoic, myristic acid, stearic acid, arachidic acid, behenic acid, and the like; unsaturated acids such as oleic acid, erucic acid, linoleic acid, linolenic acid and others. Hydroxy fatty acids such as 12-hydroxy stearic acid and ricinoleic acid may also be used. Naturally occurring fatty acids such as fish oil acids, tallow acid, coconut oil acids, castor oil acids, etc. may also be utilized either directly or after hydrogenation. Mixtures of these high molecular weight fatty acids, e.g. hydrogenated fish oil acids with oleic acid, in any proportion, are also operable.

Compositions of this invention will contain by weight about (a) 90.0 to 99.9% of cutback asphalt comprising about 30 to 70% of asphalt, e.g. 40 to 60%, and about 30 to 70% of a volatile solvent, e.g. 40 to 60%, and (b) 0.1 to 10.0% by weight of zirconium salt. A preferred composition will contain about 97 to 99.5% by weight of cutback asphalt and 0.5 to 3% by weight of the zirconium salt. Other additives may also be added. The invention is illustrated by the following examples:

EXAMPLE I

0.5% by weight of zirconium stearate was added to an asphaltic cutback (Base A), consisting of 50% by weight, of oxidized asphalt having a softening point of 183° F. (ASTM, ball and ring), a penetration of 27 at 77° F. (100 gm./5 seconds), prepared from a Lagunillas crude, and 50% by weight of a petroleum solvent containing 95.5 wt. percent aromatics and having a boiling range of 300–370° F.

EXAMPLE II

2.0% by weight of zirconium stearate was added to the same base stock used in Example I.

These samples were subjected to salt spray exposure tests, which measure the ability of a protective coating to prevent the corrosion of steel specimens exposed to a constant mist of brine.

These tests were carried out as follows: Two 2" x 4" steel panels polished with a 280 grit polish, were immersed in the samples for one minute, withdrawn at the rate of 4" per minute, and then allowed to dry at 77° F. for 24 hours. The panels were then placed in a salt spray cabinet, tested and evaluated in accordance with

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the procedure described in Military Specification MIL-C-16173A, which is a well recognized standard test procedure. In this test, the specimens are exposed to a continuous mist or spray of brine (20% sodium chloride in water) at 95° F. It is an extremely severe test for rust-preventive coatings. After 8 days' exposure in the salt spray cabinet, the panels were removed, rinsed in methanol, immersed in mineral spirits to remove the asphalt base film, and carefully examined for signs of corrosion.

Results of salt spray exposure tests on the composition of Examples I and II are shown in Table I below:

Table I

EFFECT OF ZIRCONIUM STEARATE ON THE RUST-Preventive PROPERTIES OF ASPHALT CUTBACKS

Example No.	Material Composition By Weight	Rusting of Steel Panels After 8 Days in Salt Spray Test
I	Base A..... 0.5% Zirconium Stearate and 99.5%, Base A.	Light, scattered rusting all over the steel panel. Trace, few dots of rust.
II	2.0% Zirconium Stearate and 98.0%, Base A.	No rusting.

As seen from the above table, the inclusion of zirconium stearate with the asphalt cutback materially improved the rust-preventive properties of the composition.

To compare the effectiveness of zirconium with other heavy metal organic salts, three other blends were prepared, one containing 2% by weight of zirconium stearate, one containing 2% by weight of chromium stearate and the third containing 2% by weight of lead stearate. The cutback asphalt (Base B) in these blends consisted of 54.7% of oxidized asphalt having a softening point of 166° F., 36.4% of a petroleum solvent naphtha having 19% aromatics and 8.9% of pure toluene. All three of these blends were tested for (1) homogeneity, (2) film appearance and (3) rust-preventive properties by the salt spray test previously described. Results of these tests are set forth in Table II below:

Table II

EFFECT OF METAL STEARATES ON THE HOMOGENEITY, FILM-FORMING AND SALT SPRAY RESISTANCE PROPERTIES OF ASPHALT CUTBACKS

Material Composition	Nature of Blend @ 77° F.	Appearance of Film on Polished Steel After 4 Hr. Drying at 77° F.	Amount of Corrosion on Polished Steel Panels at end of 8 days
Base B.....			
2 wt. percent Zirconium Stearate in Base B.....	Smooth, uniform.....	Continuous, smooth, glossy.....	Light-medium scattered rusting.
2 wt. percent Chromium Stearate in Base B.....	Appreciable settling.....	Lumpy, irregular.....	No rusting.
2 wt. percent Lead Stearate in Base B.....	do.....	Many specks, irregular film.....	Very heavy rusting (40-60%) of total surface rusted.
			Light rusting, scattered pin-point rust dots.

In considering the results of Table II above, it will be noted that the zirconium stearate blend was smooth and uniform, while the chromium and lead stearates settled out of the composition. This settling is particularly undesirable since it interferes with the commonly-used spray method for applying these rust-preventive compositions to metal surfaces. In addition, the lead and chromium salts cause undesirable gelling or thickening of the asphalt base.

While the zirconium stearate gave a smooth film, the films formed by the chromium and lead stearates were irregular. A continuous, more regular protective coating is more desirable from the standpoint of protection against corrosion. This point is further illustrated by the salt spray data. In the salt spray test only the zirconium stearate effectively improved the rust-preventive properties of the asphaltic film. The addition of the

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chromium stearate actually had a detrimental effect on the rust-preventive properties of the film.

In addition, the inclusion of the zirconium salt in the asphalt cutbacks had no adverse effects on other desirable properties of this type of rust-preventive, such as drying time, low temperature adhesion to metal surfaces and storage stability.

What is claimed is:

1. A coating composition adapted to prevent rusting consisting essentially of a major proportion of a cutback asphalt and from about 0.1 to 10.0 wt. percent of a zirconium salt of an aliphatic monocarboxylic acid having about 12 to 24 carbon atoms per molecule.

2. A hard film rust-preventive composition comprising about (a) 90 to 99.9 wt. percent of a cutback asphalt comprising about 30 to 70% by weight of an asphalt having a softening point of from 150 to 250° F., 30 to 70 weight percent of a volatile solvent; and (b) from about 0.1 to 10% by weight of a zirconium salt of an aliphatic monocarboxylic acid having from about 12 to 24 carbon atoms per molecule.

3. A hard film rust-preventive composition according to claim 2, wherein said zirconium salt is present in amounts of about 0.5 to 3% by weight, based on the total composition.

4. A hard film rust preventive composition according to claim 2 wherein said monocarboxylic acid contains about 16 to 20 carbon atoms per molecule.

5. A hard film rust-preventive composition which comprises about (a) 97.0 to 99.5% by weight, of a cutback asphalt comprising about 40 to 60% by weight of an asphalt, selected from the group of reduced and oxidized asphalts, having a softening point of about 160 to 200° F., and about 40 to 60% by weight, of a volatile petroleum hydrocarbon solvent having a boiling range of about 200 to 600° F., and 0.5 to 3.0 weight percent of a zirconium salt of an aliphatic monocarboxylic acid, containing from about 12 to 24 carbon atoms per molecule.

6. A rust preventive composition according to claim 5 wherein said aliphatic monocarboxylic acid contains from 16 to 20 carbon atoms per molecule.

7. A rust preventive composition according to claim 5 wherein said zirconium salt is zirconium stearate.

8. An improved process for protecting metal surfaces from corrosion, which comprises coating said metal parts with a rust-preventive composition which is about 90.0 to 99.9%, by weight, of an asphalt cutback and about 0.1 to 10.0% by weight, of a zirconium salt of an aliphatic, monocarboxylic acid having about 12 to 24 carbon atoms per molecule.

References Cited in the file of this patent

UNITED STATES PATENTS

2,132,997	Plechner	Oct. 11, 1938
2,573,878	Schiermeier et al.	Nov. 6, 1951
2,587,777	Smith	Mar. 4, 1952