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ENGINE CORROSION PREVENTIVE

William Henry Adams and William Denis Ervine, Kingston, England, assignors to Standard Oil Development Company, a corporation of Delaware

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The present invention relates to improved corrosion preventive compositions which may be applied to metal surfaces, especially ferrous metal surfaces, to form protective coatings.

The invention is particularly concerned with the production of wax-containing compositions which have good adhesion properties when applied to metal surfaces.

It is well known that internal combustion engines, when left idle for extended periods after use, suffer corrosion particularly of the cylinder walls, piston and cylinder head. In consequence the use of corrosion inhibiting oils containing oil-soluble corrosion inhibitors has been widely practised, but difficulty has been experienced due to draining of the protective film and it has been proposed to add waxes to the corrosion preventive composition to give the film greater mechanical strength. Such wax-thickened oils have in practice been blended with a volatile solvent or solvents to enable the composition to be sprayed into the engine cylinders.

After evaporation of the volatile solvent, the waxy film should form a protective coating over the whole of the exposed metal surface, but it has been found that the film frequently cracks and even, in some cases, slips bodily over the surface exposing part of it to corrosion.

It has now been discovered that the structure of the wax coating may be modified by the addition to the wax of minor proportions of well known types of pour point depressor which are conventionally used with lubricating oils, together with a high molecular weight polyiso-olefin. The effects of these wax modifiers are such that the adherence of the coating to the metal is greatly improved and the tendency to crack or craze is greatly reduced.

Accordingly the invention provides an improved corrosion inhibiting composition comprising as the more essential ingredients a wax-based corrosion preventive having incorporated therein minor proportions of a pour point depressor and a polyiso-olefin of molecular weight between 20,000 and 200,000.

The pour point depressor is preferably a Friedel-Crafts condensation product of the halogenated long-chain hydrocarbon and aromatic type, e. g. a chlorinated paraffin wax and naphthalene but other known and generally equivalent pour point depressors such as chlorinated wax-phenol compounds may be used.

The polyiso-olefin to be used may be any C_3 to C_{14} iso-olefin polymer having a molecular weight between 20,000 and 200,000 but is preferably a

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polyisobutylene and preferably has a molecular weight between 40,000 and 100,000. The copolymers of similar properties, such as "Butyl" rubber, which is a copolymer predominantly of isobutylene with small proportions of a multiolefin such as isoprene, may be used for the same purposes.

The wax-containing corrosion preventive may comprise essentially a de-oiled petrolatum wax, i. e., a microcrystalline petroleum wax, a volatile solvent in which the wax is sparingly soluble at room temperature and readily soluble when hot, a lubricating oil and, usually but not always necessarily, minor proportions of conventional corrosion inhibitors.

The composition may be prepared by melting the wax together with the pour point depressor, the polyiso-olefin, the lubricating oil and corrosion inhibitors, dissolving this mixture in the moderately heated volatile solvent and chilling the solution rapidly and with agitation. This allows the formation of a suspension of microcrystalline wax of very fine particle size having a good degree of stability.

The wax used should preferably be a hard de-oiled petroleum wax such as a microcrystalline petroleum wax having a melting point in the range 135 to 210° F. and one having a melting point between 180 and 200° F. is preferred.

The solvent may be any volatile solvent boiling, for example, in the range 40 to 190° C. and in which the wax is sparingly soluble at room temperature and readily soluble at higher temperatures but it is preferred that a hydrocarbon solvent be used and it is most convenient that the solvent chosen should have a boiling range between 70 and 120° C.

Minor proportions of lubricating oil, preferably of mineral base, such as an aircraft engine oil, should also be incorporated, together with any of the corrosion inhibitors conventionally used in protective compositions of this type. These improve the texture of the coating and enhance corrosion prevention.

Examples of conventional corrosion inhibitors are the alkali-metal and alkaline earth metal oil-soluble petroleum sulphonates, particularly sodium petroleum sulphonates, and animal fatty materials such as lanoline or wool-grease, and mixtures thereof, as described in the U. S. patent to Lebo, No. 2,182,992.

The preferred proportions to be used in preparing the compositions are from 1 to 10 parts by weight of the wax, preferably 3 to 8 parts, 3 to 15 parts by weight of lubricating oil, preferably 5 to

10 parts, 0.01 to 0.05 part by weight of polyiso-olefin, 0.05 to 5.0 parts by weight pour point depressor, preferably about 0.2 to 1 part, and 0.5 to 2.0 parts by weight of combined corrosion inhibitor. A volatile solvent should be added in proportions of about 10 to 100 parts by weight, proportions of 50 to 100 parts being preferred for spraying and lesser quantities such as 20 to 50 parts for other methods of application.

An example of a composition made in accordance with this invention is as follows, the percentages being by weight in each case:

83.8% solvent (a petroleum spirit or naphtha having a boiling range of from 90 to 103° C. and density of .722 at 60° F. containing about 11.5% by weight of aromatic hydrocarbons).
5.0% amber microcrystalline wax (melting point 180–200° F.)
8.5% aircraft engine oil.
1.0% sodium petroleum sulphonates of about 400 to 450 molecular weight.
0.5% lanoline (degras).
1.0% chlorinated paraffin wax/naphthalene condensation product (conventional pour depressant for waxy oils). (This is a 17.5% solution in mineral oil—actual condensation product is 0.175%.)
0.2% polyisobutylene (M. W. 40,000–100,000) in 10% oil solution.

In one series of tests the inside surfaces of a number of aircraft engine cylinder sleeves were sprayed at room temperature with the above composition. Each sleeve was dry and free from oil and the piston was fitted into the sleeve, the spraying being done through the orifices.

In order that the conditions should simulate as much as possible those encountered in workshops, some of the sleeves were sprayed with the piston at top dead-centre and some were sprayed with the piston at the bottom dead-centre and some of each were allowed to remain as they were while others had the pistons moved from top to bottom or from bottom to top after the spraying.

In some cases a single charge of 5 ccs. of the composition was sprayed onto the surface of each cylinder sleeve while in other cases two charges each of 5 ccs. were sprayed.

The sprayed cylinder sleeves were then stored together with some unsprayed sleeves in a partially open shed where they were exposed to a dusty atmosphere although being shielded from direct sunlight. After five months the sleeves were examined. The unsprayed sleeves were heavily rusted but the sprayed areas were wholly free from rust except in one case where slight spotting had occurred due to water dripping onto the sleeve from the roof of the shed.

Where some sleeves had some areas sprayed and other areas left unsprayed, the demarcation line between the sprayed and unsprayed areas was very marked.

It was found that equal protection was given by the single spraying and by the double spraying and there was no deterioration in the sleeves where the piston had been moved after spraying.

Other tests were carried out under different conditions, that is:

(1) At room temperatures using cylinders the inside surfaces of which had been coated with oil.
(2) At a temperature of 50° C. using cylinders the inside surfaces of which were dry and free from oil.

(3) At a temperature of 50° C. using cylinders the inside surfaces of which had been coated with oil.

In each case the protective coating formed was found to be uniform and firm. After standing for several months there was no sign of cracking or crazing of the wax surface and no sign of any slippage. The composition prepared in accordance with this invention gave complete protection during accelerated corrosion tests under conditions shown to cause extensive corrosion of the unprotected metal.

Obviously the proportions of the various ingredients may be varied within the limits set forth above, and conventional modifiers, such as sodium nitrite, antioxidants such as the phenyl amines, etc., may be included if desired. Also, while it is suggested above that the compositions of this invention are particularly suitable for spraying into internal combustion engines, it will be obvious that they may be applied in various ways to various types of metal surfaces to protect them from rusting or other forms of oxidation or corrosion.

What is claimed is:

1. A coating composition for protecting metal surfaces against corrosion, comprising about 1 to 10 parts by weight of microcrystalline wax, 3 to 15 parts of lubricating oil, 0.01 to 0.05 part of a polyiso-olefin, and 0.05 to 5 parts of a pour depressor for waxy oils, said pour depressor being a condensation product of a chlorinated long chain hydrocarbon with an aromatic compound selected from the group consisting of naphthalene and phenol.

2. Composition according to claim 1 to which is added a corrosion inhibitor comprising an oil soluble sulfonate.

3. A rust preventing composition for ferrous metals, comprising 1 to 10 parts by weight of microcrystalline wax, 3 to 15 parts of lubricating oil, 0.01 to 0.05 part of a C_3 to C_{14} polyiso-olefin of molecular weight between 20,000 and 200,000, 0.05 to 5 parts of a pour depressor for waxy oils, said pour depressor being a condensation product of a chlorinated wax with an aromatic compound selected from the group consisting of naphthalene and phenol and a volatile solvent in sufficient proportions to thin the composition to convenient thickness for application to the surface to be protected.

4. A composition consisting essentially of 1 to 10 parts by weight of microcrystalline wax of melting point between 135° and 210° F., 3 to 15 parts of mineral base lubricating oil, 0.01 to 0.05 part of a predominantly isobutylene polymer of molecular weight between 20,000 and 200,000, 0.05 to 5 parts of the Friedel-Crafts condensation product of chlorinated wax and naphthalene, 0.5 to 2 parts of a corrosion inhibitor comprising oil soluble metal petroleum sulfonate and lanoline, and 20 to 100 parts of a hydrocarbon solvent having a boiling point between 40° and 190° C.

5. A composition consisting essentially of 3 to 8 parts by weight of microcrystalline wax having a melting point between 180° and 200° F., 5 to 10 parts of mineral base lubricating oil, 0.01 to 0.05 part of polyisobutylene, 0.2 to 1.0 part of the Friedel-Crafts condensation product of chlorinated wax and naphthalene, 0.5 to 2.0 parts of a combination of oil soluble sodium sulfonate and degras, and 50 to 100 parts of a hydrocarbon solvent having a boiling point between 70° and 120° C.

6. A composition consisting essentially of

about 84% by weight of petroleum hydrocarbon boiling between 90° and 103° C., 5% microcrystalline wax melting between 180° and 200° F., 8.5% mineral lubricating oil, 1% soluble sodium sulfonate, 0.5% degras, .175% chlorinated wax—naphthalene condensation product pour point depressor, and 0.02% polyisobutylene of 40,000 to 100,000 molecular weight.

WILLIAM HENRY ADAMS.
WILLIAM DENIS ERVINE.

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